Acceptance of Precast Concrete Septic Tanks for use in On Site Wastewater Treatment Systems: State of Colorado

Doug Jatcko and Keith Dorwart
Front Range Precast Concrete, Inc.

Regulation 43

* Regulation 43 was enacted on June 20th 2014

DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Water Quality Control Commission

ON-SITE WASTEWATER TREATMENT SYSTEM REGULATION

5 CCR 1002-43

43.1 Authority

This regulation is promulgated pursuant to the On-site Wastewater Treatment System Act, 25-10-101, et seq. C.R.S.

43.2 Scope and Purpose

A. Declaration

1. In order to preserve the environment and protect the public health and water quality; to eliminate and control causes of disease, infection, and aerosol contamination; and to reduce and control the pollution of the air, land and water, it is declared to be in the public interest to establish minimum standards and regulations for On-site Wastewater Treatment Systems (OWTS) in the state of Colorado and to provide the authority for the administration and enforcement of such minimum standards and regulations.

2. This regulation shall apply to On-site Wastewater Treatment Systems as defined in section 25-10-103(12), C.R.S.

Replaced Colorado's Previous ISDS Regulation Adopted in 1973


I ♥ 70s


INAUGURATION DAY
JAN. 20th, 1973
RICHARD M. NIXON
37th PRESIDENT

The Focus

* The focus of this presentation is the design, construction, installation, maintenance, and approval of septic tanks, but that is only one component within the regulation.

Heart of the System

* Storage,
* Collection
* Primary Treatment
* Transportation of the Effluent to the Soil Treatment System


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COLORADO


Soil Structures


490D

Climate


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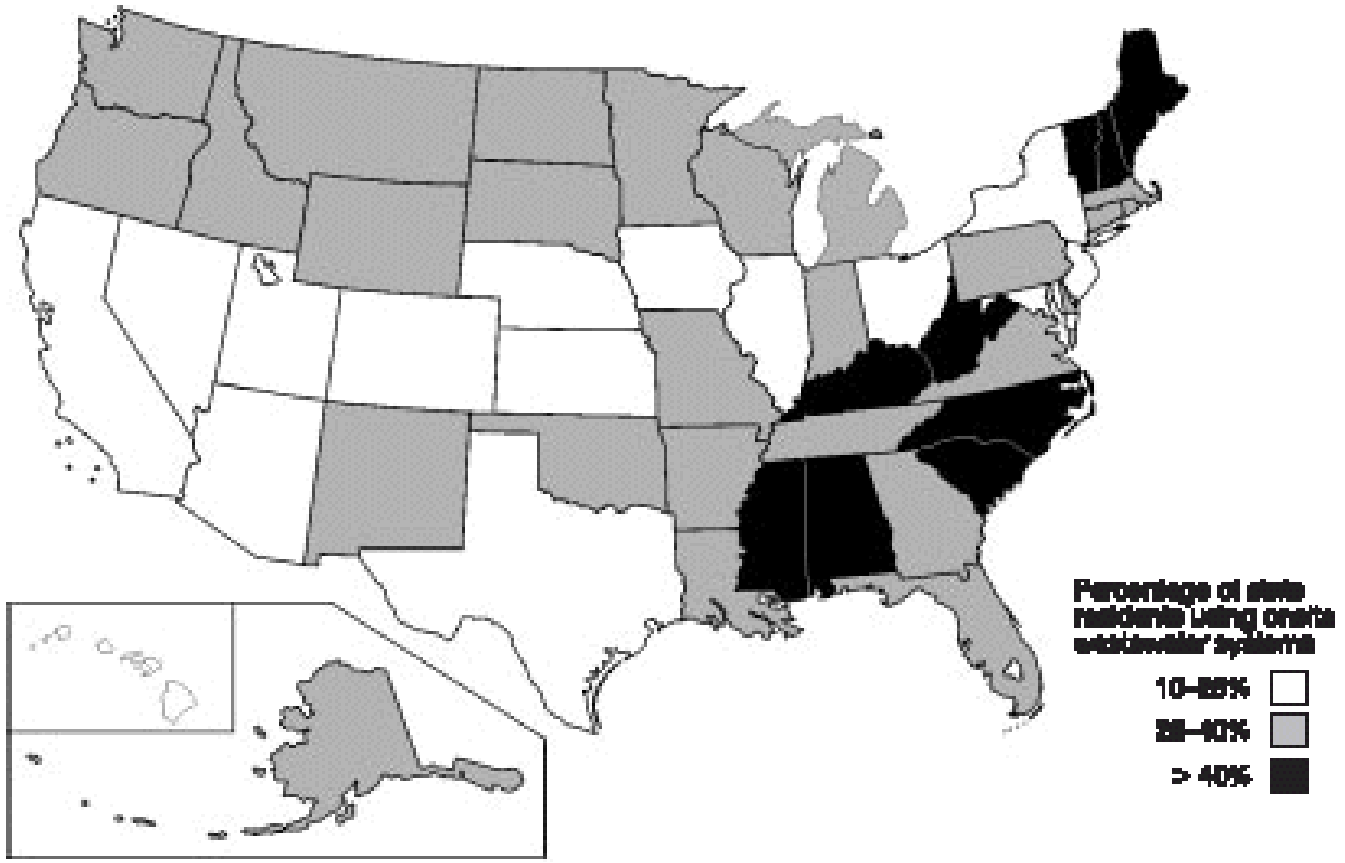
THANK YOU
UNITED WAY
RED CROSS
SALVATION ARMY
THE COMMUNITY FOUNDATION
4 MILE CANYON VOLUNTEER FIRE FIGHTERS
E.F.A.A
BOULDER COUNTY HOUSING AUTHORITY


