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On-site wastewater treatment systems

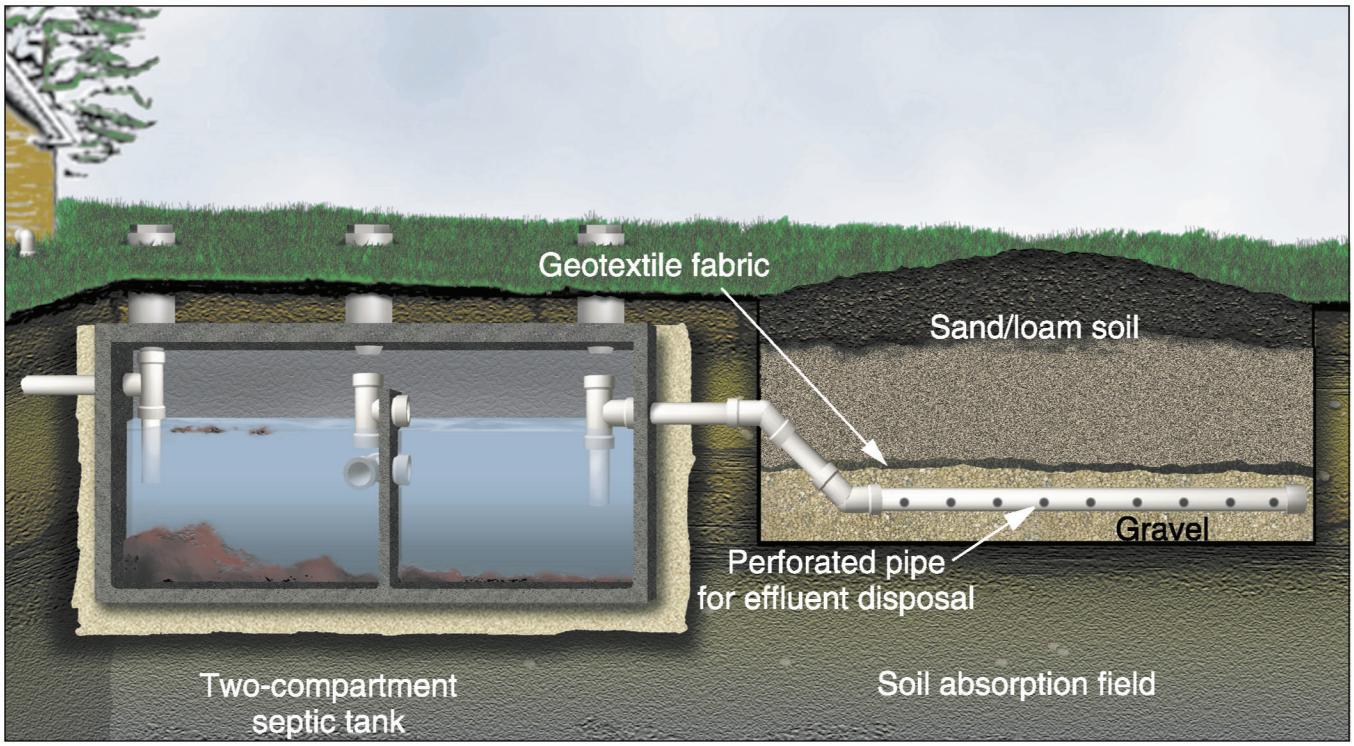

Figure 1: A septic tank and soil absorption field system.

Selecting and permitting

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About 50,000 on-site wastewater treatment systems are installed annually in Texas to treat wastewater from rural and suburban homes as well as from small businesses. An on-site wastewater treatment system collects, treats and applies wastewater to the soil.

By definition, wastewater managed by an on-site system cannot leave the property where it is generated. The water can evaporate into the air, transpire through plants or move through the soil to groundwater. An effective on-site system removes wastewater from the home, treats and distributes the wastewater, and protects our water resources.

Selecting the appropriate system for the site conditions is critical to the system's success. If you select the wrong system or design, or install, operate or maintain the system improperly, it can fail, which could result in pollution of your property and that of others. You could also be fined.

Because homeowners are responsible for conducting or contracting for maintenance of a system, they should be involved in selecting the technology, or type of system used.

State regulations

In 1987, the Texas legislature passed a law (HB 1875) to regulate on-site sewage facility (OSSF) systems statewide. The law called for regional and local governments — such as counties, cities, river authorities and special districts — to implement and enforce on-site sewage regulations with approval and oversight by the Texas Commission on Environmental Quality (TCEQ).

