Model Code Framework for the Decentralized Wastewater Infrastructure

VOLUME I

WORKBOOK FOR WRITING THE CODE

NOWRA
National Onsite Wastewater Recycling Association

March 2007

IMPORTANT NOTE

The Model Code Framework for the Decentralized Wastewater Infrastructure remains a work in progress. Its three major elements are code structure, user guidance, and evaluation of treatment components. While each element can stand alone, the three are intended to work together. Volume I and Volume II—essentially completed at this time—represent, respectively, the first two elements; they are particularly important because they address specific code issues and policy options. The tools for evaluating the performance of confined treatment components (pretreatment) and the unconfined-soil component remain in development.

The protocol for evaluating the pretreatment components—currently under beta testing by the Florida Department of Health (FDOH)—is near completion. The joint objectives of NOWRA and FDOH are to (1) perfect the evaluation protocol and the performance classification matrices, (2) have FDOH and NOWRA jointly administer the protocol, and (3) have FDOH incorporate the protocol into the Florida state code.

The protocol for evaluating the unconfined-soil component has been more difficult to develop and is about half-way to completion. Work on documents concerned with the scientific aspects is complete; the implementation document is still in development. The completed soil-evaluation/classification documents should be available at the next NOWRA Annual Conference.

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PREFACE

Including establishment of critical definitions and concepts

The philosophical and technological Framework envisioned by NOWRA to mold a regulatory code for decentralized wastewater infrastructure is realized in the *Workbook for Writing the Code* that starts on page 1 of this volume. A Volume II, *Code Design Philosophy and Guidance*, supports the Workbook volume. Encapsulations of material from Volume II appear throughout the Workbook, appropriately placed to serve as immediate guidance on the subject matter. (See "secondary element" below.)

The *Workbook* is a tool intended to be used by state regulatory personnel for writing their state's **Code for Decentralized Wastewater Infrastructure**. It guides them through the process of writing a code that regulates the performance and management of decentralized wastewater infrastructure and promotes the achievement of ultimate goals of water-resource management.

In the context of the code's generic title suggested in the preceding paragraph, the following definitions apply:

- "Decentralized" means, with reference to, the wastewater collected, treated, and returned to the environment near the point of origin.
- "Infrastructure" means physical components and systems and the management thereof.

Details of water-resource management ideally will vary in goals and practice across the relatively large geographical area (the whole state) to which the code will apply. As a means of working toward achieving that ideal, the traditional "prescriptive" approach to code design is defective—it tends to promote state-wide prescription of fixed remedies based on the statewide problems. Furthermore, the prescriptive approach inhibits deployment of new technologies because code revisions are needed to permit their general use. Time between prescriptive code revisions is often in the range of five to twenty-five years.

To address these defects, the NOWRA Framework's approach to code design embraces the principle of "informed choice" and the flexibility in code writing and delegation of authority that it promotes. "Informed choice" means that policy makers and citizens at all affected levels participate in setting and applying regulations; they understand the regulatory options and the benefits and costs associated with each option. In the subject case, it means specifically that they have the knowledge to shape the management of human and environmental benefits and risks that are associated with using decentralized wastewater recycling in their community. This process maximizes the value of regulation by balancing benefits, costs, and risks at levels appropriate to the immediate community. Moreover, it tends to facilitate

alignment of the sometimes contentious agendas of politicians, regulators, industry leaders, homeowners, and the general public. The performance code design also promotes the establishment of performance standards. Treatment systems are evaluated; if they meet the standard, they are authorized for general use without the need for a code revision.

With the overall end of protecting public health and environmental resources effectively and efficiently, the *Workbook* focuses the code writers on the following specific objectives:

- Providing access to an affordable wastewater-treatment method and management structure for the owner of any site that meets the local and state laws governing development;
- Assessing the local risks and cost/benefit ratios associated with the use of decentralized wastewater-treatment systems;
- Adopting reasonable and responsive performance requirements for decentralized wastewater-treatment systems;
- Adopting management practices that prolong the life of decentralized wastewater-treatment systems and preserve property values;
- Ensuring professional competency through national certification programs and local training programs for personnel engaged in the decentralized wastewater-treatment industry; and
- Using a national uniform classification process for components of decentralized wastewater-treatment systems instead of using local and state evaluation programs.

The *Workbook* has two elements: a primary and a secondary.

The **primary element** is the suggested standard text, numbered by Chapter and Section and interspersed with places for the insertion of nonstandard text peculiar to the writer's jurisdiction or optional code language. Square brackets [ ] in the text denote places where nonstandard text is to be inserted. The nature of that text is identified within the brackets. The primary element is set in serif type with flush-right margins, using the full page width —similar in appearance to this paragraph.

> The **secondary element** comprises, as a whole, a series of explanatory, instructional, or background notes. Each discrete note is inserted immediately after the text to which it refers in the primary element. The notes are set in sans-serif type with a ragged right margin, indented on both sides, with a grey bar in the left margin—similar in appearance to this paragraph.

WORKBOOK

FOR WRITING THE CODE

[*name of state*] Code for Decentralized Wastewater Infrastructure

Effective Date: [*effective date*]

[*Name of writing agency*]

[*Address, contact information, etc.*]

LIST OF CHAPTERS AND SECTIONS

CHAPTER 1

INTRODUCTORY TOPICS

1.1 TITLE

These regulations shall be known as the [*name of state*] Code for Decentralized Wastewater Infrastructure (the code).

1.2 AUTHORIZING LEGISLATION

The code is authorized under the provisions of [*enabling legislation*] and created, administered, and enforced by the state Department of [*name of the department*] (the Department).

1.3 PURPOSE AND INTENT

The purpose of the code is to regulate the treatment, dispersal, and reuse of wastewater from structures not served by centralized treatment systems. It is intended to serve the best interests of the citizens. To that end, it manages risk to public health, public safety, and the natural environment and promotes public welfare in a manner acceptable to the public.

> The term "manages risk" is used rather than "eliminates or minimizes risk" because complete risk elimination is impracticable and risk-reduction measures cannot be deployed without regard for cost. The term "in a manner acceptable to the public" is included because the degree of risk reduction is a function of the public's perception of the costs and benefits of the code.
>
> "Costs" are regulatory fees, time delays, visually objectionable features, installation and operating costs, and restrictions on property use experienced by the affected property owner and neighbor.
>
> "Benefits" are the perceived and actual risk reductions to human and natural environments in areas such as nuisance control, health protection, and environmental protection. Protection of the owner's and neighbor's property values is another important benefit.
>
> The extent of applied regulation is largely determined by a process whereby the body politic weighs perceived costs and benefits and selects the optimum combination. Like setting speed limits on city streets, that process does not result in a

no-risk condition—just an acceptable-risk condition. "Body politic" means the combined interaction of individuals and groups within the political process that influences the contents of the code and the administrative and enforcement practices. Because the creation of the code and enforcement of the code are functions of different political forces, gaps between the law and the enforcement frequently emerge. While in practice those gaps may be politically useful for moderating the effects of overzealous or poorly constructed code language, they tend to create disrespect for the law and conditions for corruption and selective enforcement. An objective of the code must be to create conditions that minimize those gaps.

1.4 STATE/LOCAL RESPONSIBILITIES

The code is intended to be a **state** code in all matters that it regulates, except that **local governments** are granted certain discretionary responsibility for setting regulatory requirements and policy on a locality-by-locality basis in the following areas (see also Section 1.13.1, Delegation of Authority):

- Performance standards for effluent from decentralized wastewater-treatment trains
- Levels of system inspection, preventive maintenance, and monitoring required to manage the risk of the occurrence of a system malfunction that results in the release of non-compliant effluent.

Exercise of these discretionary powers shall not result in jurisdiction-wide pollution abatement that is less than that required by the code.

The burden of documenting the risk and effectiveness of the risk-reduction measures imposed by the code lies with the regulatory agency.

The code is structured to support the Total Maximum Daily Load (TMDL) process whereby government regulates various sources of pollution affecting surface waters. The sources of pollution that should be considered for regulation include, but are not limited too, municipal wastewater, stormwater, human induced atmospheric deposition, agricultural- and urban-applied fertilizers, farm-animal manure, crops that fix nitrogen, soil erosion, and decentralized wastewater-treatment systems. Because the mix of sources varies from area to area, the intent of this provision is to allocate responsibility for determining performance and management standards for decentralized wastewater-treatment systems to the level of government that will be most effective in making and enforcing decisions regarding TMDL pollution-abatement allocation. In most states, that level of government is municipal, county, or regional. However, those decisions may have ramifications that impinge on neighboring jurisdictions—watersheds do not respect lines of political jurisdiction. Consequently, state-level government will often play a coordinating role.

1.5 FOCUS

The code is focused on the output performance of individual wastewater-treatment systems in terms of effluent quality. Required output performance is linked to the risk conditions associated with individual sites.

A site's risk condition is partly determined by the requirements set by local or area governments based on the expected quality of surface and subsurface water. Since the sources of pollution of water are many, those government entities must allocate responsibility for pollution reduction to the various sources through imposition of performance requirements. Whether decentralized wastewater-treatment systems are a minor or major contributor of a specific pollutant may vary from one area to another. Because of this possibility, the government body that has the responsibility for allocating reduction requirements among the different sources must control the adoption of quality standards for decentralized wastewater-treatment standards.

1.6 COSTS

The state recognizes that the code may have cost implications for the public and may restrict citizens' choices and opportunities. Consequently, the code's requirements will be established at minimum levels consistent with their achieving the necessary reduction in risk to health and safety for the targeted human and natural environments.

Cost is one half of the political calculation of cost/benefit value that influences the level of code requirements and applied enforcement. For any level of benefit, as costs increase, the political resistance increases, reducing the likelihood that the requirement will be adopted or, if adopted, will be enforced. In other words, minimizing costs maximizes the likelihood that the benefits goal will be achieved. A code that applies state-wide standards rather than focused applications and uses inefficient methods for evaluating/approving designs and products will increase costs relative to benefits. For example, if risk conditions determine that only 25% of a state's wastewater-treatment systems require nitrate-reduction processes but state imposes that requirement statewide, resistance to the unneeded costs from the 75% innocent property owners is likely to block passage of the rule.

1.7 REASONABLENESS

The provisions of the code and their enforcement are intended to be reasonable. To that end, the following standards are set:

1. The requirements imposed will be minimally necessary to manage the known or reasonably anticipated risks to human and natural environments.
2. Each code provision will be drafted in a manner that makes the obligation clear to the regulated persons.
3. Each code provision will be accompanied by a statement of its purpose in language that facilitates communication and the development of alternate methods of compliance.
4. Code requirements will be based on accepted management, science, and engineering principals. In cases where the science and engineering considerations are not settled, the code will be based on the best judgment of committees of experienced and expert persons in each area of practice.

Administrative codes have the full force and effect of law. The reasonableness of rules is a serious consideration for several reasons:

- Under reasonableness and equal-protection standards, the Constitution requires that laws be clear and enforced without discrimination.

- In a democracy, a law's reasonableness is subject to review by the political process. Reasonable rules are accepted politically; unreasonable rules, if enforced, are modified as a result of political feedback. Unreasonable rules can remain unchallenged if not enforced or if enforced selectively or weakly.

The task then is to define "reasonable rules." Basic standards for reasonable rules as applied to decentralized wastewater-treatment codes are as follows:

- Rules must be in written form and formally promulgated.
- Rules must be clear. The persons that are required to comply must be able to read the rules and must be able to understand the actions needed to comply.
- Rules must be enforced without invidious discrimination—equal treatment.
- Decisions to enforce must be based on clearly determined violations.
- Rule enforcement must emphasize education to ensure that the rules are known and understood. Punitive actions must be reserved for non-compliance after an obligation is known.
- Time for processing applications and permits must be short—within the range of that needed by service vendors operating in a competitive market.
- The authority, accountability, and responsibilities of participants in the decentralized wastewater-treatment industry must be clearly articulated.
- Regulatory personnel must have no conflict of interest in the performance of their duties.

1.8 WASTEWATER-TREATMENT OR -MANAGEMENT OPTIONS FOR EVERY SITE

The code is intended to provide decentralized wastewater-treatment or -management options for all owners of building sites that are not served by any other system of wastewater conveyance and treatment.

The objective of the decentralized wastewater-treatment industry is to ensure that an effective and efficient method of wastewater management is available to every site where construction of a building is allowed under law. In some communities, access to treatment technology is formally or constructively denied to citizens for the purpose of preventing construction of buildings. This tactic is commonly invoked in the name of land-use control. Constructive denial includes regulation that unnecessarily drives the cost of installing and operating the system to a level that most citizens are unwilling to pay. That practice subverts the intent of both land-use regulation and decentralized wastewater-treatment regulation. It prevents the construction of homes on land that planning and zoning agencies deem appropriate for construction. De facto zoning through manipulation of the decentralized wastewater-treatment code denies citizens access to the process and appeal rights that accompany zoning laws. The development of a broad range of onsite treatment technologies and the deployment of cluster designs means that all land areas can be provided with service.

1.9 EQUIPMENT EVALUATION

Recognizing that standard designs and components for decentralized wastewater treatment systems are deployed in regional and national markets, this code supports

a national evaluation program and a multi-level classification system based on performance. The purpose is to eliminate duplicative product-evaluation and -approval programs at state and county levels, while supporting state and local government discretion in selection of performance standards to match local risk conditions.

> The purpose of a national evaluation and listing system is to improve the effectiveness and efficiency of the process of gaining product approval. Currently, many states operate product- and design-approval evaluations that are unique to the state. They often require the applicant to install and test systems in the state under a state experimental protocol, ignoring both the product and use approvals already granted in other states and the data collected to support those approvals. They may require a five-year evaluation program for systems that have been in long-term use in other states. The consequent high equipment-approval costs and choking of robust competition combine to reduce the overall affordability of a treatment system and increase political resistance to regulation.

1.10 ESSENTIALITY OF MAINTENANCE

The code recognizes that decentralized wastewater-treatment systems need to be maintained in a manner that assures that they continue to provide effective treatment over their predicted lifetimes.

> Capable maintenance is critical to the satisfactory performance of a wastewater-treatment system. Failure to provide it negates the intent of the code by which the system was approved and wastes the regulatory effort.

1.11 SUSTAINABLE PERFORMANCE

The code recognizes that decentralized wastewater-treatment systems are part of the continuum of water provision, conditioning, conveyance, and waste treatment for the communities that they serve. They are the permanent infrastructures for wastewater treatment for about a quarter of the population and nearly a third of new construction. Consequently, it is critical to the welfare of a large segment of the population that the performance levels of decentralized wastewater-treatment systems be sustainable for as long as the sites they serve are occupied.

> Decentralized wastewater-treatment systems support buildings that can have life expectancies of a century or more. The treatment systems must provide corresponding longevity, first by quality maintenance, then by repair, rejuvenation, or replacement as the situation dictates.

1.12 COMPONENT LOCATION

To allow for flexibility in design, the code recognizes that decentralized wastewater-treatment and -transfer components can be located inside or outside the structure served.

> There are advantages and disadvantages to locating components of decentralized wastewater-treatment systems inside the structures they serve. The advantages of interior location are:
>
> - Components are not subject to the external pressures of buried structures.

- Material degradation caused by chemical and electrical reactions with the soil environment is reduced or eliminated.
- Components are not subject to groundwater and stormwater infiltration.
- Components in tempered spaces are not exposed to the cooling effect of contact with cold or freezing soil. (Higher wastewater temperatures promote treatment and reduce the potential of freezing of external components.)

A disadvantage of interior location is the requirement that materials and venting conform to a plumbing code.

1.13 DELEGATION OF AUTHORITY

Governmental and private-sector organizations or persons may be authorized as agents of the state to administer and enforce the code.

Many state codes are administered by governmental entities (e.g., county government) or private-sector entities. Delegation needs to be explicit.

1.13.1 Governmental Entity

The following governmental entity:

[*General class of government (e.g., local; county; township) or full legal name (e.g., Board of Commissioners of Xyab County, Maryland)*]

is granted authority as agent of the state in the following matters:

- **Adopting the Code**. The agent may adopt, administer, and enforce the code by means of employees or appointed agents who possess the qualifications required by the code.
- **Adopting More Stringent Requirements**. The agent may selectively adopt more stringent requirements than those prescribed in the code in limited code areas and use them in focused application in the following regulatory matters:
  - Final effluent performance standards (requirements may be adjusted to reflect the particular human and natural conditions occurring within selected localities of the jurisdiction).
  - Operational, maintenance, inspection, and repair requirements to enhance risk management (requirements may be adjusted to reflect the particular levels of risk and other circumstances occurring within selected localities of the jurisdiction). [*Name specific areas where discretion is allowed.*]

The option for adopting "more stringent" requirements than those of the state code is included to allow local governments to focus their pollution-abatement tactics most efficiently and equitably in the localities they know to be the highest contributors to the total pollution load of their jurisdiction

This is one of several intertwined topics addressed in other sections of this document. The issues include:

- Which regulatory topics should be applied statewide or countywide and which should be applied in a focused manner?