FL WATERTIGHT
WON'T FLOAT
WON'T LEAK

Changes in the last century

In 1940 barely half of U.S. Households had features such as a toilet, hot water, or a bathtub

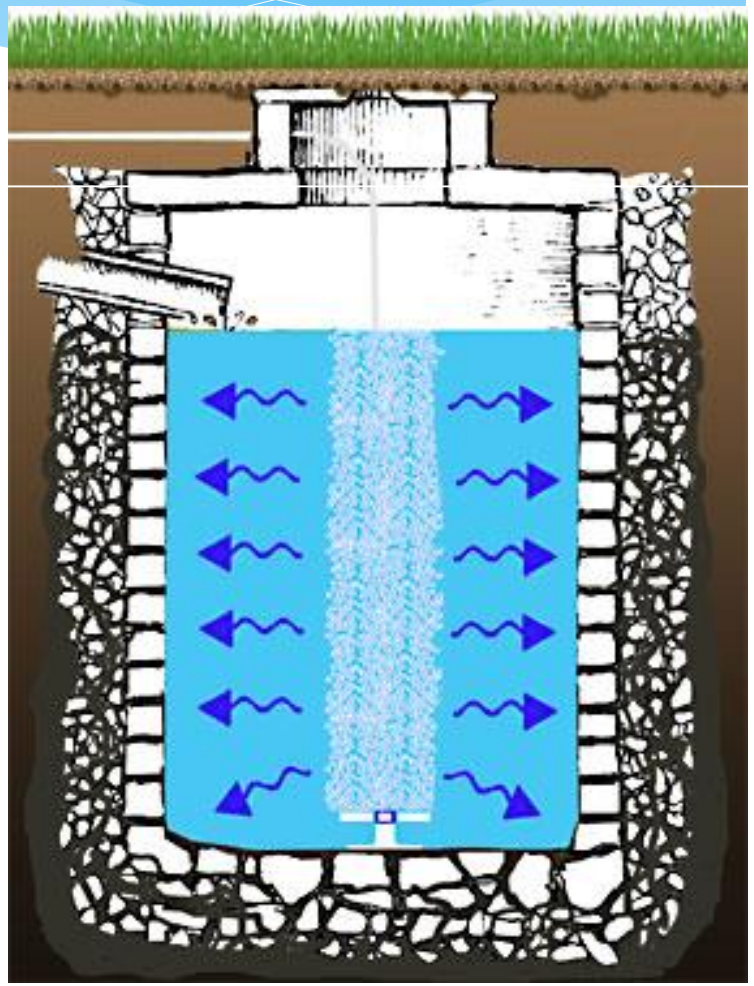


Density of OWTS's Per the 1990 Census Bureau

60 million people are on decentralized systems, including one third of all new homes, some communities rely entirely on OWTS Systems.