Table 1. Minimum required separation distances for on-site sewage facilities.[A]

From	To: Sewage treatment tanks or holding tanks	Soil absorption systems and unlined ET beds	Lined evapotranspiration beds	Sewer pipe with watertight joints	Surface distribution (spray area)	Drip distribution
Public water wells	50	150	150	50	150	150
Public water supply lines	10	10	10	10	10	10
Private water well	50	100	50	20	100	100
Private water line	10	10	5	10 except at connection to structure	0	10
Private water well (pressure cemented or grouted to 100 ft. or cemented or grouted to water table if water table is less that 100 ft. deep	50	50	50	20	50	50
Streams, ponds, lakes, rivers (measured from normal pool elevation (with and water level); saltwater bodies (high tide only)	50	75, LPD (Secondary treatment and disinfection) - 50	50	20	50	25 when $R_a \leq 0.1$[B] 75 when $R_a > 0.1$ secondary treatment and disinfection) - 50
Foundations, buildings, surface improvements, property lines easements, swimming pools and other structures	5	5	5	5	No separation distances except: property lines - 10[E] swimming pools - 25	No separation distances except[C] property lines - 5
Sharp slopes, breaks	0 Special support may be required for zero separation distances	25	5	10	25	10 when $R_a \leq 0.1$[B] 25 when $R_a > 0.1$[B]
Edwards Aquifer recharge features[D]	50	150	50	50	150	100 when $R_a \leq 0.1$[B] 150 when $R_a > 0.1$[B]

[A] All distances measured in feet.

[B] R_a refers to the application rate for wastewater to the soil. This term is presented as gallons of wastewater applied per square foot of absorption area. Soil types Ia, Ib, II, III and IV have the corresponding Ra values 0.5, 0.38, 0.25, 0.20 and 0.1, respectively.

[C] Drip distribution lines may not be placed under foundations.

[D] No on-site sewage facility may be installed closer than 75 feet from the banks of the Nueces, Dry Frio, Frio or Sabinal rivers downstream from the northern Uvalde County line to the recharge zone.

[E] A separation distance of 10 feet is for spray systems controlled by a timer. A separation distance of 20 feet is required for uncontrolled spray systems, which spray effluent when the pump tank is full. This can occur at any time of the day.

Although the state law has since been modified and expanded, its basic intent remains: The state sets minimum standards, and local authorities can adopt more stringent rules if the TCEQ approves them.

Obtaining a permit

Before building, altering, extending or operating an on-site sewage facility, a person must have a permit and approved plans from the TCEQ or its authorized agent.

The permit process comprises nine steps. Follow all nine steps when installing an on-site system. The various players — designer, site evaluator, installer and designated representative — should work as checks and balances to ensure that an appropriate technology is built at the site. These steps are a safeguard to ensure that the homeowner receives a quality product.

Step 1. The site and soil are evaluated.

A licensed site evaluator or professional engineer must conduct a site and soil evaluation. This person prepares a report on the soil conditions and site survey and locates structures on the property that have specified separation distances from on-site wastewater treatment systems. Table 1 lists important separation distances for on-site wastewater treatment systems.

Step 2. A sewage treatment system is chosen.

The choice of on-site wastewater treatment system is based on the site and soil conditions found during the evaluation. Choosing the appropriate technology is critical to the system's success.

Each on-site wastewater treatment system consists of a treatment component, which initially treats the wastewater, and a final treatment and dispersal component, which distributes the wastewater to the soil. To determine possible final treatment and dispersal options, compare the key conditions of the site and soil to the requirements for the various systems.

Key players in the Texas on-site wastewater industry

Several agency and industry representatives are responsible for making sure that the right on-site wastewater treatment system is chosen for a site and that the system is designed and installed properly:

- ✓ *Texas Commission on Environmental Quality (TCEQ):* The state agency that oversees permitting, inspection, complaint investigations and enforcement of state on-site sewage facilities OSSF regulations.
- ✓ *Authorized agent:* The local governmental entity (permitting authority) authorized by the TCEQ to implement and enforce rules for OSSFs. In areas with no authorized agent, TCEQ staff members enforce OSSF rules.
- ✓ *Site Evaluator:* A person who conducts preconstruction site evaluations, including visiting a site and performing a soil analysis, a site survey or other activities needed to determine the suitability of a site for an on-site wastewater treatment system. The person can be a TCEQ-licensed site evaluator or a professional engineer.
- ✓ *Designated representative:* A person or group designated by the TCEQ or its authorized agent to evaluate sites and to design and inspect systems subject to the TCEQ or its authorized agent's approval. The representative must have successfully completed an educational training program and passed a certification exam.
- ✓ *Installer:* A person paid by another to build, install, alter or repair an on-site wastewater treatment system.
  - *Installer I:* can install on-site wastewater treatment systems. The person has been an Installer I with 1 year of experience or a registered apprentice with 2 years' experience, has completed the Installer II course, has passed the exam, and holds a license from the TCEQ.
  - *Installer II:* can install all on-site systems. This person has been an Installer I with 1 year of experience or a registered apprentice with 2 years' experience, has completed the Installer II course, has passed the exam and holds a license from the TCEQ.
- ✓ *Professional designer:* A registered professional engineer or registered sanitarian who develops the layout for an on-site wastewater treatment system. A professional design is required by the state for some systems.
- ✓ *Apprentice:* A person registered with the TCEQ as a worker for an installer. The installer takes responsibility for the work performed by the apprentice and must visit the job site at least once a day during construction. The apprentice is to be paid only by the supervisor installer.
- ✓ *Maintenance provider:* A person who performs the routine planned activities required to keep a specific on-site wastewater treatment technology performing.

Table 2 illustrates the various final treatment and dispersal options available for specific soil types, soil depths and groundwater conditions. Contact your county Extension agent for additional fact sheets on the various wastewater treatment and distribution systems. To obtain approval for the system you have chosen, you must contact the local permitting authority. You can find a contact for a permitting authority at *www.tnrcc.state.tx.us/enforcement/csd/ics/aa_search.shtml*.

The type of final treatment and dispersal system you choose determines what kind of pretreatment system can be used. Examples of pretreatment options include septic tanks, aerobic treatment units, sand filters, media filters and constructed wetlands. The pretreatment system chosen depends on the water quality requirements of the final treatment and dispersal system, which is chosen to accommodate the site and soil conditions. Final selection of the system components should be completed in cooperation with the professional designer.

Step 3. A plan is developed for the system.

The system must be planned by a person authorized by the permitting authority under current regulations. Installers can normally plan standard or conventional systems, including gravel-filled standard drain fields, unlined evapotranspiration beds, gravelless pipe leaching chambers and pumped effluent drain fields.

In some instances, homeowners can design their systems with help from the local designated representatives. Systems that are more complex — including surface distribution, low-pressure distribution, mounds and nonstandard systems — require professionally developed planning materials.

Table 3 specifies which systems must have planning materials submitted by a professional designer and what level of installer may install it.

A professional designer is either a registered professional engineer (PE) or a registered sanitarian (RS) licensed to practice in Texas with experience in designing on-site wastewater systems. Several local jurisdictions in Texas require that the planning materials of all systems be submitted by a PE or RS.

A PE or RS is also required when submitting planning materials for:

- ✓ Nonstandard and other more complex systems specified as required in Table 3.
- ✓ All systems in the Edwards Aquifer recharge zone.
- ✓ Any on-site sewage system serving manufactured housing communities, recreational vehicle parks or multi-unit residential developments owned or controlled by a person who rents or leases such space.
- ✓ Any OSSF for a structure not exempted by the Texas Engineering Practice Act. Such systems must have planning materials submitted only by a registered professional engineer.
- ✓ Systems needing variances from the rules.

Step 4. An application and planning materials are submitted to the permitting authority.

A permit application and planning materials must be prepared and submitted in the property owner's name and on a form provided by the permitting authority.

Step 5. The permitting authority reviews the application and planning materials.

The permitting authority reviews the application, site and soil evaluation, the type and size of the system selected, and other supporting documents including filing of deed affidavits and maintenance contracts when required for a permit to be issued.

The review ensures that rules in that jurisdiction are followed and that good engineering and scientific practices are used. An agency representative may visit the site to verify the application's accuracy and completeness.

Step 6. The permitting authority grants an authorization to construct.

An authorization to construct must be granted by the permitting authority before building can begin. This authorization should include specific instructions on the number and schedule of inspections and at what stages of construction the inspections are required.

Step 7. The system is built.

Licensed installers or their apprentices can begin building the system only after receiving the authorization to construct. The installer must notify the permitting authority of the intended start date. The system must be built according to the approved plans and permit application. Any changes to the system must be approved by the permitting authority before the changes are made.