- Which level of government should have the authority to write rules on the various code topics?
- Which level of government is best able to focus requirements that address differing site and regional risk conditions?
- Should state codes adopt statewide requirements based on managing statewide minimum-risk conditions or should they adopt statewide requirements based on managing high-risks conditions found at a few sites in the state? In both situations: How does the code manage risk at sites that do not have the same risk conditions as those targeted by the statewide standards? Where the statewide standard targets the higher risk level, does the state permit local codes to adopt lesser standards for low risk sites?

The recommendations in this Workbook and reflected in Volume II, *Code Design Philosophy and Guidance*, concerning generalized application versus focused application, are summarized as follows:.

- In generalized application, statewide topics should include:
  - The evaluation and certification of treatment components, people, organizations, and processes.
  - Rules governing the scope, administration, and enforcement practices of local units of governments authorized to enforce the state code.
  - Determination of minimum requirements for effluent performance of decentralized wastewater-treatment systems to manage the risks to human and natural environments that exist at all sites within the state.
- "Focused application" means the differential application of requirements based on the varied site risk conditions and the political and resource capacity of the enforcing governmental unit—the choice is between state government and local government. For treatment requirements, the focused application should be flexible enough to apply different performance requirements based ideally on individual site risk. This level of focused application of requirements is important because the cost impact of rules on individual households can be severe. Marginal cost differences can be in the range of $5,000 to $15,000 per household depending on requirements for enhanced levels of treatment.

The recommendations do not prescribe the answer to the question, "Which effluent-performance standard should be adopted for any given statewide or focused application issue?" They do not say definitively which level of government can best deliver discrete application of site-based risk-management standards. They do suggest that in many cases local units of governments are best suited to make the focused application decisions for the following reasons:

- Local governments enforce state codes in most states; they largely determine the level of applied enforcement, occasionally not enforcing the state rules with the vigor intended by the code's authors. This relaxed enforcement creates gaps between state rules and their enforcement. On the other hand, when the governmental level that enforces performance requirements is the same level that wrote them, those gaps will be smaller because the performance requirements are more likely to reflect the local political consensus.
- The level of government that determines the allocation of pollution-reduction responsibilities under the TMDL program between the various local sources of pollution should be able to determine the level of treatment required of decentralized wastewater-treatment systems. If the state makes that determination, the local governments are less able to make the political tradeoffs necessary to resolve the many issues. For example, Community A's nitrogen contribution to Local Lake could be 90% from housing, 3% from agriculture, and 7% from other sources; community B's contribution could be

90% from agriculture, 3% from housing, and 7% from other sources. If the objective is to reduce nitrogen mass loading to the lake by 20%, the two communities would likely arrive at different solutions if left alone. However, if the state dictates an 80% reduction of onsite nitrogen in a statewide standard, then the homeowners in Community B will be forced to spend many thousands of dollars per household to reduce the total nitrogen load to their lake by 2.4%. Local sources of pollution will vary and may include different mixes of the following sources: agricultural fertilizers, farm-animal wastes, urban storm water, wildlife, soil erosion, leaking municipal collection systems, atmospheric deposition, and effluent from municipal treatment works.

- Different areas of the state have different tolerances for risk and for acceptance of the costs needed to reduce that risk. Local units of government are likely to be more responsive to those considerations.

State statutes define the authority of state agencies and local governments to regulate these matters. States have variously taken three different code approaches under generic names such as uniform code, minimum code, and default code (see definitions in Chapter 2).

The regulatory philosophy behind state minimum codes is that the state should adopt requirements at the minimum level needed to manage the statewide risk level. Then local governments are permitted to adopt more stringent provisions where local conditions warrant the additional protection. Some states ignore the minimum-code design philosophy and instead adopt a "maximum code" designed to manage the enhanced risk conditions existing at a minority of sites. Such behavior by the state agency frequently causes local governments and the state itself to ignore or under-enforce the state provisions in areas where the risk conditions do not warrant the severe requirements.

A problem with granting local governments discretion to modify the state code is the opportunity it gives them to set standards that affect issues other than health, safety, and environmental protection. A frequent ulterior motive for setting relatively severe requirements for lot size, setbacks, and waste-water effluent is the desire to control land use and the income profile of residents.

In light of these circumstances, the recommended way to manage the code-creation process for the best benefit of the citizens is as follows:

- State codes should set minimum effluent and operational-management requirements. They should give local governments the authority to adopt more stringent requirements for focused application where warranted by local risk conditions. This code follows those suggestions.

  This does not permit adoption of local ordinances that modify state product-approval processes and state certification programs for individuals, organizations' and processes.
- As a checks-and-balances mechanism, local government changes to the code should be approved or reviewed for reasonableness by the state agency before they are adopted (see the following section). The state government also influences local government behavior by the manner in which it conducts the TMDL regulatory process.
- A checks-and-balances mechanism for the state agency's establishment of its minimum requirements for waste-water effluent is a more difficult subject. Full disclosure of the rationale for the proposed minimum requirements and involvement of local government, industry, and citizens in their establishment will provide the best likelihood of reasonable rules being developed.

- ADOPTING MODIFYING LANGUAGE — Governmental entities modifying state code language in areas where such modification is permitted must first submit the language to the Department for approval [*optional: "comment"*] and may not implement until such approval [*optional: "comment"*] has been received.
- IMPOSING FEES — Governmental entities may be granted authority as agents of the state to adopt fee schedules for permits, reviews, inspections, and other related administrative functions.
- ESTABLISHING APPLICATION PROCEDURES — The department will establish a uniform permit-application form and procedure. Local government entities may be granted limited authority as agents of the state to establish modifications to the procedures, provided the modifications are first approved by the Department.

> A uniform application form and procedures facilitate statewide efficiency for state regulators and for designers, installers and service providers that operate in multiple jurisdictions. The procedures for application in each jurisdiction should be as uniform as is reasonable. The code recognizes that the procedures may be modified to account for exceptional conditions at the local governmental level.

1.13.2 Private-Sector Entities

The Department or its delegated governmental agents may appoint qualified nongovernmental entities or persons as agents to perform regulatory duties required by the code. Those agents are subject to the direct supervision of the appointing authority.

> Many state codes are enforced by persons who are not employed by the state—usually local-government employees, but also employees of private code-enforcement agencies.

1.14 WITHDRAWAL OF DELEGATED AUTHORITY

The Department may discipline or revoke the authority of an agent to administer or enforce the code for good cause. "Good cause" in the case of a governmental entity is defined as any of the following transgressions: failure to enforce the provisions of the code as required by the Department; failure to provide timely service to citizens; failure to adequately supervise the performance and qualifications of employees and private-sector agents; malfeasance; and conflict of interest.

"Good cause" in the case of a private-sector agent is defined as any of the following transgressions: failure to maintain required credentials, failure to conduct required inspections, failure to maintain accurate records of inspections, malfeasance, and conflict of interest.

> Delegation of authority must be accompanied by a mechanism by which to withdraw the authority. Otherwise, the state abdicates its authority and responsibility to administer its rules and state laws.

1.15 CONFLICT OF INTEREST

Employees of the state, employees of agent-government entities, and private-sector agents and organizations who are engaged in administrating or enforcing the code are prohibited from engaging in activities that create a conflict of interest between those regulatory responsibilities and their private interests, professional responsibilities, or

other duties. Specifically, other than their official regulatory services, they may not provide any person or organization with compensated services related to decentralized wastewater treatment, such as, but not limited to, soil evaluation, site evaluation, and system design, construction, installation, operation, or maintenance.

> Table 1 and related text in Volume II, *Code Design Philosophy and Guidance*, provide the position of the NOWRA Board and Code Committee on conflict of interest as it applies to regulatory personnel. Conflict of interest creates serious issues of law enforcement, equal protection, and fairness for citizens. The conflict occurs even if the services in question are provided outside the employee's regulatory jurisdiction.
>
> Several arguments are advanced in support of (1) regulatory agencies' providing design work and (2) individual regulatory staff's moonlighting as service providers in neighboring jurisdictions.
>
> With respect to item (1): Some argue that the local population is too poor to pay for the work, that private service vendors do not exist in the area, or that, if they do exist, they are not sufficiently qualified. Reply: If parts of the population are really too poor to pay private practitioners, then government subsidies should help to pay the costs. If private contractors are not available, they have probably been excluded or priced out of the market. If private service vendors really are insufficiently skilled to do the work, then the state should develop a training and certification program.
>
> The primary reason for the no-conflict-of-interest provision in the code is that a government agency should not be in the position of conducting the site assessment, designing the system, approving the design, and enforcing the rules against the owner if the system fails or is otherwise non-compliant with the rules
>
> With respect to item (2): The argument is that individuals have a right to work in private-sector employment. Reply: Agreed, but they do not have a right to a public-sector job at the same time if the combination creates a conflict harmful to the public interest. A staff member of a regulatory agency who moonlights in a neighboring jurisdiction may be supervising the work of his/her competitors when acting as a regulator in his/her home jurisdiction. This is not an insignificant issue, because many designers and installers work in multiple jurisdictions.

1.16 SCOPE

These regulations shall apply to:

1. The structure and components referred to as a decentralized wastewater-treatment system, including its design, its manufactured, site-constructed, or in-situ components, its location, its operation, and its effluent quality.

(OPTIONAL:

2. Activities and personnel involved in evaluating the site and soil associated with the installation of the wastewater-treatment system.
3. Activities and personnel involved in designing, manufacturing, constructing, installing, repairing, modifying, maintaining, monitoring, inspecting, and regulating the wastewater-treatment system.
4. The qualifications and training of personnel referred to in Items 2. and 3.)

> As a minimum, the code should regulate the object of interest—the decentralized wastewater-treatment system. The code may regulate objects, activities, and individuals, provided authority is granted under applicable law.
>
> *Recommendation:* Scope should include all four items listed, if permitted by law.

1.17 APPLICABILITY

1.17.1 Effective Date of Code

The effective date of the code is [*date*].The code applies to decentralized wastewater-treatment systems installed or modified on or after the effective date.

1.17.2 Uniform Code

The code is a Uniform Code. All matters regulated by the code are subject to its specific requirements, except in cases where authority is granted to delegated government agencies to modify the requirements or adopt alternative ones. The delegated authority must be exercised only with respect to matters specifically identified in the code as subject to that prerogative and exercised in accordance with any concurrently specified limitations.

More stringent requirements may be adopted in the following areas:

- Determination of final effluent performance standards
- Determination of operational, maintenance, inspection, and repair standards

(See Section 1.13.1; also notes following that section discussing code types.)

> The intent of the code is to give local governments discretion in areas that affect the quality of the local human and natural environments, specifically control of the effluent-performance requirements. The code grants no local discretion in requirements for product evaluation and approval, licensure or certification of personnel, organizations, processes, and methods.

1.17.3 Application of the Code to Existing Facilities

A decentralized wastewater-treatment system that existed prior to the effective date of the code is subject to the regulations in existence at the time the system's permit was first issued or, if no permit was issued, at the time the system was first used, except that operation of a decentralized wastewater-treatment system under any of the following circumstances is prohibited:

- Operation results in wastewater with a fecal coliform content that exceeds [*matrix standard, e.g.,*$< 10^5$*, 50% of the time*] being discharged to surface waters or to land surfaces in a manner that permits direct human contact.
- Operation results in discharge of wastewater to groundwater from soil treatment components deemed to generate fecal coliform exceeding [*matrix standard*].
- Change in the principal use of the structure has caused the effluent loads and flows to exceed the limits of the design parameters of the system's components.
- Changes to the structure have caused the effluent loads and flows to exceed the limits of the design parameters of the system.
- Changes to the loads and flows of a cluster system have caused the design capacity of the system to be exceeded

This topic is politically sensitive and regulators will need to engage the support of the public and the body politic if an environmentally effective outcome is to be achieved.

Retroactive provisions that cause the modification of existing systems have a major detrimental effect on owners and should be applied only when such systems present a significant and immediate threat to the human and natural environments.

Judicious retroactive application of provisions of the code may be deemed reasonable for addressing problems in the following areas of existing systems:

- Operational maintenance and inspection
- Direct discharge of untreated sewage to the land, groundwater, or surface water.
- Localized discharge of polluting agents.
- Unsafe conditions such as collapsed or failing structures and unguarded access points.
- Service-access discrepancies, such as inadequate risers.

Retroactive application of code requirements in the following areas is considered less acceptable and would likely raise significant opposition if not presented under the mantle of public-welfare imperatives:

- Increased vertical and horizontal separations
- Increased size of components
- Changes to design requirements in general
- More stringent or new effluent-performance standards

Recommendations:

- Include language emphasizing that the regulations in effect at the time that a system was installed govern the system.
- Limit retroactive application of the new code to the circumstances deemed "reasonable" above. Focus them on areas of perceived major problems.
- Avoid retroactive application to provisions deemed "less acceptable" above unless critical health or environmental issues are involved—and then focus the application on the most severe problems. The burden of proof of critically is on the regulatory agency, which must accept the responsibility of convincing the public.
- Decisions should be based on research findings, not arbitrary numbers, and applied in a manner commensurate with site risk.

1.18 SEVERABILITY

Should any provision of this code be held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remaining provisions shall remain in full force and effect**.**

1.19 LIABILITY LIMITATION

Liability of the state and its employees, agents, and deputies, when acting within the scope of their authority is limited by the provisions of [*state statute and section on limitation of liability*].

1.19.1 Exception to Liability Limitation

State agencies, local governments, and individual agents providing services deemed to be a conflict of interest in Section 1.15 are subject to tort claims in the same manner as private persons and organizations offering the same services.

Except as provided in the preceding paragraph, regulatory approval of any authorized activity of this chapter may not be construed as an assumption of responsibility by the agency or its agents for any decisions, errors, and omissions in the execution of its duties. The responsibility for the design, construction, repair, and operation of any decentralized wastewater-treatment system is ultimately the responsibility of the owner. The performance of duties by any other person is the responsibility of that person.

> The purpose of this language is to reduce agency and staff liability for errors and omissions and other sources of liability.
>
> Authority to limit liability by code is problematic without specific authority to do so in the law. Most states have statutes that cover this issue.
>
> Liability is a component of responsibility. A goal of a performance code is to assign responsibility for the quality of discrete portions of the work to individuals and organizations.The question here is the responsibility of government for the quality of the work performed. A reasonable position is that a government agency should not take on a task unless it intends to perform it adequately. If the work is important, it should be done well. If it is not important, the requirement should not be enacted. If the work is important, but internal budget and political restraints prevent adequate staffing, the option to shift the work function to third parties needs to be explored. The state agency staff can then concentrate on consultation and audits of third party service providers.
>
> *Recommendations:*
>
> State statutes should limit liability, not the code. Where such state liability limitation exists, it should be noted.
>
> Provision of non-regulatory services for homeowners such as soil and site assessment, design, construction, and maintenance services that are provided by government staff should be subject to the same liability as if the work were performed by the private sector. If the statute otherwise limits liability, the regulation should reapply it. At least one state provides state-level liability reduction to county agents providing regulatory services but removes state liability protection from county agents providing private-sector services. Further, the code should prohibit regulatory staff from performing non-regulatory decentralized wastewater-treatment services normally provided by the private sector. If they perform these services, the work will be outside the scope of authorized work and subject the agency or person to the full scope of tort action.

1.20 CODE AND POLICY ADVISORY COUNCIL

The Department shall appoint a Decentralized Wastewater-Treatment System Policy Advisory Council and may create technical subcommittees as appropriate. No member of the Department may be a voting member or officer of the Council.

The council shall have [*number*] members.

Council membership shall be balanced with proportional representation between local government regulators, manufacturers of decentralized wastewater-treatment

equipment, service providers of the decentralized wastewater-treatment industry, users of decentralized wastewater-treatment systems, and citizen interest groups, as follows:

Regulators	[*number*]
Manufacturers	[*number*]
Service Providers	[*number*]
Users	[*number*]
Citizen Interest Groups	[*number*]

(OPTIONAL language to expand the scope of Council)
The council, upon request of citizens affected by a Department decision or a dispute over application of the code at the local or state level, may conduct a hearing and provide an advisory opinion [OPTION "a final decision"] on the matter.

> The purposes of creating an Advisory Council are (1) to provide advice and technical expertise to the Department and (2) to provide communication channels between decentralized wastewater-treatment entities, interest groups, and the Department.
>
> Advisory council members provide two forms of advice: policy and technical. At the policy level the council should represent a broad base of interest groups. Appointees do not need to be technical experts, but should be familiar with the topic. The Department and the council should have access to technical experts to serve on technical subcommittees.
>
> A major role of advisory councils is to approximate the interests of the citizens in deciding the balance between the cost and benefit of the regulation. To do so, the committee membership should be balanced and represent a broad range of interest groups, essentially the same groups that would attempt to influence the legislature.
>
> Interests groups by their nature represent the private interests of the groups, often to the detriment of the overall citizenry. Regulatory agencies are also interest groups and if allowed to unilaterally write rules would tend to serve their interest, just as would interest groups of installers, designers, or pumpers. The broad based council creates a structure where conflicting special interests can approximate the interests of the citizenry.
>
> There are two forms of councils. In some states the councils decide Department policy and in others the matter is determined by statute. In most states the councils advise the Department. Where the council is advisory, Department representatives should serve as advisors, not as voting members, for several reasons. 1) There is a conflict between giving and taking advice. 2) If Department staff sat on the committee as voting members, the Department would be advising itself. 3) As voting members the Department representatives would be the most powerful members of the committee because they would be giving advice and then accepting or rejecting the advice of the council. 4) The Department might find itself in the embarrassing position of reversing decisions that its representatives proposed and voted for.
>
> As staff to the council in most states, state regulators still maintain significant influence over council activities.
>
> Local regulators, as users of the code, should be assigned to the committee as voting members as a part of a balanced membership. The total number of regulatory personnel should not exceed 1/3 of the committee and may be limited to a smaller share depending on the breadth of other interest groups represented. Note: This 1/3 regulatory membership cap is employed under the balanced-committee requirements of the American National Standards Institute (ANSI).