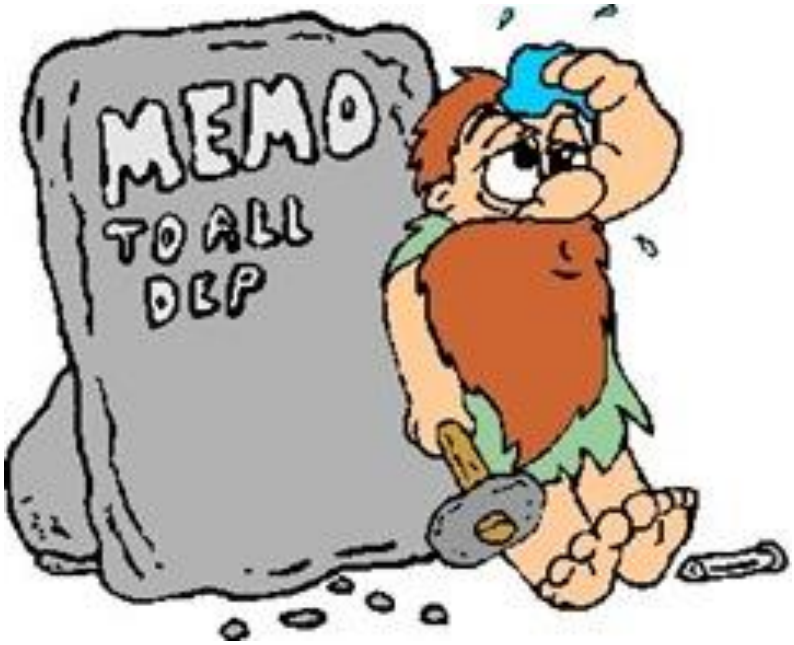
Other Collection Device Techniques

Seepage Pit
Cesspools
Sewer Pipes to Daylight Drains



Primitive and Unsanitary

There Had to be a Better Way



History

* The term “Septic Tank” was not coined until 1895, by **Donald Cameron** installed a watertight covered basin to treat sewage by anaerobic decomposition.

History

* He received a **US letters patent** on **October 3rd 1899** and attempted to collect royalties.
* **Leonard Metcalf** researched the history of the septic tank, and 1901 Published an article showing that **Cameron's design was nothing new**, Cameron was unsuccessful in collecting fees and future claims for royalties on septic tanks were not honored.
* **The anaerobic septic tank became public domain.**

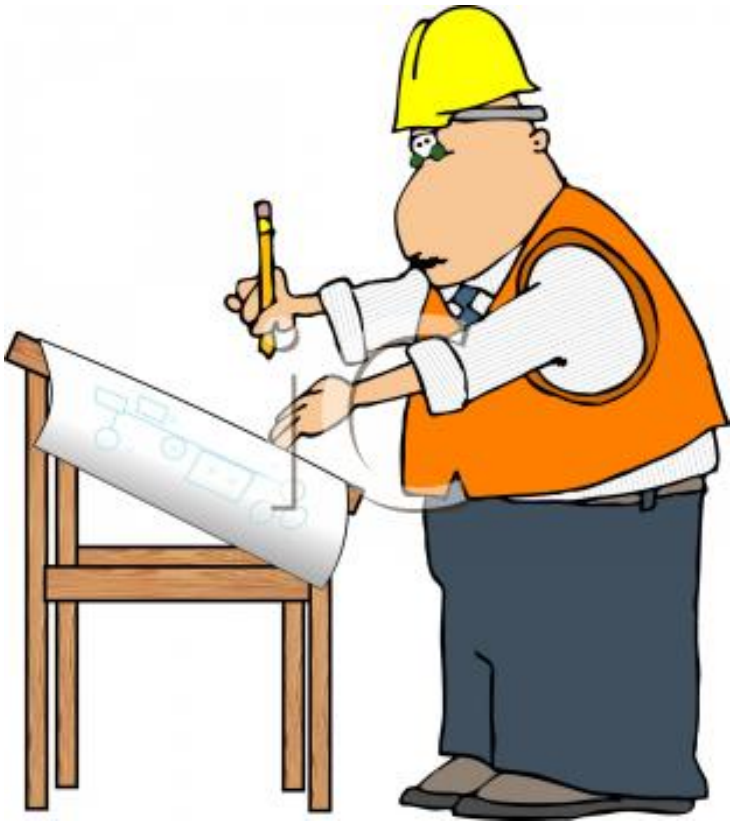
Anaerobic Treatment

* adjective: **anaerobic**
* relating to, involving, or requiring **an absence of free oxygen.**

Anaerobic Treatment

* **Cleaner**
* **Neater**
* **Smaller Areas of Influence Underground**

What to Make it Out Of?

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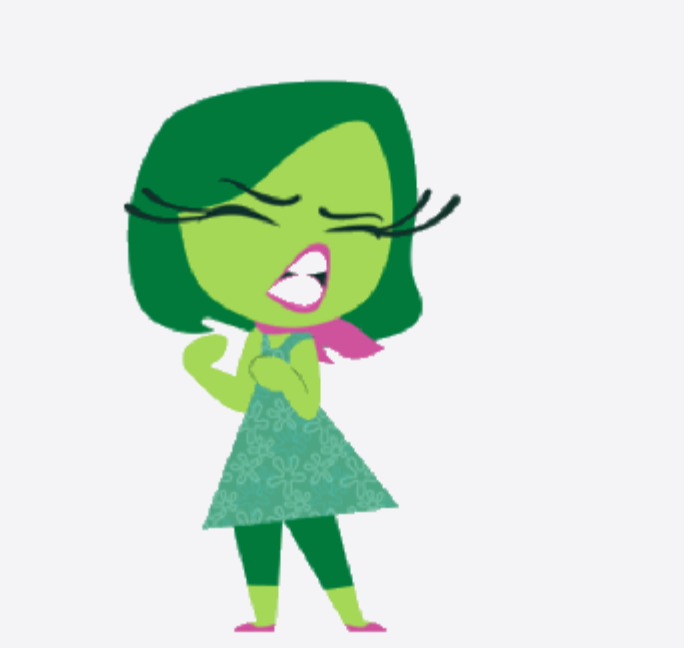
What Size to Make It