In some cases, a new review will be needed, such as when site conditions are different from those submitted in the planning materials. The

Table 2. Choices of wastewater distribution systems for various soil conditions. Information obtained from the site and soil evaluation is used to determine which distribution system can be used.

Soil conditions		Distribution systems							
		Standard drain field[A]	Low-pressure distribution	Subsurface drip distribution	Spray distribution[B]	Mound system	ET bed[C]	Soil substitution drain field	Pumped effluent drain field
Soil type[D]	Ia	No	No[B]	No[B]	Yes	Yes	Yes (lined only)	Yes	No
	Ib	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	II	Yes[H]	Yes[H]	Yes[H]	Yes	Yes[H]	Yes	Yes[H]	Yes[H]
	III	Yes[H]	Yes[H]	Yes[H]	Yes	Yes[H]	Yes	Yes[H]	Yes[H]
	IV	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Depth of good soil (type Ib, II, III) below application depth	2 or more feet	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	1 foot	No	Yes	Yes	Yes	Yes[F]	Yes (lined only)	Yes[E]	Yes
	Less than 1 foot	No	No	Yes[B] (6 inches)	Yes (must support vegetation)	Yes[F]	Yes (lined only)	Yes[E]	No
Groundwater depth below application depth	2 feet or more	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	1 foot	No	No	Yes[B]	Yes	Yes[F]	Yes (lined only)	No	No
	Less than 1 foot	No	No	No	Yes	Yes[F]	Yes (lined only)	No	No
Soil surface slope	0-30%	Yes[I] < 30%	Yes	Yes	Yes[G]	≤10%	Yes	Yes	≤ 2%
	Over 30% or complex slopes	No	Yes	Yes	Yes[G]	No	No	No	No

[A] This option includes conventional gravel-filled trench, leaching chambers and gravelless pipe.

[B] This option is available with a pretreatment system giving a secondary-quality effluent and disinfection. Class I aerobic units and sand filters are designed to give secondary-quality effluent. Other treatment systems need to be professionally designed to obtain the secondary-quality effluent.

[C] ET= Evapotranspiration

[D] Soil types: Ia - sandy soil with more than 30% gravel; Ib - sand and loamy sand; II - sandy loam and loam; III - silt, silt loam, silty clay loam, clay loam, sandy clay loam and sandy clay; and IV - silty clay and clay. A site evaluator determines these conditions.

[E] The soil substitution drain field is built by removing the unsuitable soil and placing 2 feet of suitable soil around the absorption system. However, this system cannot be used in a type IV soil.

[F] The mound must be constructed to maintain 2 feet of good soil below the wastewater application level and above groundwater, 18 inches to restrictive horizon.

[G] Spray distribution of wastewater can be used on surface slopes of 0-15%. Land with steeper slopes needs to be landscaped and terraced to minimize runoff.

[H] May require gravel analysis for determning further suitability.

[I] Sites with a slope of less than 2% need a drainage plan for removing rainfall runoff.

level of certification (Installer I or II) required for construction depends on the type of system (Table 3).

Step 8. The permitting authority inspects the system.

The system must be inspected by the permitting authority at the appropriate stages of construction according to the type of system being installed. Inspections must be scheduled in advance and according to local policies. They should be comprehensive, covering all parts of the system.

The inspection should be based on the approved application and plans, current regulations, and accepted engineering practices. There should be no surprises during the inspection if the approved application was detailed and complete, and the system was built according to the approved application.

Step 9. The permitting authority issues a notice of approval or license to operate.

A notice of approval or license to operate is issued by the permitting authority after the completed system has passed all inspections.

Table 3. Texas Commission on Enviromental Quality on-site sewage facility system designation.

System description	System type	Professionally developed planning materials[A]	Installer requirements
Septic tank and absorptive drain field	Standard	No	Class I or II
Septic tank and evapotranspiration bed			
Unlined	Standard	No	Class I or II
Lined	Standard	No	Class II
Septic tank and pumped drain field	Standard	No	Class I or II
Septic tank and leaching chamber	Proprietary	No	Class I or II
Septic tank and gravelless pipe	Proprietary	No	Class I or II
Septic tank, filter and drip distribution	Proprietary	Yes	Class II
Septic tank and low-pressure dosing	Nonstandard	Yes	Class II
Septic tank and absorptive mounds	Nonstandard	Yes	Class II
Septic tank and soil substitution	Nonstandard	Yes	Class I or II
Septic tank, secondary treatment, disinfection and surface distribution	Nonstandard	Yes	Class II
Aerobic treatment and absorptive drain fields	Proprietary	Yes	Class II
Aerobic treatment and evapotranspiration bed	Proprietary	Yes	Class II
Aerobic treatment and leaching chamber	Proprietary	Yes	Class II
Aerobic treatment and gravelless pipe	Proprietary	Yes	Class II
Aerobic treatment, filter and drip distribution	Proprietary	Yes	Class II
Aerobic treatment and low-pressure dosing	Proprietary	Yes	Class II
Aerobic treatment and absorptive mounds	Proprietary	Yes	Class II
Aerobic treatment and surface distribution	Proprietary	Yes	Class II
Any other treatment system	Nonstandard	Yes	Class II
Any other subsurface disposal system	Nonstandard	[B]	[B]
Any other surface disposal system	Nonstandard	Yes	Class II
Nonstandard treatment and surface distribution	Nonstandard	Engineer only	Class II
Holding tank	—	No	Class I or II