If the council has the power to decide the policy and technical issues, then it is more appropriate to have a Department representative as a voting member because the department is just another interest group among many.

A key feature of the deployment of advisory councils is that the Department should follow the advice of the council most of the time and when it does not, it should explain the reasons to the council before announcing the decision publicly. Failure to do so can convert the council from an ally of the Department to a powerful political opponent.

Recommendation: Establish broad-based, balanced advisory councils for policy issues, either by rule or law. Policy includes code development, administration, enforcement and integration with related regulations. Balanced means that major interests are represented with no single interest allowed to dominate or control the process. Establish technical committees of experts to advise the councils. Do not appoint Department staff as voting members of the policy councils.

CHAPTER 2

DEFINITIONS OF TERMS

WITH SPECIFIC REFERENCE TO THEIR USE IN THIS VOLUME

NOTE: The definitions contained in [*name of dictionary*] apply to words or terms not included herein.

Accepted engineering practice means the norms by which components and treatment trains are (1) designed in accordance with all relevant factors influencing safety and performance and (2) manufactured, installed, built, and verified in a manner that ensures their operational safety and performance during their intended life spans when used in reasonably foreseeable conditions.

Acceptance rate is the maximum flow and load rate acceptable for treatment or conveyance by any component of the system, measured in [*unit/time*].

Black water means wastewater contaminated by human body waste, toilet paper, and any other material intended to be deposited in a receptor designed to receive urine or feces.

Capacity means

- The maximum liquid volume able to be accommodated without effluent surfacing or backing into the structure.
- The maximum flows and loads as specified by the design manual or permit for the treatment train of component.

Cluster system means a wastewater collection and treatment system that is under some form of common ownership and management and provides treatment and dispersal/discharge or reuse of wastewater from two or more homes or buildings but less than an entire city or metropolitan area.

> There is significant overlap between decentralized clusters and centralized systems. The divide between the two is often a function of design and engineering style and the state law that assigns the respective regulatory functions to different agencies.

Decentralized means a generalized class of wastewater-treatment applications that includes onsite and cluster systems that discharge their treated wastewater near the point of origin. The contrasting term "centralized" refers to the extensive collection-and-treatment works serving large geographic areas such as a cities.

> The historical concept of the term "decentralized" proposed that cluster and onsite systems should be under active management. The current use of the term includes both managed and unmanaged systems. EPA has various definitions of the term, some with and some without the management inclusion.

Deemed to comply means that a system is assumed to comply with pertinent effluent- performance standards during operation without effluent-sample monitoring, provided the system is operated and maintained in a manner specified in the approval document.

Default code means a state code whose provisions concerning given subject matter(s) are, by state statutes, applicable to a political subdivision only if that subdivision has not adopted regulatory provisions applicable to the same subject matter(s). The subdivision's provisions may impose greater or lesser levels of regulation than the state's code. If the subdivision imposes no requirements, the state's requirements apply by default—whence the term "default code."

> State statutes define the relative powers of state agencies and local governments to adopt regulations for decentralized wastewater-treatment systems. Default codes assign the bulk of the power to write codes to the local governments. In contrast, a state with a Uniform Code assigns the sole power to draft regulation to the state agency, which then has the authority to grant discretion to local governments to supplement or revise the regulations. Minimum Codes split the power between the state and local governments with the state agency being authorized to adopt minimum health, safety, and environmental-protection provisions and local governments being authorized to adopt more stringent requirements

Department means [*name of the state department with authority to regulate decentralized wastewater-treatment systems*].

Engineered design means the design of an onsite or cluster system created to meet specific performance requirements for a particular site as certified by a licensed professional engineer or other qualified and licensed or certified person.

Experimental system means a type of system component or treatment train that does not conform to an evaluated design and whose processes are not based on confirmed science or engineering practices. These are systems for which valid and reliable data are being sought to demonstrate compliance with the intent of the code.

Final effluent means the wastewater at the point it leaves the treatment train.

Grey water means any putrescible wastewater discharged from domestic activities including, but not limited to, washing machines, sinks, showers, bath tubs, dishwashers, or other sources except toilets and urinals.

Habitable structure means a permanent or semi-permanent structure intended for human habitation.

Holding component means a vessel designed to hold sewage or wastewater without leaking to the immediate environment while awaiting transportation to a treatment and dispersal facility.

Imminent threat to human health and safety means a substance, activity, or condition that poses an unacceptable risk to public health and safety and requires immediate abatement.

Load and flow means:

- Load—the total weight of individual wastewater constituents of interest entering a pretreatment component over a given period of time or applied to a given area of soil over a given period of time (unit of weight / time).
- Flow—the volume of liquid entering a pretreatment component over a given period of time or applied to a given area of soil over a given period of time (unit of volume / time).

Long term acceptance rate means the acceptance rate of a component after the break-in period is complete. The break-in period may include the development of a suitable level of biological activity. The break-in period for a soil dispersal component may also include the time to develop ponding of the surface caused by the development of a hydraulically restricting biomat.

Major repair means the replacement of a component such as a septic tank or other treatment component including the dispersal system.

Management Model IV means the situation wherein a decentralized wastewater-treatment system is owned by the property owner and managed by a third party organization. (See EPA Voluntary Management Guidelines.)

Management Model V means the situation wherein a decentralized wastewater-treatment system is owned and operated by a third party organization, such as a utility. (See EPA Voluntary Management Guidelines.)

Minimum code means a state code that, in accordance with state statutes, may be amended by sub-units of government in a manner that equals or increases its health, safety, and environmental requirements. This term is contrasted with “uniform code” and “default code.”

> The purpose of a minimum code is to allow the state regulatory agency to adopt minimum requirements to manage the risk conditions existing at all sites statewide and local governments to adopt additional requirements to manage higher risk levels existing within the jurisdiction.

Several problems may occur with minimum provisions:

- Some states adopt statewide "minimum" provisions based on the highest risk found at a minority of sites. This practice leaves little room for local code revision to address discrete problems. Instead, local governments are placed in the position of enforcing state provisions at individual sites where the risk is not perceived. Their alternative is to under-enforce the code by ignoring the provision or applying selective enforcement.
- Local regulatory agencies may choose not to address the higher risk areas because the local population may have a different tolerance for risk than state officials.
- Designers tend to design to the code requirement without regard to site conditions which may pose a greater risk than that contemplated by the code.

Also, see the discussion of "uniform" code provision.

Minimum daily flow means the minimum flow required to maintain the level of biological activity necessary for treatment.

Minor repair means the replacement of subcomponents such as a switch, pipe, pump or valve. Servicing of the system by cleaning, tank pumping tank, filter replacements, and adjustments is not considered a repair.

Modification means to substantially alter the design or use of a component or group of components in an existing wastewater-treatment system.

New construction means the installation of a wastewater-treatment system on a parcel that did not previously have such a system installed.

Non-treatment component means a wastewater confinement, holding, or transfer device that is not intended to provide wastewater treatment.

NOWRA means National Onsite Wastewater Recycling Association.

Onsite wastewater-treatment system means a system that (1) collects wastewater from as single structure, treats it, and disperses it to the surface or subsurface environment on one or more legal parcels near the source of the wastewater generation or, alternatively, (2) stores the collected wastewater or the collected and treated wastewater in a holding component until transported to another location for the necessary final step(s).

Onsite system means an onsite wastewater-treatment system.

Operating permit means a document or certificate issued by an authorized government agency giving permission to operate a decentralized wastewater treatment system.

OWTS means onsite wastewater-treatment system.

Performance code means an administrative regulation written in terms of ends or results that are required to be achieved by application of a process. It allows the general use of designs or components that achieve the objective requirements or standards without a code revision.

> Performance codes contain measurable requirements, a method of evaluation of alternate design specifications or manufactured components to the specified requirements and a method to allow the general use of the designs or manufactured components once approved without first necessitating a code revision. Performance codes often create lists of acceptable designs or manufactured components available for general use. The listed design specifications and manufactured components are prescriptive solutions to the adopted performance requirements. This is contrasted with "prescriptive" codes in that the latter specify the details of one or more processes and disallow the general use of other processes until the code is revised. The prescriptions are assumed to meet the objectives of the regulation, often without first listing the specific objectives or conducting an evaluation of the prescriptive design's performance.

Performance requirement means a clear statement, numeric or narrative, of a measurable and achievable condition or output to be achieved at a specific point in a process. The requirement must allow for multiple solutions and a clear pass/fail determination of compliance.

Performance standard is a substitute term for "performance requirement."

Point of standards application means the specific location, depth, or distance from a regulated facility, activity or practice at which the concentration of a substance in the system effluent plume must comply with the specified performance standard.

Point of standards application, design means the point where the wastewater leaves the last treatment zone. This may be the same as the point of standards application or some point prior to reaching that point.

Prescriptive code means an administrative regulation that specifies the process of achieving an objective and excludes or limits the use of other processes that achieve the same objective.

> The objectives of prescriptive codes are usually stated as high-level purpose statements such as "protect public health and the environment." Specific requirements, such as allowable fecal coliform in final effluent, are often missing. The primary objections to traditional prescriptive codes are that they offer limited design choices and require a code change to allow use of additional designs. Code revisions seldom occur more often than 5 years and frequently take 10–25 years between substantial revisions. This inflexible structure frequently resulted in unbuildable residential lots and no authorized design to replace failing systems.

Quality assurance (QA) means an integrated system of activities involving planning, quality control, quality assessment, reporting' and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence.

Repair means to restore a system to a functional condition without substantial modification.

> "Major repair" means the replacement of a component, such as the septic tank or replacement of other treatment components, including the dispersal system.
>
> "Minor repair" means the replacement of sub-components, such as switches, pipes, pumps, and valves. Servicing of the system by cleaning, tank pumping, filter replacements, and adjustments is not considered a repair.

Requirement. (See "Performance requirement.")

Responsible management entity (RME) means a legal entity responsible for providing various management services. It must demonstrate managerial, financial, and technical competence and capacity sufficient to ensure long-term, cost-effective management of onsite or clustered wastewater-treatment facilities in accordance with applicable regulations and performance criteria.

System means a decentralized wastewater-treatment train.

Sewage means wastewater containing fecal matter that exceeds the adopted performance standards for bacteria in the final effluent of a wastewater-treatment train.

> Currently many states regulate and define sewage in ways not appropriate to a performance code. Terms like "water carried wastes" or "untreated wastes" do not describe a measurable boundary between the state of the water being sewage and not sewage. This *Workbook* relies on fecal coliform bacteria counts for the definition of sewage and indicator of treatment quality. Other indicators or direct measurements could have been used, but none of those processes have the historic body of information that currently exists for fecal coliform.
>
> Wastewater containing nutrients can be a valuable resource or a serious threat to citizens' health and welfare depending on site conditions and use. Consequently, the presence of nutrients alone is not a basis for classifying wastewater as sewage.

Standard. (See "Performance standard.")

System construction inspector means a person who observes construction of wastewater-treatment systems for compliance with code specifications and the approved design.

System designer means a person who matches site and soil characteristics with appropriate wastewater-treatment technology and prepares system designs and installation plans for the site.

System installer means a person who constructs and assembles the components of a wastewater-treatment train to the designer's specifications.

System maintainer/operator means a person who provides operational, maintenance, and service activities to assure the effective and continuous operation and performance of a system.

System operation inspector means a person who inspects the system for compliance with the code and permit specifications.

System plan reviewer means a person who reviews required documents for compliance with the code prior to issuance of a construction permit. The documents may include but are not limited to the permit application form, site and soil evaluation report, management plan, and system-construction plans.

System soil evaluator means a person who makes the determination of soil morphology by defining its physical constitution as exhibited by the types, thickness, and arrangement of the horizons in its profile and by the texture, structure, consistence, and porosity of each horizon. (Modified EPA)

Treatment means the intended transformation of specific properties of wastewater from one state or condition to another.

> "Treatment" modifies the mass or concentration of a pollutant or other wastewater constituent of interest. Concentration is often reduced by means of dilution. Mass can not be reduced by dilution.

Treatment component means a discrete portion of the wastewater-treatment train within which wastewater treatment is intended to occur. It may be located within or outside the structure and is defined by specifically identified points of influent and effluent.

Treatment train means the total assemblage of wastewater treatment, transfer, and holding components beginning with the first wastewater treatment component within or outside the structure and ending at the point where the effluent is dispersed from the last treatment or conveyance component. The term "system" is often use synonymously with "treatment train."

Type I compliance violation means discharge of sewage to the ground surface or surface water or within a structure where such discharge is not otherwise intended or permitted.

Type II compliance violation means the dispersal of sewage to the groundwater measured at a point of standards application for the regulated constituent where such discharge is not otherwise intended or permitted.

Type III compliance condition means the performance or operation of a treatment or conveyance component in a manner that does not comply with an applicable standard or specification but which is not a Type I or II compliance violation. The expected response to a Type III condition is maintenance of the component by an authorized person.

> The terminology used in the three previous definitions is intended to shift the classifications away from the term "failure." The "Type III compliance condition" is differentiated from Types I and II violations because Type III conditions are issues that do not immediately cause a compliance violation. For example, a blower on a pretreatment device may fail but the downstream components are capable of continuing to treat the wastewater for a period of time without creating a Type I or Type II violation.

Unconfined treatment component means the volumetric area of land and water that is not within a confining structure with a discrete point of effluent discharge and which has been evaluated for treatment capacity by a person or organization authorized to do so by the code.

> The treatment component can include in-situ and engineered soils and surface and groundwater where permitted by rule. The definition includes saturated soils and surface water as potential treatment areas because nitrate reduction in soil requires anoxic conditions provided by saturated soils (groundwater by most definitions.) Further, ground and surface water provides dilution as a treatment mechanism.

Uniform code means a state code that reflects provisions in state statutes prohibiting subordinate levels of government from adopting ordinances that add to, delete from, or otherwise modify the regulations contained in the code except where the state code specifically permits such modifications. This term is contrasted with "minimum code" and "default code."

> Some provisions are appropriately standardized across political jurisdictions. This code promotes the uniform application of provisions in the area of evaluation and certification of equipment, standard designs and personnel. A design approved at the state level should be available statewide if it meets local effluent performance requirements. An installer certified to install conventional systems by the state should not be subjected to a separate evaluation in each local jurisdiction. On the other hand, this model code promotes minimum state code provisions for final effluent quality and the level of management attention paid to a system, leaving the local governments to regulate their various local risk conditions affecting their unique human and natural environments.

Wastewater means:

- Wastewaters associated with dwellings, business establishments, institutions, and other structures or places used for human habitation, employment, or congregation. It may be further characterized as domestic wastewaters normally discharged from or similar to those discharged from plumbing fixtures, appliances, and other devices dedicated to, but not limited to, sanitary, bath, laundry, dishwashing, garbage disposal, water conditioning, and cleaning purposes.
- Storm and clear-water wastewater generated in or near buildings or other site improvements, when commingled with domestic wastewater.

> Storm and clear-water wastewater treatment is included in the scope of the "decentralized wastewater treatment" definition because states are beginning to require the treatment and onsite infiltration of stormwater under Phase II of the EPA Stormwater Regulations. The processes for flow management, treatment, and dispersal for both are similar and can be combined if properly designed.

Water reuse means any specific beneficial use of the treated wastewater in place of releasing it to the surface or subsurface environments.

CHAPTER 3

GENERAL REQUIREMENTS

3.1 DEPLOYMENT OF DECENTRALIZED SYSTEMS

An onsite or cluster wastewater-treatment system or holding component shall be provided where a permanent or semi-permanent structure discharges wastewater through a plumbing system whose effluent is not conveyed by sewer to a centralized municipal treatment facility other than a cluster system.

(OPTIONAL requirements if allowed by law)

A wastewater treatment or holding component shall be provided at habitable structures that do not have wastewater plumbing.

An approved wastewater collection and treatment system or a holding component shall be provided at property or locations where people routinely congregate or are employed, such as construction sites, fairs, carnivals, revivals, agricultural workers' field locations, encampments, and other locations where the public congregates for short temporary periods.

> The above requirements are intended to ensure that approved systems are provided to safely remove, treat, and recycle sanitary waste from structures where such removal is not provided by another method such as a municipal collection and treatment system. This can include a requirement to provide systems for structures that do not have plumbing. However, the scope of this code does not extend to the requirement to install plumbing itself, which must be left to a plumbing code or building code.
>
> *Recommendation:* The first requirement should be adopted. The two "options" should be addressed at the local level by the health department.

3.2 ABANDONMENT

3.2.1 When?

The system shall be properly abandoned in the following circumstances:

- When the system is permanently disconnected from the structure served and has not been approved for subsequent use by another structure.