Table 9-1 Minimum Septic Tank Size Based on Number of Bedrooms

Number of Bedrooms	Tank Capacity (gallons)
2 or 3	1,000
4	1,250
Each Additional	250

Three Cardinal Rules

Never Let Them See It



Never Let Them Smell It

Never Let it Back Up

5 Core Functions

* Receive and **contain** wastewater from the source
* **Separate** solids from effluent through settling and floatation
* Promote reduction and further digestion of and **decompos**ition of organic solids
* Separate and **store solids.**
* **Pass on** the clarified effluent for further treatment.

What's in a Name?... W.M. Shakespeare

What's in a Spec?

Cameron 1895	ASTM C 1227-12	Regulation 43
"Tank of Cement Concrete" 1	The aggregates, cement, and water shall be proportioned and mixed to produce a homogenous concrete meeting the requirements of this specification	Directly references ASTM C 1227
Described as covered by a "concrete arch" 2	"Tanks shall be designed so that they will not collapse or rupture when subjected to anticipated earth and hydrostatic pressures when the tanks are either full or empty."	"be certified by a professional engineer as complying with these design and structural requirements and the watertightness standard of this regulation."
"the inlet was carried down below the water surface so that air could not make its way down with the sewage and also so gases could not escape from the tank back up the sewer." 3	"The inlet baffle or tee shall extend at least 8 in. (200 mm) below the liquid level and at least 5 in. (125 mm) above the liquid level line".	"Inlet tee or baffle shall extend above the surface of the liquid at least five inches and shall extend a minimum of eight inches below the liquid surface."
"The effluent outlet was also below the level of the liquid to avoid currents that might be likely to carry floating matter from the surface." 4	"Outlet solids deflectors may be used in conjunction with outlet filter devices to deflect suspended solids away from the outlet filter device…"	"Outlet tee or baffle shall extend at least 14 inches below the outlet invert and, if needed, be modified to accommodate an effluent screen."
central manhole was provided with a glass window for inspection of the tank 5	"An access opening or openings shall be provided to permit pumping of all compartments."	"At least one access manhole no less than 20 inches across shall be provided in each compartment of a septic tank."

Regulation 43: Creation, Implementation, and Enforcement

Creation

* Lengthy Stakeholder Process
* Numerous Revisions
* Thorough Industry Review Period
* Establishing criteria for the design, sizing, testing and inspection/maintenance of precast concrete septic tanks.

SECTION	REVISION	COMMENT
		• Detention Time • Impervious Layer • Flow Equalizer • Manhole • Vacuum release valve Also a site plan definition of what a site plan should contain should be a major focus in this glossary as it is so fundamental to an effective septic system.
	Abbreviations and Acronyms	This section may benefit from the inclusion of CPOW, NOWRA, NPCA. Also "individual sewage disposal system" should contain an asterisk or note indicating that it is an obsolete term remaining from former CRS.
4.1.1.1	Local Boards of Health	In this section permission is granted to the local boards of health to form their own regulations however later in the section we see many procedural obstacles in the path of the local health department boards (deadlines, public hearings, submittals for review by the division) which seem to restrict the effectiveness in setting local regulations
4.2.11	Should not be prohibited	OWTS permits should not be prohibited automatically; rather local officials should be encouraged to consider them on a case by case basis.
4.3.1-4.3.3.1	Clarification	First this section does not state that the information must be accurate. Second the term such information is open ended. Exactly what information should be included? ex. distance to wells in the vicinity.
4.13	Section is Deficient	The installer is the most likely to introduce difficult to correct deficiencies and as such there should be some minimum criteria they must meet. Citizenship, age, testing, training or even a familiarity with this document. I recommend rather than writing these that either the NEHA installer class and class A or B License be referenced or the NAWT installer credential.
4.14.3.6	Septic Tank – Septic System	This section should state a (septic system report) rather than a (septic tank report) and should be required within the previous 6 months.
4.14.3.7	NAWT?	Inspector needs a NAWT credential and the installer doesn't?
5.4.4.7.1	Importance	If we need or it's important to include this detail regarding percolation testing what about back filing, pipe bedding, PVC glue joints, etc. or shouldn't a recognized national percolation protocol be mentioned.
5.4.4.11.2	Accurate Information	This is the first requirement that information be accurate and specific to the identified site. What training or credentials does this person need to have to design the system?
5.8	Information to Be Included Elsewhere	These requirements or some like them should also be included in the installer description.
9.1.1.1	Delete / Replace	Replace with a reference to the national specifications ASTM C-1227 or IAPMO Z1000, then launch in the water tightness tirade so hysterical that both 9.1.1.1 and 9.2.3 are titled "water tightness" and testing methods are listed in both places.
9.2.1	How Does the Manufacturer Determine	How would a manufacturer determine this without receiving info on the specific site