[a]Professionally developed planning materials can be provided by a professional engineer or a registered sanitarian.

[B]Subject to review and determination by the executive director of TCEQ.

Texas Commission on Environmental Quality

Regional Offices and OWTS Contacts

Region 1, Amarillo
3918 Canyon Drive
Amarillo, TX 79109-4933
(806) 353-9251

Region 2, Lubbock
4630 50th Street, Suite 600
Lubbock, TX 79414-3520
(806) 796-7092

Region 3, Abilene
1977 Industrial Boulevard
Abilene, TX 79602-7833
(915) 698-9674

Region 4, Dallas/Fort Worth
2301 Gravel Drive
Fort Worth, TX 76118-6951
(817) 588-5800

Region 5, Tyler
2916 Teague Drive
Tyler, TX 75701-3756
(903) 535-5100

Region 6, El Paso
401 East Franklin Avenue, Suite 560
El Paso, TX 79901-1206
(915) 834-4949

Region 7, Midland
3300 North A Street,
Building 4, Suite 107
Midland, TX 79704-5404
(915) 570-1359

Region 8, San Angelo
622 Sout Oakes, Suite K
San Angelo, TX 76903-7013
(915) 655-9479

Region 9, Waco
6801 Sanger Avenue, Suite 2500
Waco, TX 76710-7826
(817) 751-0335

Region 10, Beaumont
3870 Eastex Freeway, Suite 110
Beaumont, TX 77703-1892
(409) 898-3838

Region 11, Austin
1921 Cedar Bend, Suite 150
Austin, TX 78758-5336
(512) 339-2929

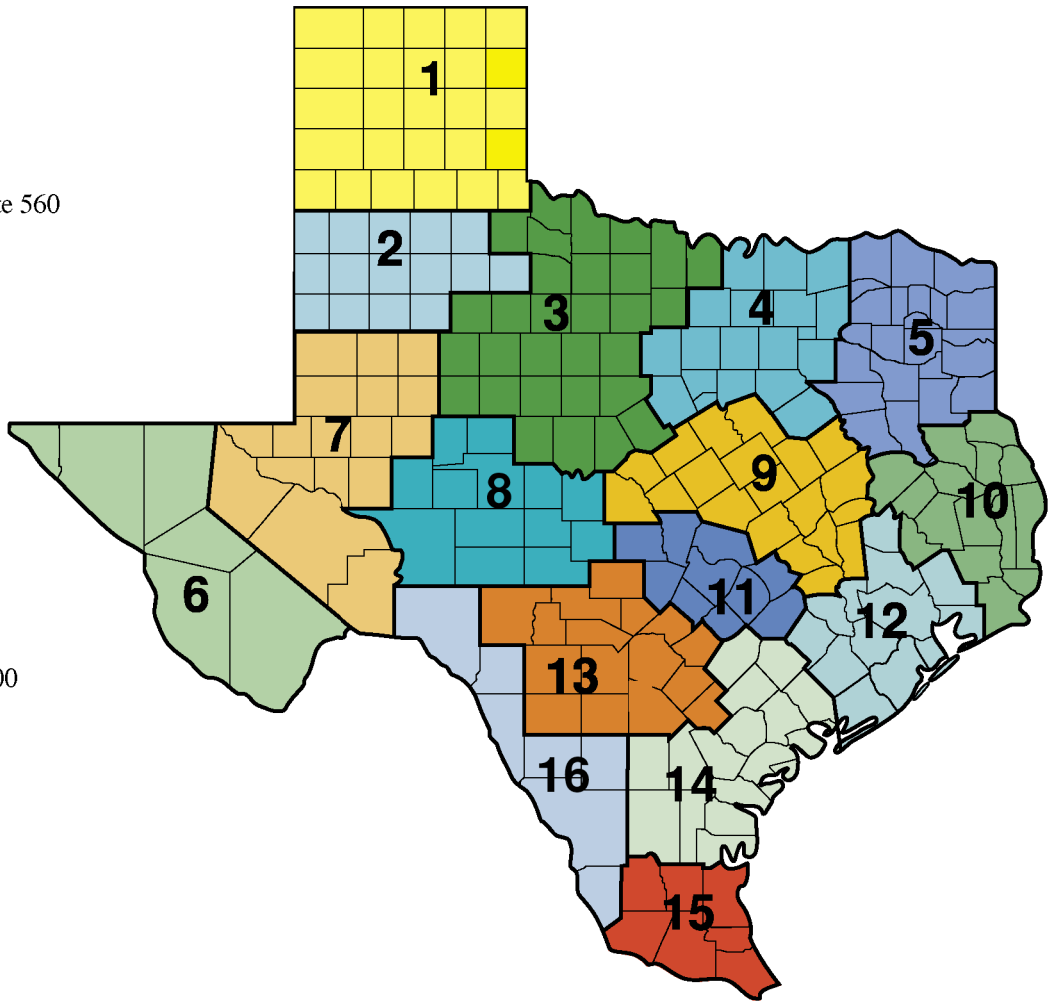
Region 12, Houston
5425 Polk Avenue, Suite H
Houston, TX 77023-1486
(713) 767-3500