- When the building sewer has been connected to a sanitary sewer that is part of a municipal treatment works.
- When the system has been condemned by the regulating authority

3.2.2 How?

The procedures for abandonment of external vaults and tanks are as follows:

- The property owner or agent shall apply for a permit to abandon the system if the system contains tank or vault components.
- The contents of tanks or vaults shall be pumped and equipment removed.
- Pipes or plumbing attached to the tanks or vaults shall be disconnected or sealed.
- Electrical connections shall be disconnected.
- Tanks or vaults shall be EITHER:
  - Removed and the void leveled to the surrounding grade with sand or other suitable inert material and completely covered with soil or material similar to that at the surface in the immediate area,

  OR

  - The covers of tanks or vaults shall be removed, the bottoms ruptured, and the void leveled to the surrounding grade with sand or other suitable inert material and completely covered with soil or material similar to that at the surface in the immediate area.

(Instead of removing the tank covers, the tank may be completely filled with material such as concrete, sand, or pea gravel smaller than #1 stone.)

> The purpose of requiring use of approved abandonment procedures is to protect the population from injury associated with residual pollution and from collapsed tanks, child access, and other unintended/unauthorized entry.

3.3 EMERGENCY REPAIR

Notwithstanding any provision requiring a permit to commence repair to a system with a Type I or Type II compliance violation, if a Type I or Type II compliance violation poses an imminent threat to public health or safety, the owner or agent may commence corrective action immediately without securing such permit. The owner or agent must then notify the regulatory authority within 2 workdays of commencement of the action and apply for any required permit.

Where an imminent threat to human health and safety exists, the regulatory agency may cause the abatement of the threat by:

- Issuing a directive to the owner to abate the threat
- If the owner does not abate the threat in the time specified in the directive, the agency may abate the threat and bill the owner for the cost.

> Authority to abate an imminent threat is important for application in the rare cases when the owner will not take action. The authority must not be abused. Its use must be reserved for major problems and exercised in accordance with uniform triggering criteria, lest accusations of unequal treatment arise.

3.4 RIGHT TO INSPECT

Staff and agents of the regulatory authority may enter the property of a permittee to inspect the system during reasonable hours and with appropriate notice to the owner and occupants. The right to enter does not include the right to enter an occupied private residence or associated structure absent permission or an inspection warrant.

The owner or agents shall produce permit documents and required records at the request of the regulatory agent inspecting the system.

> The purpose of an inspection is to reduce the risk that a code violation will pose a threat to the human or natural environments.
>
> Inspection activity raises difficult issues because the government's right to enter private property is restrained by state and Federal law. Furthermore, even when lawfully established, the authority can be restrained politically if perceived to be abusive in its application. Care must be taken to ensure that individual regulators are thoroughly aware of the constraints on their rights in areas that are limited by law and custom. Likewise, care must be taken to ensure that the public is not misinformed regarding its rights to bar government entry.
>
> A different conceptual approach may be useful here. While the citizen's ability to limit government entry to private property is protected by the Constitution, no such protection is afforded to the right to operate a wastewater-treatment system. If the issuance of a permit is conditioned on the right to inspect the facility, then failure of the owner to allow such inspection may be a sufficient basis to suspend the permit. In other words, the individual has the right to bar entry absent a warrant of the court, but not the right to operate a treatment system.
>
> To protect the regulatory agency and the regulator personally, the best practice is to (1) announce the visit to the occupant(s), (2) request permission to conduct the inspection, (3) if refused, leave the site, and (4) secure an inspection warrant from the appropriate authority or revoke the permit.

3.5 FINAL-EFFLUENT REQUIREMENTS

The system design selected for a site is required to comply with the final-effluent requirements adopted in Chapter 5 or determined by local ordinance.

3.6 COMPATIBLE SYSTEM COMPONENTS

Components listed in NOWRA Matrices may be selected to create a treatment train if they have complementary influent and effluent parameters as specified. A treatment train designed by site-specific engineering or an experimental design is considered to be a single, discrete treatment component and is evaluated at the time of the application for a permit.

3.7 DOMESTIC WASTEWATER FLOW— DETERMINATION

3.7.1 Systems Designed to Serve One To Eight Households

The owner or owner's agent of a residential system designed to serve one to eight households may select one of the two following methods for calculating the estimated

wastewater load and flow from a structure for the purpose of determining the system's minimum design flow.

3.7.1.1 ***Prescriptive Determination*****.** Determination of minimum design flow for systems treating or containing domestic wastewater wherein black water is present shall be based on [*Gpd or Lpd value selected from* OPTIONS *below*] per defined two-person bedroom and half that amount for a defined one-person bedroom.

OPTIONS FOR INSERTION ABOVE

– High risk avoidance: 150 gpd [568 Lpd)
– Moderate risk avoidance: 100 gpd [379 Lpd]
– Low risk avoidance: 75 gpd (284 Lpd).

For plumbing systems that separate grey water from black water, an estimated 60% of the unseparated flow is considered to be grey water and the remaining 40% is considered to be black water.

3.7.1.2 ***Adjusted Base Flow Determination*****.** The designer of the treatment system may adjust the minimum design flow determined in accordance with paragraph 3.7.1.1 based on, but not limited to, the following:

- Incorporation of water-conserving features within the structure
- Utilization of flow-management techniques
- Use of actual occupancy values and flow rates

The adjusted design flow in [*units/time*] for the structure must be recorded as provided in paragraph 3.7.1.4.

> The designer of the system needs to consider the fact that reduced flow achieved by water conservation increases the strength of the constituents in the wastewater.

3.7.1.3 ***Determination Waiver.*** The designer may specify a treatment design of a given capacity (in gallons/liters per day) without regard to the design features of the structure, provided the actual use is equal to or less than the design flow and provided notice is provided as required by paragraph 3.7.1.4.

3.7.1.4 ***Recording of Adjusted Flow Rate***. For system designs that invoke the provisions of 3.7.1.2 or 3.7.1.3, the design capacity in gallons/liters per day maximum flow shall be declared and, along with the prescriptive design flow specified in paragraph 3.7.1.1, (1) filed with the regulatory agency, (2) recorded with the deed, and (3) displayed on a permanent placard mounted in clear view near the primary electrical distribution box of the structure. The notice shall also contain the estimated number of occupants the system will support based on an average daily use of 60gpd (227L) per person.

3.7.2 Systems Designed to Serve More than Eight Households or More than Twenty People

Design flows and loads for multifamily structures and cluster systems designed to serve more than eight households or more than 20 people shall be determined by a

professional engineer or other qualified designer who shall be responsible for the design. The design flow shall be filed with the regulating agencies and recorded with the property deed. The owners of the structures served shall be presented with notices that inform them of the capacity of the treatment systems. The notices shall explain that, in the event of the capacity's being exceeded, either the capacity of the system must be increased or the total flow must be limited.

3.7.3 Systems Designed to Serve Commercial Structures

Design flow and loads from commercial structures shall be determined by a professional engineer or other qualified designer who shall be responsible for the design. Such determination shall be recorded with the property deed.

> Estimation of flows from single-family structures is very difficult because of differing occupancy levels, water-use habits, hours of occupancy, use of water-conservation devices and practices, amounts and types of cooking, and other activities. Two identical 3-bedroom houses may be occupied in one case by a single retiree who spends the winters in Arizona and, in the other case, by a year-round family of eight. So, hourly, daily, and seasonal flows vary widely.
>
> As the number of households and individuals using a single treatment system increases, the variation in flow decreases. As the population served by a treatment system approaches 20 persons, the variation in daily flow drops significantly. Based on the 2000 Census statistic that the average number of persons per household is 2.59, that 20 persons translates roughly to eight households.
>
> Over estimating flows and loads has the following consequences:
>
> - Greater costs for the owner.
> - The soil component may not fit in the space available or may restrict the use of significant areas of land.
> - Longevity of some components may be increased, lengthening the times until/between their need for servicing, repair, or replacement.
> - The larger components may provide better treatment results.
> - Performance of some components may be degraded by inadequate flows—some components, such as aerobic pretreatment devices, require minimum levels of influent to maintain the bacterial colonies upon which the treatment process depends.
>
> Under estimating flows and loads has the following consequences:
>
> - Performance of some treatment components may be degraded.
> - Longevity of some components may be decreased, shortening the times until/between their need for servicing, repair, or replacement.
>
> Most prescriptive codes estimate flow based on one or more features of the structure. The concept assumes that larger structures mean more people and higher flows. This may or may not be accurate—housing sizes and occupancy statistics are heading in opposite directions. According to census data, between 1970 and 2000, the average household size decreased by 16% (from 3.1 to 2.6 persons), while the average home size increased by 46% [from 1500 sq. feet (139.35 sq. meters) to 2,200 sq. feet (204.4 sq. meters)].

The three most common factors used for estimating flows are: number of bedrooms, assumed occupancy per bedroom, and assumed per-capita water use. Typical values assigned to those estimators are:

- 3 bedrooms
- 2 people per bedroom—therefore a three-bedroom home would generate 6 people for flow-calculation purpose. (In actuality, the 2001 census reports that only 3% of all households have 6 or more members, providing an actual average occupancy of about 0.9 persons per bedroom.)
- 75 gallons per day (gpd) per person, i.e., 150 gpd per bedroom. Some states estimate 100 gpd per bedroom.

The estimated 75 gpd per person for water use is at about the 70th percentile of actual use. Table 3-4 in the EPA Onsite Wastewater Treatment Systems Manual indicates that the 75 gpd estimate is low for about 30% of the population. The average per capita use indicated by the graph is about 60 gpd. (Note: 60, 75, 100 and 150 gallons are 227, 284, 379 and 568 liters respectively.)

The common code-design practice tends to over-estimate household occupancy by a factor of 2 but undersize the drainfield for the corresponding loads and flows estimates. The result is frequent early failure for 3-bedroom homes occupied by 6 persons.

The NOWRA soil component treatment calculations will determine the size of a dispersal area accurately by basing them on estimates of influent loads and flows—but only if those influent estimates themselves are accurate.

These factors should allow the sizing of systems to be undertaken with more flexibility than is possible under traditional prescriptive codes.

Recommendations:

- Allow multiple methods for determining estimated flows.
- If prescriptive sizing is used, give notice to the owner explaining the actual gallons per day that the system can handle, the range of likely per capita use, and the option to use alternate flow-estimation processes.
- For designer-determined loads and flows, record the information as required in paragraph 3.7.1.4.

3.8 OPERATIONAL RESPONSIBILITIES

3.8.1 System Owner and System Operator

The owner of the system is ultimately responsible for the proper installation, operation, and maintenance of the system, unless otherwise provided in the code. A designated system operator shall comply as a minimum with the operational and maintenance requirements contained in applicable component manuals and the code.

The purpose of the above paragraph is to clearly identify the person responsible for the system and to provide for alternate methods of providing management. The concept of a responsible management entity (RME) provides for third-party management.

3.8.2 Licensed and Certified Person

Licensed or certified personnel involved in the regulation, design, installation, and monitoring of decentralized wastewater-treatment systems shall perform their functions in conformance with the code and the standards of practice of their occupation.

> Pertinent professional personnel are linked to the continuation of a system's license or certification. They can be held liable in a tort action for design errors even if the design is code compliant. A professional designer may be responsible for safety requirements incorporated in published standards even if the code has not adopted the standards. Furthermore, it is the professional's responsibility to design a system that is fit-for-use under the owner's pattern of water use. As far as the owner and designer are concerned, the code is a minimum specification, and they must exceed the code requirements if necessary to meet individual needs and expectations.
>
> Disciplinary action against a licensed or certified person for violations of the code or standards of practice should be the responsibility of the certifying or licensing organization in addition to the regulatory agency.

3.9 TIME LIMITS FOR REPAIR

A system deemed to have a Type I or II compliance violation not an imminent threat to health and safety shall be repaired or replaced within the following time limits:

- Type I compliance violation—Plan of action within 30 days; remedial work completed within 90 days.
- Type II compliance violation—Plan of action within 30 days; remedial work completed within 120 days.

If weather conditions prevent timely repair, the time periods for correction of Type I and II violations may be extended by the regulatory agency.

> The purpose of setting repair time limits is to protect the human and natural environments from the effects of malfunctioning systems. If the malfunction poses an imminent threat, it must receive attention, such as pumping, immediately.

3.10 POINT OF STANDARDS APPLICATION

The performance standards applicable to the system's final effluent quality must be equaled or exceeded as the wastewater exits the treatment train. The unconfined treatment component terminates at the edge of the assessed volume of soil.

> Some states have adopted specific locations where adopted performance standards must be achieved, such as a drinking-water well or property line. This code applies the performance standard at the end of the design treatment zone because treatment beyond the assessed area is unknown. This code does not limit the extent of the treatment zone, an area that could include on-lot and off-lot surface and ground water where treatment, such as dilution and nitrate reduction, are likely to occur.

3.11 DEEMED-TO-COMPLY DETERMINATION

Treatment components that have been evaluated and classified by approved field or test center evaluation protocols to specific performance requirements are deemed to comply with those requirements without sample monitoring of the effluent provided that:

1. The influent characteristics comply with those listed in the component's specification manual.
2. There is no Type I or Type II compliance violation.
3. The system is in compliance with the adopted operation and maintenance requirements.

The purpose of this section is to allow the use of treatment systems without effluent-sample monitoring for the vast majority of installations that are located in low-risk environments.

Effluent monitoring in performance-based codes is the alternative regulatory approach to "deemed to comply." Ideally, effluent monitoring is the most appropriate and direct measure of compliance with a performance standard. If employed, many of the common, costly prescriptive and QA/QC requirements can be eliminated. The problem with effluent monitoring is that it is technically difficult for the soil component and very expensive for all treatment components if conducted to accepted statistical confidence levels, performed by persons without a conflict of interest, and performed in compliance with standard sampling methods. For the most part, those sample-monitoring costs are not justified for the risk posed by small individual onsite treatment systems.

Effluent sample monitoring of installed systems is deployed by regulatory agencies for two reasons: to enforce standards against individual system owners and to evaluate the performance of a manufactured component or a standard design. A common practice in some states is to combine both programs by using the information from the enforcement program to evaluate the component or design. The programs need to be separated because the protocols for the two purposes are different.

- Enforcement of mean-based standards against individual homeowners requires many samples of the individual system to estimate its mean to a reasonable degree of confidence to support an enforcement action. Because the number of samples needed increases as variability increases, it may take more than 100 samples of an individual system to adequately estimate the mean. The cost of this level of sampling is too high for the risk at most sites and is not justifiable.
- The effective evaluation of a component/design in field conditions may need about 35 homes in the study with about 4 samples from each system. Collecting data from hundreds of sites does not significantly improve reliability of the test protocol and is very expensive to homeowners. See the following paper for information on field evaluation of treatment components:
  Groves, T.W, F. Bowers, E. Corriveau, J. Higgins, J. Heltshe, M. Hoover. 2005. *Variability and Reliability of Test Center and Field Data: Definition of Proven Technology from a Regulatory Viewpoint.* Project No. WU-HT-03-35. Prepared for the National Decentralized Water Resources Capacity Development Project, Washington University, St. Louis, MO, by the New England Interstate Water Pollution Control Commission, Lowell, MA.
- Influent values are needed to evaluate the component/design and are not needed for enforcement purposes. Including data from an undersized system (system designed for 600 gpd receiving 1,000 gpd) in the evaluation of the component is inappropriate.
- Current state field-enforcement and product-evaluation programs frequently do not employ third-party evaluation or use standard methods for sampling and testing. Field sampling for the purpose of design evaluation should be designed to the same quality standards as test-center evaluation.

- Some states require field evaluation of manufactured products within their jurisdiction even though the product/design may have been evaluated in similar conditions in other states. That process is inefficient in the extreme because of the high cost of the evaluations and the barriers it creates to the deployment of new technologies and methods.

Recommendations:

- Code enforcement for installed systems. For onsite systems and small cluster systems, rely on site evaluation and evaluated designs supported by mandatory operational maintenance to promote compliance. Discontinue effluent sampling except in high risk situations. If sampling is conducted, collect sufficient samples to establish the degree of statistical significance needed to support enforcement.
- Field evaluation of standard designs and equipment. Create a national installed-system evaluation program using strict evaluation protocols that collect sufficient data concerning conditions that affect treatment. That might entail 35 systems tested 3–4 times a year each, selected by the evaluation agency, and scattered in the various regions of the country. Until such a program is created, accept evaluation data from other states and provinces, and, if the data are sufficient, do not require in-state field evaluation.

3.12 CODE VIOLATIONS

Installation or operation of a system in violation of the code is unlawful. Notice of a code violation from the regulating authority to the responsible party shall be in writing and shall identify the nature of the violation, the code provision violated, amount of time permitted for correction, and potential penalty if not corrected.

Prosecution of unsatisfied corrective orders is provided by [*name of government unit*].

3.12.1 Penalties

Penalties for violations of the code are identified in the following schedule:

- [*penalty schedule or reference thereto*]

3.12.2 Imminent Threat Abatement—Enforcement

Enforcement action to abate imminent threat to human health and safety or to the natural environment from Type I and Type II compliance violations consists of one or both of the following.