Implementation

* Colorado Department of Public Health and Environment identified 31 precasters in the state.
* informed them of the requirements of the new Regulation 43, and that they must come into compliance with these requirements to continue providing septic tanks for in state use.
* Septic tank manufacturers in Colorado must submit a report describing, in detail, the test procedures and data confirming the performance and properties of the tank including:
  * Certification by a professional engineer
  * Water testing/vacuum testing procedures, and/or NPCA or IAPMO plant certification

Implementation

* At the time the paper was written 19 precast concrete tank manufacturers were approved in the state with sizes ranging from 400 – 4000 gallons.
* All tank designs and proprietary products had to be submitted and approved.

Enforcement

* The state website now has a list of acceptable tank manufacturers, available for anyone that wishes to view it.
* Precasters not included in this list, as far the state is concerned, are not permitted to provide septic tanks within the state.
* This year the water testing or vacuum testing report for 5% of all tanks distributed from a company will be required.
* If this report is not received the company will be removed from the list of state approved suppliers.

Front Range Precast Concrete, Inc. State Submittal

* The initial submittal from Front Range Precast Concrete was not comprehensive enough to warrant state approval.
* The initial submittal included:
  * Engineered Tank Designs for All Tank Bodies
  * Specifications for all proprietary products
  * Water Testing Procedures

COLORADO
Department of Public
Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

October 24, 2014

Keith Dorwort
Front Range Precast
5439 N. Foothills Highway
Boulder, CO 80302

Subject: Model FLXX Septic Tank - Review Comments
For Use in Colorado On-site Wastewater Treatment Systems

Dear Mr. Dorwort,

Pursuant to section 43.13 of the On-site Wastewater Treatment System Regulation 5 CCR 1002-43 (Regulation 43), the Water Quality Control Division (Division) has reviewed drawings and specifications received October 10, 2014 for the following septic tank(s):

- FLXX Single Compartment Septic Tanks, 400 gal., 500 gal., 1000 gal., 1250 gal., 1500 gal., 2000 gal., 2500 gal., 3250 gal.

During the review, Division identified the following inconsistencies or conflicts in the proposed tank designs with regard to section 43.9 of Regulation 43:

Front Range Precast Concrete, Inc. State Submittal

* While it was understood by Front Range Precast Concrete that single compartments tanks were to be used in series, the state clarifies this in the first section of its letter.
* Initially Front Range Precast Concrete had only provided drawings of single compartment tanks, as it was not understood that a drawing of each tank configuration was to be provided. Ultimately these drawings were provided, which speaks to the thoroughness of the implementation.
* At point number 2 and 3 it was noted that even though the 400 and 500 gallon tanks are small in comparison to the other tanks in the product line, these too required the same attention to detail, and had to meet the same requirements for inlet/outlet locations as the larger tanks.
* At point number 6 it was noted that watertightness testing of sealed compartments was also required by the state, this had not been understood until clarified. This shows the necessity of the approval process.

FLXX Watertight Concrete Tanks
Front Range Precast Concrete, Inc.
5439 N. Foothills Hwy, Boulder, CO 80302
(303) 442-3207 (800) 783-3207 Fax: (303) 442-3209
www.flxx.com

Front Range Precast Concrete

Submittal Review – Comments and Changes per CDPHE's Review

1. The "Septic Tank Product Review Submittal Form" has been included.
2. Regarding items pertaining to the 400 gallon and 500 gallon tanks and all single compartment tanks submitted : These are ancillary products not designed to be primary treatment systems and as such have been designed to accommodate additional equipment and/or to be used in series with other tanks that would come before them.
3. Inlet, outlet, and access dimensions have now been provided on all tank drawings for the review of CDPHE
4. All septic tank, and ancillary tank models have been included with this submittal under "Exhibit B".
5. All sealed compartments for pumps and siphons in three compartment tanks have now been included in our tank testing as detailed on page 2 Citation G.2 of the Product Acceptance Requirements section.