Region 13, San Antonio
14250 Judson Road
San Antonio, TX 78233-4480
(210) 490-3096

Region 14, Corpus Christi
6300 Ocean Drive, Suite 1200
Corpus Christi, TX 78412-5503
(316) 825-3100

Region 15, Harlingen
1804 West Jefferson Avenue
Harlingen, TX 78550-5247
(956) 425-6010

Region 16, Laredo
1403 Seymour, Suite 2
Laredo, TX 78040-8752
(956) 791-6611



Enforcement

A homeowner can be subject to criminal penalties for not following proper procedures or for using a failed septic system.

The licenses or registrations of installers, apprentices, site evaluators and designated representatives may be suspended or revoked for:

- Violating OSSF laws or regulations;
- Submitting false documents or information;
- Other causes such as fraud or deceit; or
- Failing to use reasonable or professional judgment in performing their duties.

Locating the players

Local permits: Generally, the local health department can help you find the authorized agent responsible for permitting on-site wastewater treatment systems. The regional TCEQ office with responsibility for your county can also help (Fig. 2).

In counties without an authorized agent, the TCEQ regional offices are the contact for permitting. The regional office staff handles the permitting and inspection of the complete system. See the list of TCEQ regional offices in the state for the one in your region.

State TCEQ offices: Statewide leadership for the on-site wastewater treatment permitting program is provided through the TCEQ offices in Austin:

Regulator Compliance Section
Compliance Support Division; MC-178
P.O. Box 13087
Austin, TX 78711-3087

Installers and professional designers: Professionals in the industry have valid licenses.

Local permitting authorities generally have lists of licensed professionals working in their jurisdiction. Local advertisements will also assist in locating these professionals.

The TCEQ maintains a database of licensed professionals in the on-site wastewater treatment industry. This database can be accessed via the World Wide Web at: *http://www.tceq.state.tx.us/nav/data/licensed_data.html.* A search can be conducted by licensed individual's name, county, ZIP code, TCEQ region or certification license.

Summary

On-site wastewater treatment systems can effectively manage our wastewater. Historically, on-site systems served 25 percent of the new homes built in Texas. However, current projections estimate that 37 percent of new homes are being served by on-site wastewater treatment systems.

To make sure your system functions properly, the first step is to choose the most appropriate technology for the site. Then the system must be properly designed and installed. The checks and balances of the various steps in choosing, designing and installing an on-site wastewater treatment system can help ensure that your system will work properly. However, do not forget the maintenance requirements of your system. Failure to conduct this maintenance in a timely manner can destroy the best systems.

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Texas On-Site Wastewater Treatment Research Council
Texas Commission on Environmental Quality
USDA Water Quality Demonstration Projects
Consortium of Institutes for Decentralized Wastewater Treatment
USEPA 319(h) Program
Texas Cooperative Extension
Texas Agricultural Experiment Station
Texas On-Site Wastewater Association
USDA Natural Resources Conservation Service

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