- Issuance of a compliance order to repair the system in a specific period of time or to discontinue use of the system until repaired.
- Issuance of a citation. Authority to issue citations is provided by [*name of the government unit*].

Issuing citations is an enforcement tool that is less difficult to deploy administratively than other enforcement techniques. In most states, the provision usually requires specific authority by ordinance or statute.

Citations increases citizen attention to the law and ease the administrative burden associated with prosecution. Most people comply with the requirements of the citation and pay the fine(s) without appearing in court. However, it does not force the owner to repair the system, only to pay the fine and be subject to further citations. Depending on the size of the fine, the persistence of the regulator, and the cost of the repair, the owner may choose to ignore the fine and/or not repair the system, forcing the matter into court. Once in court, the burden of proof rests with the regulatory agency to defend the code provision and the agency's administrative practices and to prove the violation.

3.13 APPEALS TO REGULATORY DECISIONS AND ORDERS

A person affected by an order or decision of the regulating authority may file a Level I or Level II appeal. The appeal shall be sent to [*name and address*] .

3.13.1 Level I Appeal

A person receiving an order or decision from the department may appeal the order or decision by filing a written appeal within 30 calendar days of receipt. The appeal shall be signed by the appellant and contain a clear statement of the issue(s), reasons for the appeal, a proposed alternate decision, rationale for the proposed alternate decision, and the applicable fee (see schedule available from [*name and address where fee schedule is available*]). At the request of the appellant, the department may conduct a meeting with the appellant and representative(s).

The department shall consider the appeal and issue a determination within 15 working days of its receipt. The 15-day period may be extended by mutual consent. If the agency does not answer in writing within the 15-day period or any extension thereof, the fee shall be returned to the appellant and the complaint deemed to be denied. The appellant, after denial or receipt of an answer deemed to be unsatisfactory, may, within 30 days, file a Level II appeal.

In the event the appellant desires to skip the Level I Appeal stage, he/she may file a Level II appeal in the first instance.

3.13.2 Level II Appeal

A person receiving an order or decision of the department may appeal the order or decision by filing an appeal within 30 days of receipt of the order or decision. The appeal shall be signed by the appellant and contain a clear statement of the issue(s), reasons for the appeal, a proposed alternate decision, rationale for the proposed alternate decision, and the applicable fee (see source of fee schedule in paragraph 3.13.1). The department shall schedule a contested-case hearing within 30 calendar days and issue a determination within 30 working days after the hearing. Failure of the department to respond to the appellant within 15 calendar days to schedule a hearing or failure to answer the complaint with a decision within the 30 days shall be deemed a denial of the appeal and the appellant may appeal the decision to court. Failure to schedule a hearing or to render a decision within the time limits shall cause a return of the fee to the appellant.

Level I Appeal. The purpose of the Level I Appeal is to provide the regulatory authority with the opportunity to re-examine the issue and allow the appellant an opportunity to express his/her views in an informal, relatively inexpensive process. It also provides the agency's top management with an audit of the quality of the code language and the staff's interpretation thereof.

Level II Appeal. The more formal Level II Appeal requires a formal hearing before an independent hearing officer with sworn testimony, formal exhibits, and a precedent-setting decision (or, if not precedent-setting, a decision that could sway the case before a circuit-court judge at the next appeal level.)

The appeal process should have short timelines because of the continuing injury to the appellant if the appeal has merit. Return of the fee for tardy work is an incentive for efficient delivery of services.

3.14 VARIANCES

Any person affected by the code may apply for a variance to a code provision for a specific application. The regulatory agency that adopted the provision shall consider the variance request. If both the local and state agency adopted the provision, the state has primary jurisdiction and shall consider the position of the local government in the determination.

The variance request shall be in writing. It shall identify the code provision(s) for which the variance is requested, state the requested variance, identify the proposed application, and state the rationale for the request. The variance request shall be sent to [*name and address*] with the required fee (see source of fee schedule in paragraph 3.13.1).

The standard for approval is that the variance substantially achieves the purpose of the provision(s) and provides a degree of protection equal to or greater than that afforded by the provision(s).

The regulatory authority shall render a decision on the variance request within 30 working days of receipt of the application, unless the applicant agrees to an extension. Failure to answer the variance request within the 30 working days or within the period of extension shall be considered a decision to deny and the fee shall be returned to the applicant.

The agency granting all or part of the variance request shall include in its decision a declaration as to whether the decision is nonprecedent-setting or precedent-setting. Precedent-setting variances shall be published [*frequency*].

The following circumstances highlight the need for variance provisions and increase the frequency of requests to apply them:

- Inflexible prescriptive codes that do not provide sufficient design or other options for the range of likely circumstances.
- Performance codes that set performance standards that are stricter than warranted by site risk.

The need for variance provisions diminishes under performance codes. If performance standards are determined commensurate with site risk, the need for variances largely disappears. The deleterious affects of statewide performance standards that are over-specified relative to site risk are ameliorated by variance provisions.

> The process for issuing a variance must be formalized to provide equal treatment and to create a record of the action. A busy variance docket is a signal to code writers that the code needs to be adjusted. Vague provisions and provisions with standards that do not accurately reflect level of risk invite variance applications.
>
> Timely response is a measure of and agency's performance..
>
> *Recommendation:* Include a variance provision in the code.

3.15 WRITTEN RECORDS

Administrative codes, policy statements, code interpretations, compliance directives, and agency determinations shall be in written form or, if maintained in electronic form, shall be capable of being converted to written form upon request.

CHAPTER 4

APPROPRIATE SOURCES

4.1 STANDARDS, PROTOCOLS, AND LISTS

The following protocols, standards, and lists are recognized as appropriate sources for supporting a claim of compliance with performance standards or requirements:

4.1.1 NOWRA Classification Matrices (Appendix A)

4.1.2 NOWRA List of manuals for evaluated components that meet the various performance-classification levels within the NOWRA Classification Matrices

4.1.3 NOWRA soil-treatment credit tables and calculations. (Appendix C)

4.1.4 NOWRA protocol for component evaluation (Appendix D)

4.1.5 NSF Standard 40 and listed components

4.1.6 ETV-NSF protocol and reports

4.1.7 The publication of Bureau de normalization du Québec (BNQ) entitled: *Wastewater Treatment — Stand-Alone Wastewater Treatment Systems for Isolated Dwellings — Certification Protocol*

4.1.8 NOWRA tank standard (Appendix E)

4.1.9 20th Edition of *Standard Methods for the Examination of Water and Wastewater*, a joint publication of the American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF).

> The third-party standards, protocols, and lists are incorporated into this volume by reference for the sake of efficiency and because some or all are protected by copyright or trademark.
>
> It is advantageous for both safety and efficiency reasons to be able to recognize evaluated designs without having to wait for a code change to be adopted. Code revisions can take years to accomplish; timelines as long as 5–12 years are not uncommon, especially when dealing with prescriptive codes. It is unreasonable to require citizens to wait years for access to evaluated, suitable technology and methods that could immediately solve existing problems such as a failed treatment system or an unbuildable lot.

CHAPTER 5

EFFLUENT AND SITE REQUIREMENTS

5.1 EFFLUENT REQUIREMENTS

5.1.1 Characteristics of Final System Effluent

The final effluent of a decentralized wastewater-treatment system as it leaves the final treatment component shall achieve the treatment levels prescribed in paragraph 5.1.2. by constituent. The following methods may be used to determine whether compliance with the final-effluent minimum requirements has been achieved:

- ***Deemed to Comply.*** The whole system is deemed to comply with the final-effluent requirements if it is operated and maintained in accordance with the permit-approval documents. The system may consist of components evaluated according to methods contained in Appendices C and D (see paragraphs 4.1.3 and 4.1.4) or it may be designated as having a site-specific engineered design. A treatment component individually classified as "deemed to comply" is assumed to comply with the requirements without effluent sampling during system operation.
- ***Experimental.*** The treatment train or one or more of its components is (are) defined as experimental and appropriate safeguards are in place at the time the permit is issued to ensure that the requirements are met.
- ***Effluent Monitoring.*** The final effluent is evaluated under an approved sampling protocol.

5.1.2 Final Effluent Minimum Requirements

The system effluent shall meet the following requirements as it leaves the final treatment component:

- **Land surface discharge**
  - – Fecal coliform: [requirement *]
  - – [other constituent] [requirement]
  - – Etc.

- **Land subsurface discharge**
  - – Fecal coliform: [requirement *]
  - – [other constituent] [requirement]
  - – Etc.
- **Surface water discharge**
  - – Fecal coliform: [requirement *]
  - – [other constituent] [requirement]
  - – Etc.

* Example: <200 colony-forming units per 1000mL, 95% of the time.

SECTION 5.1.3 IS FOR OPTIONAL USE BY LOCAL REGULATORY AGENCIES ONLY

5.1.3 Final Effluent Minimum Requirements — Local Agency

At the locations severally identified in paragraphs [*numbers* (e.g., 5.1.3.1, 5.1.3.2 . . . 5.1.3.n)], the requirements for system final effluent and operational management shall be as set forth in the respective paragraph, notwithstanding the requirements set forth in section 5.1.2.

5.1.3.1 Property at: [*location, reference to appended map, etc.*]
- Special Circumstances: [*circumstances prompting need for special requirements*]
- System Final-Effluent Requirements: [*requirements* (see para. 5.13 for sample presentation of requirements.)]
- System Operational-Management Requirements: [*requirements*]

5.1.3.2 Property at: Etc. …….

5.1.3.n Etc. ….....

> The *Classification Matrices* in Appendix A are designed to provide policy options for effluent performance standards.
>
> Statewide minimum requirements are intended to manage the risk conditions that prevail statewide. Higher levels of risk should be handled by focused application of more stringent requirements at the local government level.
>
> *Recommendations*:
>
> The state code should adopt minimum final-effluent requirements for fecal coliform. The state code generally should not adopt final-effluent requirements for nutrients unless required by statute. The reason for this is that risk associated with nutrients from household wastewater vary significantly by site and the presence of other sources. Decisions to reduce onsite nutrients should be made as part of an evaluation of all pollution sources and the efficiency and effectiveness of managing each. For example, these decision processes should be deployed to implement the determination of a TMDL for a body of water. Private and public resources may be more efficiently and economically deployed in reducing nutrients from other sources.
>
> See Volume II, *Code Design Philosophy and Guidance*, for more information on the selection of performance standards.
>
> In areas where site risk levels raise concern, local governments should consider adopting more stringent requirements than those contained in the state code. Local governments should try to focus application of additional and enhanced requirements at the site, neighborhood, or watershed levels. In all circumstances, requirements should be set at levels that the enforcing government agency is able and willing to enforce.

5.1.4 Requirements for Reused Water

The following requirements pertain to treated non-industrial, domestic wastewater, including gray-water, that is reused above the soil. The requirements shall be met both at the discharge point and a point prior to a transmission line.

5.1.4.1 ***Potable Water.*** Refer to the USEPA potable water standards

5.1.4.2 ***High-Contact-Risk Water.***

- Fecal coliform shall have a median level of <1 colony-forming units/100 mL. (<2.2 mpn/100 mL), with a single sample not exceeding 14 colony-forming units/100 L.
- Turbidity shall be < 2 NTU (continuous monitoring)
- No odor shall be detected

5.1.4.3 ***Low-Contact-Risk Water.***

- Fecal coliform shall have a median level of <200 colony-forming units/100 mL (<200 mpn/100 mL.), with a single sample not exceeding 800 colony-forming units/100 mL. (<800 mpn/100 mL).
- Turbidity shall be < 5 ntu (continuous monitoring).
- No odor shall be detected.

> The most prominent documented cause of disease transmission by water-delivery systems (including wells) is infrastructure failure. Because we do not have equipment, tests, and processes capable of determining instantaneously whether pathogens are present in our water, we use surrogates to indicate the extent to which human waste is present. However, even these tests (Coliform and E-coli) are not instantaneous; they take days to run. Accordingly, several other tests are used to provide assurance that the risk-reductions requirements are likely to have been met. Those include testing for turbidity, pH, BOD/CBOD, suspended solids, odor, and disinfectant concentrations (e.g., chlorine residual or UV intensity). Some of those tests are instantaneous and are used as measures of process quality control.
>
> The U.S. Environmental Protection Agency has set Potable Water standards that cover a host of parameters. Anyone intending to treat wastewater to produce potable effluent must conform to those standards.
>
> The standard for high contact risk is to be used for water-reuse applications at residential or office buildings where the public is likely to come in direct contact with the water—above-ground irrigation, car washing, laundry work, and landscape impoundments, for examples.
>
> The turbidity standard is to facilitate disinfection; the odor standard is for aesthetics. Adhering to those standards along with the following requirements can help to assure that the infrastructure is performing satisfactorily: BOD <15 mg/L, pH of 6 to 9, and chlorine residual of >1 mg/L after 30 minutes. Use of other disinfectant processes such as Ultra Violet disinfection is permissible. Although technology may be able to meet the standard without a disinfectant, reliability and quality assurance normally dictate its use.
>
> The standard for low contact risk is intended to be used with reuse applications where the public is unlikely to come in direct contact with the reuse water—toilet and/or urinal flushing and subsurface irrigation, for examples. Use of aesthetics control in these circumstances will depend on the application and user but is not required.

Absence of odor is one indicator that a system is functioning properly, and, together with the following, can help to assure that the infrastructure is performing: BOD and SS <30 mg/l; pH of 6 to 9; and a Chlorine residual after 30 minutes of > 1 mg/l or other disinfectant equivalent such as that for Ultra Violet disinfection which monitors the intensity (253.7 nanometers/sq cm) which is the wavelength that is the most effective for killing bacteria. Again, although technology may be able to meet the standard without a disinfectant, reliability and quality assurance may dictate its use, or backup availability.

The following are additional infrastructure vulnerabilities:

- ***Cross connections.*** A common cause of pollution in water supplies is cross connections. Often, they occur because of plumbing errors or lack of signage on tanks and connections. All reuse-water connections should be marked with a permanent sign, and pipes and faucets should be color-coded. Pipes carrying reuse water can be identified by an electronic signature to distinguish them from soil and water-supply lines. Where possible, air-gaps should be provided to prevent cross connections. Inspection by a third party will help to reduce pollution-causing errors.
- ***Parts and supplies on hand.*** The on-site stocking level of parts and supplies should be commensurate with the contact-risk level and the importance of maintaining the supply of reuse water. Where those factors are high, parts and supplies should be available within one day.

Sizing/duplication of the system. Communal systems should have the capacity for at least one day's storage to continue product supply when the system is shut down for repairs. Also there should be a mechanism (with air gap) for inserting potable make-up water during those periods of shut down. Duplication is a function of critical-unit availability and the demand for the product. The greater the product need, the greater is the need for duplication.

Additional treatment requirements. Proposed reused of treated water may dictate adding facilities necessary for the treatment of such things as heavy metals, sodium, salinity, calcium, magnesium, oil, grease, etc. Car washes, laundry, irrigation, and industrial use are examples of where additional-treatment needs should be evaluated.

Monitoring. Monitoring of parameters that can be measured with automated equipment, and consequently capable of being alarmed, is most effective when used on a continuous basis. A disinfectant system should be tested anywhere from daily to weekly depending on the magnitude of the contact risk, meaning not only the immediate potential for contact but also the potential for contact's spreading beyond the immediate user area.

5.2 SITE REQUIREMENTS

5.2.1 Horizontal Setback Requirements

The horizontal setback requirements between system components and other features shall be determined by the system designer by use of one of the two options presented respectively in paragraphs 5.2.1.1 and 5.2.1.2:

5.2.1.1 Compliance with the prescriptive requirements provided in Table 5-1.

5.2.1.2 Compliance with the following performance requirements:

- Released effluent may not pond around the structure's footings or reenter the structure

- Released effluent may not cause a violation of the applied water quality standards at a drinking-water well.
- Released effluent may not pond in the trench of a utility service or suction-pump discharge line.

TABLE 5-1
Required horizontal separation distance in feet (meters) between a system component and a site feature*

Feature	Dispersal component	Exterior septic tank or holding tank	Servicing, suction lines and pump discharge lines
Structure	[number]	[number]	[number]
Property line	[number]	[number]	[number]
Ordinary high water mark of navigable waters	[number]	[number]	[number]
Swimming pool	[number]	[number]	[number]
Water service	[number]	[number]	[number]
Well	[number]	[number]	[number]

*Distances assume that site soil evaluation was properly conducted.

Horizontal setback is intended as a design safety factor, on the assumption that all components will fail to perform as expected.

Setback requirements were originally established in a time of hand-dug wells and privies. Regulated distances have tended to expand under recent codes despite advances in design as cautious regulators tended to set uniform separation distances based on largely unknown or unmeasured risks.

Traditional prescriptive application of setback distances has not been reflective of actual site conditions or risk. For example, the statewide setback requirement for a well often is identical in widely disparate circumstances, such as:

- Karst or clay conditions
- Managed or unmanaged sites
- Well up- or down-slope of the system
- Ten- or a thousand feet to groundwater
- Advanced pretreatment used or not used
- Site and soil professionally evaluated or not

Consequently, setback distances are too great in many instances and too short in others relative to the risk.