Front Range Precast Concrete, Inc. State Submittal

* The second edition of the submittal was much more comprehensive.
* 40 engineered tank designs were submitted (and ultimately approved)
* Sizes from 400 – 3250 Gallons
* All Proprietary Products Listed
* Pictures of Required Stenciling Included
* In total the second edition submittal clocks in at 72 pages long

Product Acceptance Requirements

Citation: C.1.e – A description of the functions of the proprietary product along with any known limitations on the use of the product;

- Front Range Precast Concrete, forthwith referenced as FRPC, provides concrete water tanks for the storage/treatment of residential and commercial wastewater. Known limitations and our general product warranty can be seen in Exhibit A.

Citation: C.1.f – Product description and technical information, including dimensioned drawings; materials and characteristics, design specifications, volumes, and other calculations as relevant;

- Please review Exhibit B.

Citation: C.1.j – Copies of manufacturer's literature to include sales and promotion, design, siting, installation, operation and maintenance, and owner instructions;

- Please review Exhibit C.

Citation: C.1.k – Identification of information subject to protections from disclosure and trade secrets, if any;

- We are reticent to allow release of this submittal to the general public and our competitors as we have directed this document to the Colorado Department of Public Health and Environment. It is intended to show our willingness to comply with the new state regulations and to gain approval of our comprehensive line of water and wastewater treatment tanks.

Citation: C.3 – Manufacturers must have readily accessible and up to date information for designers, regulators, product owners, and other interested parties about their product including: Product manuals, Design limitations, installation instructions, and Operation and maintenance;

- Our entire catalogue is listed online at www.FLXX.com. In the event that a tank must be specially made for an application FRPC provides in house shop drawings and consultation. In the event that an inquiry surpasses the working knowledge of the staff, FRPC employees do their best to reference customers to the correct vendor or workman.

Citation: C.3.e – A list of locations in Colorado where the product is manufactured and locations where the product is available for purchase;

- Manufactured at 5439 N. Foothills Highway, Boulder CO, 80302.
- Manufacturing facility moving to 5901 Dexter Street, Commerce City, CO 80022. This move is anticipated to take place before the end of the 2014 year.
- Products are available for purchase directly through Front Range Precast Concrete, Inc. or a number of unlicensed distributors. Delivery of products available state wide.

Septic Tank Acceptance Requirements

Citation: G.2 – Each manufacturer must test five percent of its tanks for watertightness at the manufacturing facility… Define the proposed method of testing.

- Testing shall be done with a 24 hour water retention test

Citation: G.3 – Annual watertightness testing results must be submitted to the Division by Feb. 15th of each calendar year on the form provided by the Division. This form shall also include measures take to repair any tank that fails the test and how the manufacturer plans to prevent similar problems in future tanks.

- Testing will be submitted to CDPHE for the 2014 calendar year before February 15th, 2015.

Citation G.4 – Provide copy of IAPMO, CSA, and/or NPCA certifications to the Division.

- N/A

Design Criteria – Components

Citation: B.1 – Tank Material

- **Concrete**

Citation: B.1; B.4 – Dimensional drawing including, but not limited to, the following parameters and tank dimensions: overall tank dimensions; interior tank dimensions; inlet and outlet invert dimensions; inlet and outlet tee dimension (if provided); manhole location and dimensions; effective volume of each compartment; overall surface area; height of invert of transfer opening between first and second compartments.

- Our entire product catalogue can be found at www.FLXX.com, however if you have any specific inquiries or would like me to send a hard copy of this catalogue please let me know.

Citation: A.3 – Location of identification and data markings (i.e. name of manufacturer; model or serial no., if applicable; effective volume and unit of measure; maximum depth and external loads the tank is designed to resist; inlet and outlet identifications)

- **FRPC has purchased stencils and implemented this marking detail on all of our septic tanks. Please review Exhibit D.**

Citation: A.1.a – Are rubber boot fittings or cast in tank adaptors provided?

- **Yes, in most cases FRPC will provide Cast-A-Seal Rubber Gaskets (review Exhibit E). In some custom applications these gaskets may be omitted at the request of the customer, however this is very rare.**

Citation: B.4.c, B.4.d – Some Local Public Health Agencies may require effluent screens and some may not. Identify provisions for inlet and outlet tees including precast or other options. Is there sufficient clearance for effluent screen removal through the access opening? If the outlet tee is precast, identify make and model of effluent screen to be used if required in a local area.