Excessive safety factors are not a problem if the cost of implementation is low, but the cost of severe set-back requirements is high in terms of monetary and opportunity costs. Excessive requirements cause sprawl because of the large lots needed to accommodate the requirements. Replacement systems may not be possible under current setback requirements. Neighboring lots may become unbuildable because of the location of surrounding wells and systems. A doubling of a setback distance from a well increases the sequestered area by a factor of 4.

Recommendations: This code should allow setback distances to be based on performance requirements and not on traditional uniform prescriptive requirements. Table 6-1 should be filled in at the local level, where the following questions should be answered:

- What problem is being solved by this provision of the code?
- How do we know that it is a problem?
- Do we know that our proposed solution will solve the problem?

With respect to the applied separation between a well and drainfield, it is recommended that the determination be made according to site and system risk conditions in terms of the following factors:

- The overall risk reduction desired for a point of drinking water use.
- The direction, depth of flow and the location of the drinking water source.
- The velocity of the vertical and horizontal flow.
- The time needed for sufficient reduction of pathogens under saturated and unsaturated flows.
- The amount of dilution expected.

If use of a prescriptive table has been dictated, it is recommended that the foregoing performance factors be utilized for justification of an alternative method for determining setback requirements.

5.2.2 Service Accessibility and Safety Requirements

5.2.2.1 ***Access Ports—New Systems.*** Service access ports to components shall be located to be accessible to service personnel as follows:

- The location of the access port, if not visible at the surface, shall be marked in a manner that the service personnel can determine its location. Methods may include a physical marker, a marker on the site plan, or other acceptable indicators.
- Service ports that, according to the management plan, are to be accessed more frequently than once every [*period*] shall be accessible to the surface without digging. Access ports may be covered by ornamental or other coverings provided the cover can be easily removed.
- Service ports that are buried shall be located within 6 inches (15.2 cm) of the surface and shall be accessible by use of hand tools.

5.2.2.2 ***Access Ports—Existing Systems.*** Access ports of existing systems shall be made to conform to the requirements presented in paragraph 5.2.2.1 at the first scheduled service or repair event following adoption of the code.

5.2.3 System Access by Service Equipment

In new construction, access ports for system component shall be accessible to service vehicles as follows:

- The horizontal distance between a component's pumping-access port and the closest parking point for a truck weighing 60,000 pounds (27,216 Kg) shall not exceed 200 feet (61 meters). For a holding tank, the parking point shall be suitable for truck access in all weather conditions during periods of occupancy.
- The vertical elevation difference between the parking point and the bottom of the tank to be pumped shall not exceed 20 feet (6.1 meters) for truck-mounted vacuum pumps.
- For individual systems, the vertical and horizontal requirements may be waived if other suitable transfer methods for enabling servicing of the components are demonstrated to the regulatory authority.

> Pump trucks weighing up to 60,000 pounds (27,216 Kg) need to get close enough to the components to perform their task. Two frequent barriers are the lack of all-weather access or physical barriers like landscape planting or fencing. For scheduled pumping of septic tanks, seasonal access conditions can be accommodated by scheduling the service during dry weather. Holding tanks need frequent pumping, so all-weather access is needed for year-round use.
>
> Access barriers like fencing can be removed at cost to the homeowner.
>
> Regulatory restrictions to landscaping for truck access is very intrusive on the homeowner and should be avoided if possible. The extra time and expense of getting to the components is a private matter between the pumper and owner. For cluster systems and other Management Model V conditions, access can be achieved by an easement created during the platting stage of development.
>
> *Recommendation:* For holding tanks, all weather access should be provided. For other components, dry-weather access only may be required. Access conditions should be incorporated into the management plan approved for the system.

5.3 PROHIBITED SUBSTANCES

No person may introduce any substance into a decentralized wastewater-treatment system that would cause the system's effluent-safety requirements imposed by this code to be violated or cause a violation of law if discharged to the ground surface or to surface waters.

> The list of banned substances is too large to be included in the code. Instead the regulatory agencies should publish a notice of common substances that should not be put into a decentralized wastewater-treatment system or should be limited in volume. See the "Don't flush" list in Appendix F.

5.4 ADJUSTMENT FOR POTENTIAL LEAKS

System components such as, but not limited to, septic tanks and connections, that are not watertight shall be sized to accommodate unintended infiltration of stormwater, ground water, water from high water tables, and other sources.

> The term "unintended" is used because some systems are sized by design to accommodate and treat stormwater and because some components are not intended to be watertight—drainfields, for example.

5.5 COMPONENT STRUCTURAL INTEGRITY

Components of a wastewater-treatment system shall be capable of bearing the live and dead loads applied when installed and operating. The standard applied should be determined base on site risk conditions. Optional standards that might be considered for adoption, depending on site risk, include:

- . . . shall be acceptable under expected soil load as determined by testing or suitable calculation.
- . . . shall be acceptable under expected soil and human traffic loads, including light lawn tractors, as determined by testing or suitable calculation.
- . . . shall be acceptable under expected soil load and the weight of a pickup truck as determined by testing or suitable calculation, unless physical barriers to such traffic protect the area.
- . . . shall be acceptable under expected soil load and weight of a pumper truck as determined by AASHTO H-10 standard for a 16,000 lb/axle load, unless the area is protected from such traffic

5.6 SAFETY OF ACCESS PORTS

Ports provided to give access to system components shall not create a safety hazard. All exposed access openings shall be guarded. Openings larger than 4 inches in diameter shall be secured by bolted or locking lids or by lids that are set to prevent sliding and weigh at least 59 lbs in accordance with ASTM C 1227 – "7.6.1." If the foregoing requirements will not prevent access, a physical barrier shall be erected to prevent access to the site of the opening. Covers, risers, and lids shall be capable of bearing the expected live and dead loads.

> See tank standards in Appendix E

5.7 SOIL-COMPONENT EVALUATIONS—LIMITATION OF USE

System designers may apply the soil-treatment and hydraulic-conductivity capabilities of the unconfined-soil component only to the extent that the characteristics of the site soil have been evaluated. Table 5-2 provides the amount of credit that may be claimed based on the extent of evaluation.

> The soil analysis determines the soil-treatment credits and the pretreatment requirements of the treatment train. Failure to do the analysis thwarts the appropriate use of the treatment tables.

TABLE 5-2
Soil Treatment Credit Available by Type of Soil Evaluation
(Uniform, Known Area Conditions)[1]

		X = Credit can be taken, subject to any applicable footnote						
Soil and Site Evaluation Type		**Hydraulic Conductivity**	**Nitrogen**	**Phosphorus**	**Bacteria**	**In situ Organic**	**Dilution**	**Comments**
Observation of site[2]		X	X	X	X	X	X	
NRCS Map–Scale[3]	1:400	X	X	X	X	X	X	
	1:20,000	X	X	X	X	X	X	
Percolation Test								Should be used only as a source of supplemental information if there are questions relative to water movement in area soils
Soil Evaluation								Not necessary if area soils evaluated
Ground Water Characterization								
Perched								Not necessary if area soils evaluated
Seasonal								Not necessary if area soils evaluated
Permanent								Not necessary if area soils evaluated
Vegetative								Not necessary if area soils evaluated
Soil Climate								
Temperature								Not necessary if area soils evaluated
Moisture								Not necessary if area soils evaluated

[1] Some dispersal component sites are in soils that have relatively homogenous characteristics across broad areas. If the characteristics of the area are known, the site evaluator can rely on that information. Reliance on maps and general observations should be avoided at the edge of the map classification area and at the margin of a design classification breakpoint—example if the maps indicated GW depth is at 38 inches and the code requires 35 inches, do not rely on the map. Maps should only be used in conjunction with a specific site observation.

[2] Must be used in conjunction with a suitable soil map.

[3] Must be used in conjunction with suitable site observation.

CHAPTER 6

QUALITY ASSURANCE AND QUALITY CONTROL

6.1 CONSTRUCTION AND REPAIR PERMITS

Performing construction or repair of a decentralized wastewater-treatment system may require that a permit be obtained before work begins. When such a permit is required by the state or local regulatory agency, the language in this section applies.

6.1.1 Construction Permit

Construction, installation, modification, or add-on work shall not be performed on a decentralized wastewater-treatment system unless the owner has first obtaining a permit for the work to be performed from [*name of agency*].

6.1.2 Repair Permit

No major repair of a decentralized wastewater-treatment system may be performed unless the owner has first obtaining a permit for the work to be performed from [*name of agency*]. Minor repair and normal servicing does not require a permit.

(ALTERNATE LANGUAGE: No person may repair a decentralized wastewater-treatment system by replacing components or parts unless the owner . . . . etc.)

> An application for a construction permit gives the regulatory agency notice that a regulated activity is about to commence, allowing the agency to ensure that related regulations are met.
>
> *Recommendation:* Construction permits should be required for initial construction, modifications, and replacement.
>
> An application for a repair permit gives the regulatory agency notice that a regulated repair is about to be performed. Inspection requirements sometimes can be reduced when repair personnel are identified as certified practitioners. Obtaining a permit is costly to the owner, and the requirement is often ignored, especially for minor repairs where the cost of the permit exceeds the cost of the repair.

> *Recommendation:* Permits should be required for major repairs. Waive permit requirement for minor repairs if personnel are certified or licensed.
>
> Construction and repair permits facilitate scheduling of inspections and provide easy vehicles for collecting fees.

6.1.3 Posting

The construction or repair permit shall be posted conspicuously in a place on the building or other location that is visible from the street. The permit shall remain posted until the construction or repair activity is completed and final inspection has occurred.

6.1.4 Expiration

The construction and repair permits shall expire [*number of years/months*] from the date of issuance or when the work is complete. If work is commenced within the specified period, the permit may be extended for an additional [*number of years/months*]. The code in effect at the time the permit was issued shall be applicable during the period that the permit remains active. The permit may be renewed at the discretion of the permitting authority at any time. If significant changes have occurred in the code since the permit was issued, the renewal permit may be made subject to any pertinent new requirements,

> The term of a permit should be generous—in the range of 2–4 years, depending on the nature of the project. If significant changes have occurred in the code since the permit was issued and the agency intends to apply the changes to existing permits, the revised code should specify the new requirement.

6.1.5 Transfer

Upon application by a new system owner, a construction or repair permit shall be transferred to the new owner.

6.1.6 Revocation

The permit may be revoked for the following reasons:

- An imminent threat to human health and safety or to the environment would occur if the work subject to the permit continues.
- The permit application contains false information that is material to the decision to grant the permit

6.2 OPERATING PERMIT

6.2.1 Issue

A decentralized wastewater-treatment system shall not be operated unless an operating permit has been issued by [*name of agency*] to the owner or jointly to the owner and operator when the operator is not the owner but a certified responsible management entity (RME).

6.2.2 Duration

The operating permit continues in effect until its expiration date or until it is revoked for cause. The permit expires [*number*] years after issuance or upon property transfer, whichever occurs first. (OPTION: The term of the permit is indefinite.)

> The operating permit is a legal instrument that makes it easier for the regulatory agency to enforce the maintenance requirements of the code. The primary effect is to put owners on notice that the government is interested in the operation of the system. The secondary effect is to increase the chance of a successful court action because the charge of "operating without a permit" can be added to the "failure to properly maintain" charge.
>
> The implied threat of the provision is that a system without an operating permit may not be operated and, therefore, the home must be abandoned—a politically unrealistic action in most cases.
>
> The operating permit creates obligations on the part of the regulatory agency as well as the homeowner. The regulatory agency needs to have the skills, personnel, support systems, and the political will to enforce the requirement.
>
> Statewide operating-permit programs are more difficult to adopt and enforce than local requirements focused on areas of perceived high risk. A major problem with statewide application of these provisions is the failure to enforce the provision by local governments where the risk of health and environmental effects is perceived to be minimal.
>
> *Recommendations:*
>
> - Do not establish statewide operating permits initially unless the state is assured that the enforcing agencies are able and willing to enforce the provision. Instead, first establish a focused operating-permit program in areas of perceived substantial risk of harm from failing systems, and where the regulatory capability exists to administer and enforce the provision. Linking the operating-permit program to high risk areas increases the political viability of the requirement. The question is: who should adopt the provision, the state or the local governments? The key is who is in the better position to identify focused areas of perceived risk and to secure enforcement.
> - Do not conduct regulatory inspection of individual systems if service-tracking programs are in place. Do conduct regulatory audits of service providers.
> - If operating permits are issued, they should be for a fixed period of time and linked to the risk of failure of the design.

6.2.3 Revocation

The operating permit may be revoked for the following reasons:

- Existence of a Type I or Type II compliance violation beyond the authorized repair period.
- Existence of a Type I or Type II compliance violation that is an imminent threat to human health and safety or to the natural environment.
- Persistent failure to perform required inspections and maintenance.
- Change in use or increase in the size of the structure that significantly increases the wastewater loads and flows.

6.3 PERMIT ADMINISTRATION

6.3.1 Application Submittal

- ***Person.*** The owner of the decentralized wastewater-treatment system, the owner's agent, the owner's assigned operator, or the person performing the work shall apply for the permit.
- ***Application Form.*** The permit application shall be filed on a form supplied by (or by other method acceptable to) the [*name of agency*].
- ***Attachments.*** The following documents shall be attached to the permit application:
  – [*List of documents (plot plan, soil report/certificate, system plan, etc.*)]
- ***Addressee.*** [*name and address of agency*]

> *Recommendation:* The state agency should establish a uniform permit for use in the local jurisdictions.

6.3.2 Retention of Documents

Records pertaining to construction and operating permits shall be retained in the following manner:

- ***By the owner or operator.*** Construction and repair permits and attached documents shall be retained at the worksite during the course of the work until the system is allowed to be operated. They shall be produced when requested by the inspector.

  The operating permit and related documents, for example [*names of documents*], shall be retained by the owner or operator while the permit is active and shall be made available to the inspector within a reasonable time of their being requested..

- ***By the regulatory agency.*** Construction and repair permits and attached documents shall be retained during the course of the work until the system is allowed to be placed in operation (OPTIONAL TIME PERIOD: . . . until the system is abandoned).

  The operating permit and related documents, for example [*names of documents*], shall be retained while the permit is in effect (OPTIONAL TIME PERIODS: . . . retained until the system is abandoned, . . . retained indefinitely).

> *Recommendations:* Construction and repair permits should be retained at the work site and by the regulatory agency during the work. A copy of the permit documents, especially the approved plan, should be retained by the regulatory authority until the system is properly abandoned. It is unrealistic to expect the owner to retain the records because of the turnover of owners.
>
> If there is an operating permit, the records should be retained by both the owner/operator and the regulatory agency during the period of operation of the system.

6.3.3 Application Processing Time

The regulatory agency shall process a permit request, perform a plan review (if required; see section 6.4) and issue an approval or denial of the completed permit application within [*number*] business days of receipt. The process time may be extended by agreement of the applicant. Failure to issue a determination within the required time shall cause the agency to rebate [*number*] percent of the application fee for each day the reply is late.

6.3.4 Written Response

The agency response to a permit and application shall be in writing. If the permit application or plan approval is denied, the agency shall state the specific reasons for the denial in the response.

> Performance standards can apply to the work or individuals and organizations in addition to the effluent of wastewater systems. An important performance element to citizens is timeliness of code administration. Long permit-review times delay home building projects, increase costs, and harm the citizen. The review-time performance standard should approximate the best practices in similar regulatory agencies or that provided by competitive service agencies for similar processes.
>
> *Recommendation:* Since most permit and plan reviews are bench reviews and require an hour or two of labor at most, a target permit-turnaround time should be in the range of 1 to 3 working days. Some review agencies return plans in one day with an appointment.
>
> Some agencies conduct a field audit along with the plan review; longer review times of a day or two can be expected.
>
> Agencies with insufficient staff to meet the required response time should consider authorizing third-party reviewers or waiving the review process for plans prepared by Master Designers. Third-party review options range from using peer review to directing overflow work to other public or private review organizations.

6.4 DESIGN PLAN REVIEW

A design plan shall be submitted with the permit application for construction of any new decentralized wastewater-treatment system or modification of an existing system. The plan shall contain the information specified in paragraphs 6.4.1 and 6.4.2.

[OPTIONAL ADDITIONAL LANGUAGE: Plans submitted by a Master Designer are not subject to mandatory review prior to issuance of a permit, but they may be audited for the purpose of confirming the designer's continued rating as Master Designer.]

6.4.1 Information Required for an "Onsite" System

The following information shall be provided with the design plan for an "onsite" system (as distinct from a "cluster" system):

- A scale drawing showing the property boundaries, the location of existing and proposed structures (including those associated with the subject system's components), current and proposed easements, driveways, below-ground water and utility lines, public and private wells, and surface waters. Off-site property that

potentially affects the placement of system components because of setback requirements shall be shown, but not necessarily to scale. On large lots, those features that are more than twice the distance of the largest setback requirement from any system component may be omitted. If the system's components are on a legal parcel other than that of the structure served, the site plan must include all parcels with interconnected system components.

- Soil- and site-evaluation reports, (OPTIONAL . . ., for example, NOWRA's Certificate of Performance Standard Compliance for the unconfined-soil component and non-soil component evaluation(s) issued by NOWRA within the preceding 100 calendar days.)
- Operation and maintenance manuals for the system components, including the unconfined-soil treatment/dispersal component. If the design is based on a design manual that has been approved by NOWRA, the manual's name and approval number may be provided in lieu of the manual.

The utility of a design plan's being reviewed by a regulatory agency is determined by the value added to the process. The value of regulatory review is conditioned on the following:

1. Is the quality of the regulatory review sufficient to ensure that the plan is code compliant? Can the contractor and the code-compliance inspector rely on the approved plan?
2. Does the review agency assume responsibility for the quality of the review? Responsibility means compensation to harmed parties for errors or omissions. Harm to individuals may include reconstruction costs and time delays in construction or occupancy of the structure.
3. Is the agency review timely? Optimal review times are in the range of 1–3 work days. Acceptable time may be less than 10 work days. Unacceptable permit turn-times are likely longer than 10 days. The appropriate permit turn-time is determined by benchmark regulatory agencies with rapid turn-times and service organizations operating in a competitive service environment.
4. Does the desk review requirement divert agency resources that could better be deployed in field inspection, consultation, or training?
5. Does the field inspector feel pressure to approve a non code-compliant system to cover for agency errors in plan review?

Recommendation: If any answer to items 1–3 is "no" or if the answer to item 4 or 5 is "yes," the agency should consider one of two options:

- Reform the program to make the answers to items 1–3 "yes" and the answer to items 4 or 5 "no."
- Drop the mandatory plan-review function and shift staff resources to site inspection, certification audits, consultation and training. Plans should still be submitted and available at the work site for inspector review.

The primary benefit of a design-plan review is a quality control audit of the designer's work—to reduce or eliminate errors in construction. The quality control service can be provided by any competent person, public or private. The cost of plan-design errors to the homeowner, designer, and installer is a noncompliant system, reconstruction costs, and time delay.

The ultimate determinants of code compliance are trained and certified private- and public-sector personnel and construction inspection by a trained and certified inspector.

6.4.2 Information Required for a "Cluster" System

If the decentralized wastewater-treatment system is a "cluster" system, a single cluster-system design plan may be submitted for review and permitting. The plan shall include the cluster system's maximum influent design loads and flows and a detailed specification and drawing of the standard connection between a structure's plumbing system and the last off-lot or first on-lot treatment component, whichever is applicable. Further plan reviews of the cluster system for individual structure connections are not required provided design flows are not exceeded. Hook-up of an individual structure shall be subject to any plumbing-permit process pertinent to that structure. The cluster system's construction permit shall be in effect until the development served by the approved cluster system is completed, unless revoked for cause.

An easement shall be recorded for the cluster system's components.

6.4.3 Information Required for an REM-Owned and -Operated System

If a decentralized wastewater-treatment system serving a single structure is owned and operated by a certified Responsible Management Entity (RME), the plan review and inspection provisions contained in paragraph 6.4.2 apply to the individual on-lot system.

> Traditional rules were developed to deal with the one-lot systems owned and operated by the individual building owners. Cluster systems owned and operated by certified RME organizations should be regulated more like utilities, with the regulatory attention shifted to the RME rather than system installation.
>
> Cluster or other systems serving 20 or more people are defined as Class V injection wells under federal and state Underground Injection Control programs and need to be registered with the appropriate authority.

6.4.4 Submittal of an "As-Built" Plan

A permit for system construction or modification is issued pursuant to approval of the design plan. If unexpected site conditions or other circumstances are encountered that require that the system be installed in a manner other than in conformance with the approved design plan, an "As-Built" plan shall be submitted to the approving agency.

6.5 SITE SUSTAINABILITY PLAN

The designer shall provide a site sustainability plan to the regulating agency and the owner. The plan shall describe the procedures for maintaining the decentralized wastewater-treatment system at the site in successful operating condition for the expected life of the structure(s) served. The presumed life of the structure(s) is 100 years unless stated otherwise. If the site is expected to be connected to a non-onsite wastewater conveyance- and treatment-system in the future, the sustainability plan may be limited to that period. The plan shall assume that all components will fail and require repair or replacement during the life of the system unless the designer can

demonstrate indefinite operating life for the components. For the unconfined-soil treatment/distribution component, the plan may prescribe, but is not limited to:

- Use of rejuvenation techniques.
- Relocating the component to areas reserved for the purpose.
- Using alternating drainfields or pretreatment to eliminate the formation of a clogging layer.

> Most structures will last in excess of 100 years if properly maintained. Many will rely on decentralized wastewater-treatment systems for their lifetimes. The designer should provide a contingency plan to maintain a system on the site either with repaired, rejuvenated, or replaced components.

6.6 INSPECTION

6.6.1 Construction Inspection

Except as provided in paragraph 6.6.1.1, systems and system components that have been newly installed [OPTION . . . , modified, or subjected to major repairs] shall not be covered or placed into service until inspected and approved by the [*regulatory agency's name*] construction inspector. The contractor performing the work shall contact [*regulatory agency's name*] to schedule an inspection. If the inspector is unable to inspect the facility within [*number*] days, or verbally waives the inspection, the contractor may cover the components.

> If the risk of faulty installation has been reduced by training, certification, and demonstrated installer performance, the regulatory agency should recognize the training and reduce or eliminate the "call for inspection" requirement.
>
> Late inspections can substantially slow construction and tie-up contractor work crews at large cost. The agency should be able to provide inspection no later than the day following an inspection request in at least 80% of the cases. If budget or political constraints prevent hiring sufficient inspection staff, the state should consider licensing private inspection staff to do some or all of the work. Many private inspection contractors work in both building inspection and real-estate inspection; they should be capable of adding decentralized wastewater-system inspection to their line of services.

6.6.1.1 ***Inspection Waiver.*** An installer who holds a Master Installer certificate shall notify [*regulatory agency's name*] that the work is complete. The system/component(s) then may be covered and placed into service without inspection unless the agency or the inspector specifically requests otherwise. The Master Installer shall inspect the system/components(s) prior to covering and certify that the system was installed per code and permit requirements.

6.6.2 Grading Inspection

The inspector may require an inspection of final grading and landscaping to ensure that the system is not subject to storm-water erosion or ponding over the components.

6.7 MAINTENANCE

6.7.1 Operational Maintenance

The owner shall have the system and its components serviced during its operational lifetime in accordance with the requirements of the code, the operating permit, and the components' service manuals.

6.7.2 Maintenance Oversight

[*Regulatory agency's name*] shall verify that the system and its components are being maintained in compliance with the requirements of the code, the operating permit, and the components' service manuals. A combination of maintenance-record inspections and physical inspections may be employed in a manner appropriate to the operator's history.

> Regulatory agencies should have a method of monitoring compliance with system maintenance requirements. Some agencies maintain a database of required service events and either monitor for compliance themselves or contract with a service firm to do it. Where the owner's/operator's system maintained behavior exhibits a pattern of noncompliance with requirements, the agency should take measures to enforce the requirements.
>
> *Recommendations:*
>
> - If scheduled maintenance is being performed routinely, the agency should rely on the maintenance records to verify compliance and forego routine regulatory inspections. Spot inspections may be productive.
> - If scheduled maintenance is not being performed routinely, the agency should establish routine regulatory inspections
> - The agency should not rely on the maintainer to perform regulatory inspections because of conflict of interest issues. The maintainer should be required to notify the agency of significant service events.
>
> Effluent quality monitoring—Some agencies require that effluent samples be taken to measure the system's performance against adopted standards. Those standards are often stated as measures of central tendency—average or mean values. Because of the natural high variation of effluent quality, numerous samples are needed to establish the average or mean performance levels of decentralized wastewater-treatment systems—as high as 100–200 samples to establish the 95% confidence level that often is needed to sustain an enforcement action. Because adequate sample monitoring is very expensive, it is not reasonable, relative to risk, to require it for the vast majority of small treatment systems.
>
> *Recommendation:* Do not require effluent samples from small systems. Instead, rely on evaluated designs and operational maintenance enforcement.

6.7.3 Existing-System Assessment Protocol

Inspection of an existing system shall determine whether the system is operating in compliance or not in compliance with pertinent requirements. The authority having jurisdiction shall determine the level(s) of inspection required based on risk conditions.

- Level I. The system is operating with a Type I compliance violation.
- Level II. The system is operating with a Type III compliance condition

- Level III. The system is operating with a distribution component that conforms with the pertinent design specifications or, alternatively, the distribution component functions hydraulically and provides the intended level of treatment.
- Level IV. The system is operating with a Type II compliance violation.

Determination of compliance or level of noncompliance shall be achieved by either of the two following methods:

1. Deemed-to-Comply Method. The soil-component design features are in conformance—OR are not in conformance—with the prescriptive design requirements in effect at the time the component was constructed or last modified. If those design requirements have been superseded by those of a subsequent code with retroactive application, the new design requirements apply.
2. Treatment-Evaluation Method. Treatment performance evaluated by testing the effluent as it leaves the treatment train. Sampling protocol and evaluation shall conform to recognized protocols.

> The regulatory agency needs to determine the depth of the evaluation to be conducted. The inspector's questions might be:
>
> - Is the system currently failing or showing evidence of recent failure (surfacing)? (Type I violation)
> - Does the system have the required vertical and horizontal separation distances? (Possible Type II violation)
> - Has the use of the structure changed so that it is no longer compatible with the design?
>
> The following general language expands on the code language but is not intended to be more than a guide to the development of an inspection protocol.
>
> - A Level I inspection looks for surfacing of sewage where it is not intended. This can be observed by walking the site and inspecting for discharges in buildings.
> - A Level II inspection looks at the mechanical, hydraulic, structural, and control functions of the system components. The tanks are evaluated for needed pumping.
> - A Level III inspection determines the hydraulic capacity of the distribution component without discharge to the surface.
> - A Level IV inspection determines the status of the drainfield relative to prescriptive performance standards covering the system.
>
> Inspection of an existing system frequently occurs along with a home inspection during a property sale. The information collected is intended for the private use of the buyer, seller, bank, and the realtor. Regulatory agencies should not require that the inspection report be submitted to the agency for purposed of enforcement because it creates a conflict of interest for the inspector and would otherwise discourage voluntary inspection.
>
> The results of Level III and IV inspections need careful consideration.
>
> - A ponded drainfield absent surfacing is not a failed system. In fact, it is likely to be providing an optimal level of treatment because of added treatment in the trench and equal distribution.
> - States that employ prescriptive vertical-separation requirements should consider establishing a reduced separation requirement when evaluating mature systems.

- Level IV inspections may create a political backlash unless directed in a focused manner to a publicly perceived problem. Requiring that the drainfield be replaced when the system has a 30-inch separation instead of 36 inches may be politically and scientifically unsupportable, because the system is probably performing better than a new conventional system.

Note: An inspection checklist needs to be developed for each level of inspection.

The inspection levels above describe the options for a regulatory compliance inspection. Non-regulatory inspections frequently occur as part of a home inspection during a property sale. The information collected is intended for the private use of the buyer, seller, bank, and the realtor. Regulatory agencies should not require that these private inspection reports be submitted to the agency for purposes of enforcement because the requirement creates a conflict of interest for the private inspector and would otherwise discourage voluntary inspections, which frequently lead to system repair and improvement.

6.7.4 Reporting a Malfunctioning System

The owner or operator of a decentralized wastewater-treatment system shall report the occurrence of a Type I or Type II compliance violation to [*name of agency*] within [*number of days*].

A homeowner reporting a system as failing is likely to get it fixed without a regulatory order. If a repair permit is required, making the permit application will also fulfill the reporting requirement.

A person who fails to report a failing system, is guilty of "operating a system in violation of the code."

Recommendation: Do not adopt this requirement if the agency has a maintenance-monitoring or regulatory-inspection program in place. Otherwise, adopt it.

6.8 CERTIFICATION

6.8.1 Areas of Certification

An individual or organization employed at a decentralized wastewater-treatment system to perform the services and core tasks associated with the following occupations or functions must possess current certification from the indicated organizations:

Individuals

- Construction Inspector
  [*name of certification and issuing organization*]
- Designer
  [*name of certification and issuing organization*]
- Installer
  [*name of certification and issuing organization*]

- Maintainer/Operator (OPTION: excluding homeowner)
  [*name of certification and issuing organization*]
- Plan Reviewer
  [*name of certification and issuing organization*]
- Site Evaluator
  [*name of certification and issuing organization*]
- Soil Evaluator
  [*name of certification and issuing organization*]

Organizations

- Responsible Management Entity (RME)
  [*name of certification and issuing organization*]
- Regulatory Agency
  [*name of certification and issuing organization*]

Persons holding professional licenses that nominally permit them to perform the services and tasks associated with the occupations/functions listed above must comply with their license restrictions that permit them to work only if qualified in the specific area of practice.

> The state has three options in establishing a certification program:
>
> - Issue state certification without reference to third-party certification
> - Issue a state certification contingent on the applicant's possession of a third-party certification. The terms of the certifications would need to be the same.
> - Require third-party certification but no state certification—oversee the issue by requiring production of certificates at time of contact (at plan review and site inspection, for examples).
>
> The term "certification" as used here refers to programs that issue either certifications or licenses. Some states provide certification programs but do not *require* certification to enter the workforce. A requirement for certification prior to performing commercial work is functionally the equivalent of requiring possession of a license.
>
> The purpose of certification is to reduce the risk that service providers will make errors that degrade system performance. Certification provides a mechanism for screening applicants concerning their skills, knowledge, and history, and thereby protecting the industry from the introduction of unsatisfactory individuals.
>
> The certification function can be based on either prescriptive or performance requirements. There are issues with both approaches:
>
> - Prescriptive pre-application requirements such as prior experience and possession of other licenses or degrees (engineer, plumber, for examples) tend to screen out otherwise qualified personnel.
> - Evaluation based on knowledge, skills, and ability to perform a task is an excellent screening approach that does not tend to eliminate qualified persons. The process is expensive to develop and implement, but national certification programs may have sufficient economies of scale to to warrant its use.
> - Certification programs can be abused in the following ways:
>   – Setting high pass points or requirements. This tactic may be partially intended to reduce the labor supply and thereby drive up wages.
>   – Preventing performance of minor ancillary tasks of one classification from being performed by another, causing more staff to be assigned to a task.

In general, certification programs are useful tools for improving the level of service to the public. They also are useful as base programs for structuring continuing-education programs. Both certification and training programs are primary tools for advancing the service level of the industry.

Many regulatory agencies are unable or unwilling to fund the development of performance-based evaluation procedures. Low-cost, marginal-value certification programs deployed by many regulatory agencies make robust certification programs uncompetitive. They reduce the job mobility of skilled personnel because of the cost and hassle involved in crossing political boundaries to a new job.

Recommendations:

- State codes should require certification of service providers for the key classifications listed in paragraph 6.8.1.
- State codes should recognize national certifications.
- State codes should recognize persons holding the national certificates as persons meeting state certification requirements. States can add an examination for knowledge of the state code if deemed necessary.
- Local government should accept state certifications without additional examination.

6.8.2 Prior Qualifications for Initial Certification

When initially applying for certification, applicants engaged in the following occupations/functions must demonstrate the prior training and experience shown after each listed item:

- Construction Inspector: [*requirements*]
- Designer: [*requirements*]
- Installer: [*requirements*]
- Maintainer/Operator (option: excluding homeowner): [*requirements*]
- Plan Reviewer: [*requirements*]
- Site Evaluator: [*requirements*]
- Soil Evaluator: [*requirements*]
- Responsible Management Entity (RME): [*requirements*]

If there are subclassifications in an occupation (e.g., Installer I and Installer II), it is particularly important to recognize them in connection with Prior Qualifications, so as to minimize the risk of unfairly screening out qualified persons.

Recommendations:

- Prior qualification should be avoided at the entry level.
- National certification programs should provide two levels of certification for each general classification group.
  - Entry level–common and simple elements of the task
  - Journey level— broad and complex elements of the task
- States should adopt a third classification—Master level— to identify persons, either entry level or journey level, who have demonstrated reliability in their trades at their respective levels to an extent that permits substantially reduced regulatory attention.

The purpose of multilevel certification is to allow persons with narrow but expert skills, such as ability to install conventional systems but not site-constructed sand filters, to contribute their particular expertise to the benefit of the industry.

6.8.3 Display of Certificate

A person performing work requiring certification must produce the certification document when requested by an inspector or other government agent with jurisdiction. A regulatory inspector must produce his/her certification when requested by any individual with whom the inspector is interacting as an agent of the state.

6.8.4 Duration of Certification

Certificates issued by the state expire in accordance with the following schedule:
[*List of certificates (see para. 6.8.1) with duration of each*]

> Expiration dates keep the certification list current and serve as a mechanism for enforcing the obligation to obtain continuing education. A reasonable duration is three years.

6.8.5 Continuing Education

Persons holding current certifications must successfully complete approved education programs after the effective date of the current certification and prior to applying for certification renewal.

6.8.5.1 ***Course Approval.*** Education programs shall be approved by the agency issuing corresponding certification. The content of the course shall be focused on improving the knowledge, skills, and abilities of certificate holders in the performance of the work covered by the certification.

6.8.5.2 ***Credits Hours.*** One hour of training equals one credit hour. The credit hours required for each certification are as follow:
[*List of certificate titles with credit hours required for each*]

6.8.5.3 ***Reporting Credit Hours.*** The entity conducting the approved continuing education shall perform the following functions:

- Provide mechanisms that ensure that the individual pursuing the continuing-education credit actually attends the complete program and is attentive to the subject material.
- Record the attendance and issue a corresponding certificate to the individual. If direct notice is required by the certifying agency, a list of attendees and other information required by the agency shall be provided to the agency.