- **FRPC distributes Orenco Filters to its customers which are easily accessible through the access openings and are compatible with the tank design. In some cases engineering may require a different brand of effluent screen which we may in turn offer to provide for the customer. In these cases it can not be guaranteed that the filter is compatible with our tanks, or will of a suitable design to be accessed through the access riser.**

Front Range Precast Concrete, Inc. State Submittal

Citation: 42.13.C.1.g Maximum Burial Depth

- **Maximum Burial Depth on Stock Septic Tanks is 4'-0"**
- **Maximum Burial Depth on Septic Tanks with Special Traffic Rated Lid is 8'-0"**

For: FRONT RANGE PRECAST CONCRETE
5439 North Foothills Parkway
Boulder, Colorado 80302
303-442-3207

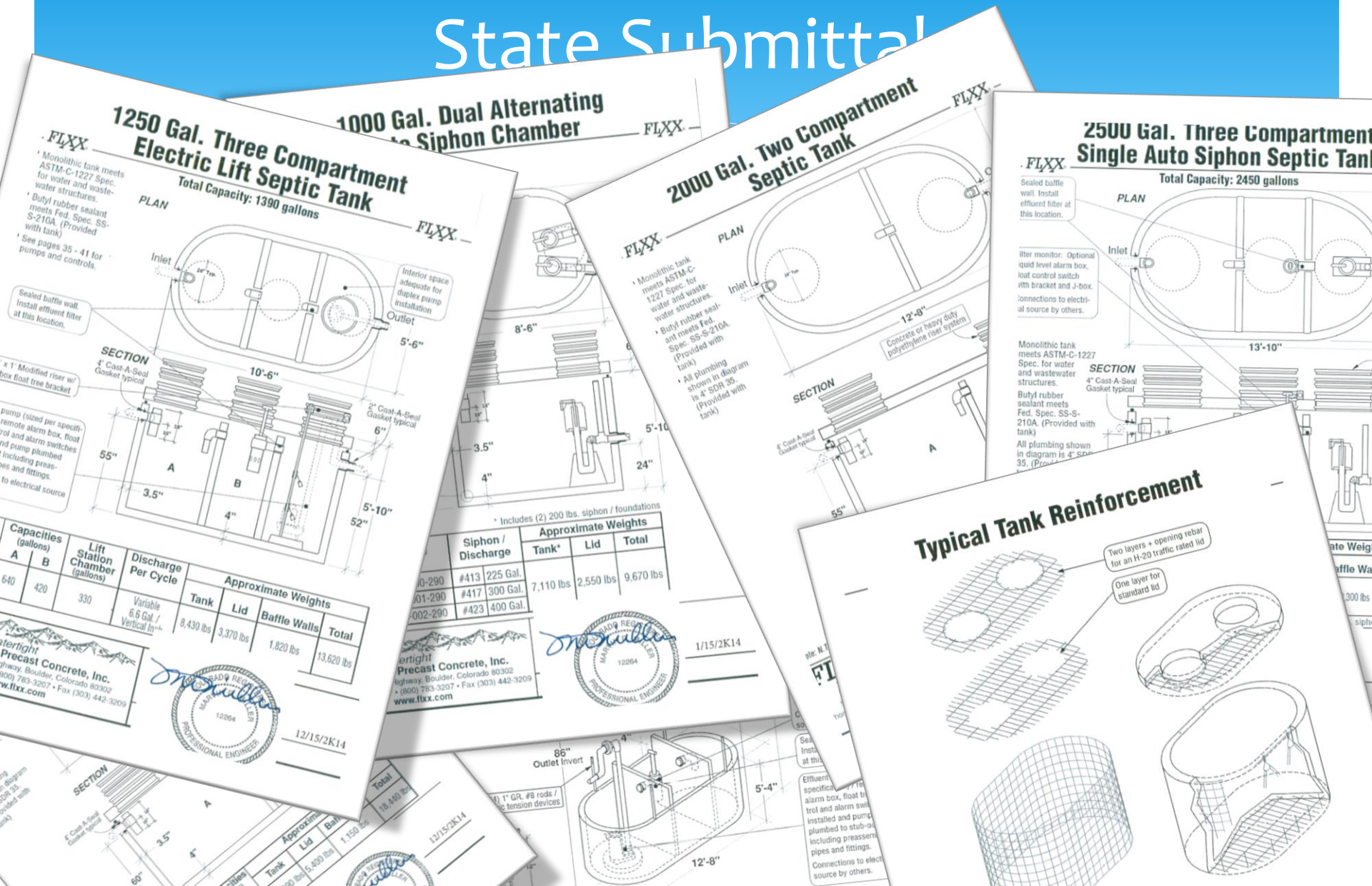
By: M.D.Miller, P.E.,P.T.,Ltd
9206 West Ranch Road 1431
Buchanan Dam, Texas 78609
303-526-9207

For: Stamped prints for eight septic tank configurations and rebar configuration

August 27, 2014

8/27/2K14

Front Range Precast Concrete, Inc. State Submittal



FRONT RANGE PRECAST

NON TRAFFIC

MAX. BURIAL DEPTH 4-FEET

43.9 Design Criteria - Components

A. Tanks and Vaults

1. Watertightness

   a. Septic tanks, vaults, pump tanks, other treatment components, risers and lids shall not allow infiltration of ground water or surface water and shall not allow the release of wastewater or liquids through other than designed openings.

   b. Acceptable watertightness testing methods performed at a manufacturer's site or in the field include water filling the tank or vacuum testing.