6.8.5.4 ***Failure to Report Required Credit Hours*****.** Persons who fail to report sufficient credit hours for certification renewal shall be denied a new certification, with the following exceptions:

- The applicant may apply for the current certification to be extended for a four-month period to provide time to earn the necessary credits hours or resolve disputes concerning awarding/reporting of credit hours.
- The agency may grant a second extension upon the applicant's request showing good cause for such extension. The determination of "good cause" shall be solely at the discretion of the agency.

> *Recommendation:* Continuing education should be required as a condition of renewal of certification. Eight to sixteen hours of approved courses is reasonable for renewal.

APPENDIX A

Classification Matrices

Pending beta testing by Florida Department of Health.

APPENDIX B

Listed Components

Reserved for list of evaluated and classified components.

APPENDIX C

Soil Component

Under development.

APPENDIX D

Procedure for Administering the Confined Treatment Component Database

Pending beta testing by Florida Department of Health.

APPENDIX E

Tank Standards

GUIDANCE

Decentralized wastewater treatment systems employ various buried structures such as septic, pump, holding and treatment tanks. While the majority of this guidance addresses the septic tank, it also applies to the other uses of the tank.

The primary purpose of the septic tank is to clarify the wastewater; to separate constituents that float and sink from the other wastewater constituents. A second benefit is that decomposition of organic material begins in the septic tank. Raw waste is reduced to sludge, scum, gases, and effluent with the aid of beneficial microbes that reduce the organic material without outside energy sources. In this regard, the septic tank is extremely beneficial at a nominal cost when compared to the overall system cost.

FIT FOR THE INTENDED USE AT THE SITE

The septic tank system needs to be fit-for-use in its operating environment. The operating environment of most septic tanks is: buried below ground, in or above ground water, empty or full of sewage. The septic tank system consists of the tank, riser and inlet/outlet ports. The common performance standard in many state codes is that the tank system is watertight and structurally sound while installed and operating.

- Watertight – Inflow of groundwater or storm water. Onsite wastewater treatment systems are designed to return a predetermined volume and quality of wastewater to the environment. A septic tank allowing inflow of water can permit large unintended volumes of ground water into the treatment and disposal system. This can overwhelm the capacity of the downstream components which may not be able to handle the extra water and provide adequate treatment. Also surges of inflow can displace solids from the tank adversely affecting the operation and operating life expectancy of downstream components. Groundwater and soil often have compounds such as sulfur, iron and manganese which can severely impact the septic tank and treatment components downstream.
- Watertight – Outflow of sewage. Leaking tanks can pollute groundwater in circumstances where there is a lack of suitable soil treatment between the tank and the groundwater.
- Structurally sound – The buried tank needs to be structurally sound to withstand the live and dead loads experienced at the site to prevent cracking or collapse.

The potential impacts include safety of people in the area of the tank, the operation of the treatment system and the formation of cracks or other openings that cause leaks.

In many jurisdictions, the watertight, structurally sound requirements have not been aggressively enforced. Because the manufacture and installation of truly structurally sound, watertight tanks are marginally more expensive, and because the customers are very cost sensitive, this lack of enforcement gives a price marketing advantage to vendors of poor quality tanks. This problem is compounded because the tank is "out-of-sight" and "out-of-mind" of homeowners so they may not know that the tank system is leaking or structurally unsound.

The intent of the NOWRA code is that the treatment system be sustainable for the expected period that the treatment system needs to serve the structure. For most systems that is the expected life of the structure. Sustainable means that the system components can be maintained in operating condition through maintenance, repair or replacement. This model code guidance does not suggest that an installed tank be designed to last for 100 plus years, the expected life of many structures. Obviously, the actual life will vary depending the waste stream influent, timely inspection, pumping and other operational factors. Robust components require less maintenance and repair and have a longer life expectancy. The determination of the targeted design life of the system can be determined by the designer/owner and/or the regulating jurisdiction.

DETERMINATION OF THE WATERTIGHT AND STRUCTURALLY SOUND REQUIREMENTS

In a performance code, the determination can be made by the inspection of an installed system during its operational life. The performance standard for a structurally sound tank with watertight connections is simple: it leaks or it does not; and it remains intact when installed and operating, or it does not. If the tank is not leaking and is not showing signs of structural collapse, the tank satisfies the two requirements. However, there are several issues to be considered in this matter:

- The inspection of an installed, operating tank may be technically impractical or too expensive.
- Pressure testing can be dangerous if the tank fails. Such tests must be done in a manner that complies with OHSA safety standards. If the test is conducted in the excavation, entry into the excavation is also subject to OSHA shoring and excavation rules.
- Most regulations are designed to prevent the non-compliant condition from occurring with health and safety rules establishing minimum design requirements and implementing construction/manufacturing inspection programs.

It is useful to be able to determine if the tank design will meet the requirement before it is placed in operation. Two methods are typically employed to verify watertightness and structural capacity, respectively:

- The tank is tested by filling with water or by applying a vacuum or pressure test.

- The tank design and construction satisfies engineered standards and approved industry quality control methods.

The tank should be designed to withstand all likely conditions with an appropriate safety factor and remain watertight and structurally sound for the intended life of the component. There are several methods to test a tank. Each tank, or a random sample of tanks can be tested at the factory and/or each tank can be inspected and tested at the site after it is installed and/or after it is placed in operation. The installed tank must meet the appropriate standards.

TANK STANDARDS

The NOWRA model code provides a series of successively more stringent performance requirements and code language. Following are the options for each of the major issues:

STRUCTURALLY SOUND

Purpose: Prevent tank collapse; protect public safety and protect the internal components and processes.

Policy Options: standard and code language

- No adopted standard
- The installed tank shall be structurally sound, capable of bearing all anticipated live and dead load conditions exerted on a buried tank. Those conditions may include: tank empty and full, and tank installed above and below the water table, as determined by the following language:

  The tank shall be structurally sound as determined by Engineering Design with appropriate safety factors, and watertight verified through appropriate testing and compliance monitored by local authority. All tanks shall be designed and certified by a Professional Engineer, licensed and qualified to perform structural design. Design should contemplate all reasonably expected loading conditions, including burial depth, tank full to top of riser, an empty tank installed with water table at top of ground and any other reasonable expected loading conditions. Manufacturer should be required to certify that all tanks manufactured meet the engineer design.

> Structural integrity of a tank is important to protect against dangerous collapsing. Septic tanks are subjected to many varying loads and stresses. In some areas tanks may be buried deep below ground to prevent freezing, in others, water tables are often above the top of the tank for extended periods of time. All tanks must be designed to withstand all anticipated structural loads. Since septic tanks are buried and usually forgotten, structurally sound requirements must be implemented, enforced and monitored by the authority having jurisdiction.
>
> Since tanks are made from several types of materials, no one industry adopted standard is available. Fortunately, all tanks of all materials can be analyzed by engineers to determine structural soundness including appropriate safety factors. Many industry standards are available for use in determining the exact requirements based upon the onsite system and conditions.

ACCESS GUARDED

Purpose: Prevent injury or death caused by child or unintended adult entry into the system components while maintaining ease of access by maintenance personnel.

Policy Options: standard and code language:

- No provision
- All exposed access openings shall be guarded. Openings larger than 4 inches should be secured by bolting or locking lids or by lids that weigh a minimum of 59 lbs (from ASTM C 1227 – "7.6.1") and are set to prevent sliding. Covers, risers and lids shall be capable of bearing the expected live and dead loads.

> This is an important safety issue. Guidelines may be found by consulting available standards: ASTM C1227, ASTM C 890, CSA B-66, and IAPMO PS-1. Potential loads could include people, lawn equipment, or vehicles.

WATERTIGHT TANKS

Purpose: Prevent unintended leaks to protect the tank's function of clarification and to protect downstream components from excess flows and loads.

Policy Options: standard and code language:

- No provision
- Tank shall be watertight to the outlet hole
- Tank shall be watertight, including inlet and outlet pipe penetrations, to a point 2 inches into the riser
- Tank shall be watertight, including inlet and outlet pipe penetrations, to and including the riser assembly
- Testing [SEE TESTING OPTIONS BELOW]

> For tanks where leaks out of the tank need to be controlled, the minimum standard should be "watertight to the outlet hole." For tanks where inflow waters are a concern, the minimum recommended standard is for all tanks and associated components to be watertight into the riser assembly. Any other standard will permit periodic uncontrolled leaking into or out of the tank. Downstream components cannot be practically designed to handle unintended flows. Post installation testing of tanks is the best method to assure this standard is met.
>
> Post-installation testing: A testing program is essential to ensure compliance. The level of testing will depend heavily on the value placed on achieving the recommended standards. A minimum should be random periodic testing of installed tanks. The most comprehensive program would require testing of every tank installed. Local conditions—availability of water and/or other testing equipment and monitoring personnel will have to be considered when setting this standard. OSHA safety standards for shoring, excavating and confined space entry also need to be considered when selecting an evaluation protocol. Testing responsibility may be other than the local regulator.

EVALUATION PROTOCOLS

The objective of quality assurance (QA) and quality control (QC) procedures is that the installed tank be "fit-for-use" as a component in an installed wastewater treatment train. The QA and QC processes focus on the safety of the tank structure and the wastewater loads and flows exiting the tank. Two key components of that process are ensuring that tanks are structurally sound and watertight when installed. Evaluating the tank assembly at the site is an important component of a QA program. However, site evaluation for structural soundness and watertight condition of the installed tank (buried in both the full and empty state) is sometimes difficult and may increase cost of system. Cost is always an important consideration along with the risk posed by failure to perform to performance requirements. As a result, alternative QA and QC processes are often employed such as evaluating the tank at the site before it is buried, certifying the personnel doing the work, certifying the manufacturer to accepted industry standards. Because tanks are made from materials that have different strengths and weaknesses, different test methods will affect the designs differently. Further, various testing methods have different time and money costs.

Adoption of existing evaluation protocols - Different tank systems and materials may require different evaluation protocols for watertight and structurally sound requirements. Where an accepted evaluation protocol for the material or tank assembly exists, the entity specifying the evaluation requirement should first consider adopting that protocol.

Listed below is a general explanation of the procedures and a rationale for selecting the testing procedure.

Watertightness Testing Procedure

- ***Water Test Procedure:*** A water test is performed by installing tank, connecting inlet and outlet piping (with caps), installing risers, and filling tank to required depth. Some materials, such as concrete, may require a period of time for natural absorption into the material prior beginning the watertight test. Backfill may or may not be in place depending on whether the backfill is integral to the structural design. Mark the level of water in the tank "or riser." After a predetermined "test time" applicable to the material or assembly, make a visual check on the outside of the tank for leakage (if possible), and check water level in the tank (or riser). If no visual evidence of leaking and water is at mark, tank passes.

  ADVANTAGES: This test is easily and quickly administered, and pass/fail is fairly obvious. A small leak will have evidence (a wet spot). The weight of the water also provides a test on the foundation under the tank. If bedding under the tank is uneven or has rock protruding, tank may crack causing failure of test.

  DISADVANTAGES: Water may not be available on site, and will have to be transported to the tank.

- ***Pressure Test Procedure:*** A pressure test is usually performed by capping inlet and outlet piping, sealing access openings, and then pressurizing tank to 5 PSI. Pressure in the tank is held for a given period of time, depending on the adopted

protocol. If leaks are discovered and repaired, the test may be run again. In the final test, any leakage is considered a failure.

ADVANTAGES: This test is easily and quickly administered, and pass/fail is fairly obvious.

DISADVANTAGES: Installer/tester must purchase and maintain testing equipment.

- ***Vacuum Test Procedure:*** A vacuum test is usually performed by plugging inlet and outlet piping, installing risers and using a vacuum pump to pull a negative pressure of 4 inches of Mercury. The tank must hold this vacuum for a given period of time, depending on the adopted protocol. Any leakage is considered a failure.

  ADVANTAGES: This test is easily and quickly administered, and pass/fail is fairly obvious.

  DISADVANTAGES: Installer must purchase and maintain testing equipment.

When selecting the method of testing, the manufacturer/engineer should be required to approve the test method procedure to insure that the actual test loading condition does not exceed the "engineered design" loading condition.

The longer a test is performed, the more accurate the result to identify relatively small leaks. Length of test must be balanced with the increased cost of the longer test.

Repairs can be made to tanks failing watertight test provided the structural integrity has not been compromised.

TANK EFFLUENT CHARACTERISTICS

Designer must ensure that the various components of the treatment train are compatible. This edition of the model code does not provide an evaluation scheme to classify effluent quality from the septic tank component. Like other treatment train components, the quality and volume of the influent are major determinants of effluent quality characteristics.

Septic tanks should be sized to minimize the required maintenance. Smaller tanks will require pumping more often than larger tanks with the same flow. Effluent filters, screens or other methods are strongly encouraged to prevent large solids from passing to downstream component during operation. Care should be taken to prevent solid flows during servicing.

Provide Access to Components

Proper maintenance and repair are important to the long-term success of all systems. If maintenance workers cannot easily or adequately access components, maintenance will either be ignored or put off until a crisis happens. Access at ground level or above is highly recommended for all tanks and/or components contained therein. Openings should be of adequate size to facilitate maintenance. See the code document for language and guidance on tank access.

APPENDIX F

Don't Flush Listing

ITEMS TO AVOID FLUSHING INTO AN ONSITE SYSTEM

The following guidance is a collaborative effort of wastewater professionals within the National Onsite Wastewater Recycling Association (NOWRA). The purpose is to identify common issues that can cause problems with the operations of newer onsite treatment and traditional septic systems. Many operational problems exist today because owners are either unaware of the results of daily practices to these systems. NOWRA's goal is to ensure that owners are educated and informed about the safe practices for their treatment systems in order to avoid costly repairs and to protect groundwater quality. The items listed below are known to have caused failures of onsite treatment systems and must be considered if waste generated by/from a particular site will contain them in excessive quantities. Since excessive is a subjective word, it is highly recommended by NOWRA that you share concerns with your Wastewater Professional to come up with a treatment strategy for your particular needs.

A list of NOWRA wastewater system professional services is found on www.septiclocator.com

Inert Materials: Plastic, rubber, scouring pads, dental floss, kitty litter, cigarette filters, bandages, hair, mop strings, lint, rags, cloth and towels do not degrade in an onsite treatment system. Inert materials will build up solids and lead to system malfunction, clogging or increased pump out frequency.

Paper Products: Disposable diapers, paper towels, baby wipes, facial tissues, baby wipes, lotioned, scented or quilted Toilet tissue, moist toilet paper, do not dissolve readily in an onsite treatment system. Excessive amounts of toilet tissue will also not decompose. All can lead to system malfunction, back-up or increased pump out frequency.

Food Wastes: Do not put animal fats, bones, grease, coffee grounds, citrus and melon rinds, corn cobs, egg shells down the sink. Garbage disposal use should be limited to waste that cannot be scooped out and thrown in the trash. Spoiled dairy products and yeasts from home brewery or baking may cause excessive growth of microbes that do not degrade sewage.

Household Products: Do not flush baby wipes, lotioned, scented or quilted toilet tissue, female sanitary products, cotton balls or swabs, or condoms. antimicrobial soaps and automatic disinfection tablets (blue, clear or otherwise) may kill the organisms needed to consume waste.

Medications/Aliments: Normal use of over the counter medications does not affect the performance of onsite systems. Do not flush expired medicines/antibiotics into an onsite treatment system. Prescriptions for the following medical conditions are known to cause biological disruption in the treatment system: bulimia, severe infections (including AIDS), chronic diarrhea, intestinal/colon by- pass, or other gastrointestinal conditions and cancer. Oral or intravenous chemotherapy is known to cause serve disruption to the treatment process and will require more frequent pump out intervals or the use of biologically based additives.

Commercial Additives: Both the U.S. Environmental Protection Agency and the Small Flows Clearing House have reported that there is no evidence to support the use of additives with normally functioning Onsite Treatment Systems. Some Septic Tank additives have been shown to do more harm than good. A normally functioning system should not require additives.

Chemicals & Toxins: The following materials kill the microbes necessary for the biological treatment to occur: paint, paint thinner, solvents, volatile substances, drain cleaners, automotive fluids, fuels, pesticides, herbicides, fertilizers, metals, disinfectants, sanitizers, bleach, mop water, floor stripping wastes, excessive use of household chemicals, and backwash from water softener regeneration.

Laundry Practices: On-site systems must process the water as it enters the system. Laundry should be spread out over the week, not all run at one time. Excessive use of detergents, especially those containing bleach, can affect system performance. Liquid detergents are recommended over powders. Fabric softener sheets are recommended over liquid softeners. Bleach should be used sparingly and at half the rate indicated on the container.

Clear Water Waste: From air conditioning discharge lines, floor drains, gutters, whole house water treatment systems and sump pumps can increase the flow to your treatment system. These flows can at least disrupt, if not destroy your treatment process.

Remember—if you have additional questions, consult your wastewater professional. NOWRA has a new online service available at NOWRA's Septic Locator to help you with these questions.