2. Tank Anchoring: In locations where ground water or floodwaters may cause instability problems to the septic tank, vault, or other treatment unit in the OWTS due to flotation, the tank, vault or unit shall be anchored in a manner sufficient to provide stability when the tank is empty. Risers shall be included in the buoyancy calculations.

   a. If a manufacturer provides recommendations for anchoring designs, they may be used if they meet the conditions present at the site.

   b. If a manufacturer does not provide recommendations for provisions to compensate for buoyancy, or if the professional engineer chooses to provide his/her own designs, the anchoring system design shall be prepared by the professional engineer.

3. Identification and Data Marking: All tanks and treatment units shall be permanently and legibly marked in a location for the purpose of inspection that is readily visible when inspected before backfilling. The marking inscription shall include the following:

   a. Name of manufacturer;

   b. Model or serial number, if available;

   c. Effective volume and unit of measure;

   d. Maximum depth of earth cover and external loads the tanks is designed to resist; and

   e. Inlet and outlet identifications, if relevant.

B. Septic Tanks

1. The manufacturer shall provide sufficient information to demonstrate that the tank will meet the design specification.

3. Testing of Septic Tank Watertightness

a. Testing of septic tanks must be performed and evaluated as specified in section 9 of ASTM C1227-12 (Standard Specification for Precast Septic Tanks) for concrete tanks or in Standard IAPMO/ANSI Z1000-2007 (American Standards for Prefabricated Septic Tanks) for other prefabricated septic tanks.

b. Each unit shall be inspected in the field for conditions that may compromise its watertightness.

c. The inspection in the field shall be conducted by the local public health agency and be performed after the tank installation but before backfilling.

d. If the inspection in the field indicates that the tank may be damaged or is not watertight, the inspector may require that the tank be tested for watertightness by the tank manufacturer or the system contractor.

4. Septic Tank Design and Dimension Criteria

a. A septic tank shall have two or more compartments or more than one tank may be used in series. The first compartment of a two-compartment tank or the first tank in a series shall hold no less than one-half of the required effective volume.

b. Inlet invert shall be at least two inches higher than the outlet invert.

c. Inlet tee or baffle shall extend above the surface of the liquid at least five inches and shall extend a minimum of eight inches below the liquid surface.

d. Outlet tee or baffle shall extend at least 14 inches below the outlet invert and, if needed, be modified to accommodate an effluent screen. The outlet tee or baffle that accommodates an effluent screen must be located so that the effluent

5. Concrete Septic Tank Structural Design

a. Concrete septic tanks shall comply with the structural design criteria of ASTM C1227-12 (Standard Specification for Precast Septic Tanks).

b. The design for each tank model and size by each manufacturer must be certified by a professional engineer as complying with these design and structural requirements and the watertightness standard of this regulation.

c. Certification by a professional engineer must be submitted to the Division for acceptance.

d. Tank slab lids or mid-seam tanks shall be sealed to be watertight.

e. Connections between tank and risers shall be sealed to be watertight.

A Little Confusion

3. Location of Pump or Siphon

   a. A pump may be, or a siphon shall be, installed in a separate tank following the septic tank and be of sufficient volume to allow pump or siphon cycling commensurate with the design capacity. The use of a three-compartment septic tank, sized to provide effective volume in the first two compartments with the pump in the third compartment, is acceptable.

   b. The second compartment of the septic tank shall not be used as the pump tank unless it can be demonstrated to the satisfaction of the local public health agency that the minimum 48-hour detention time will not be decreased and the pump is screened or provided with an approved filtering device to assure that only liquid effluent will be discharged.

5. Access

a. The pump or dosing system tank, chamber, or compartment shall have a minimum 24-inch diameter access riser, made of corrosion-resistant material, extending to or above ground level.

b. The access riser must have a watertight connection to the pump or dosing chamber/compartment to prevent infiltration or exfiltration.

Conclusion

* The new Regulation 43 provided greater uniformity in the production of precast concrete septic tanks in the state.
* Achieved Through:
  * stakeholder process and
  * across the board implementation and
  * enforcement the regulation
* This process increased the value of tanks provided by responsible manufacturers in the state while simultaneously removing bad players from the industry. While there are many opinions on the regulations as a whole, the effect on the precast concrete tank industry has been generally positive, and will further the OWTS industry in Colorado for years to come.

Thank you

Doug Jatcko
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