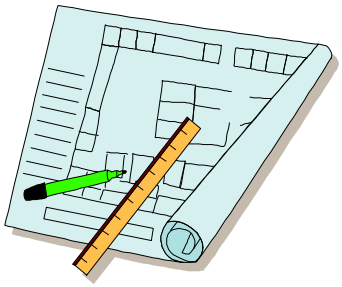
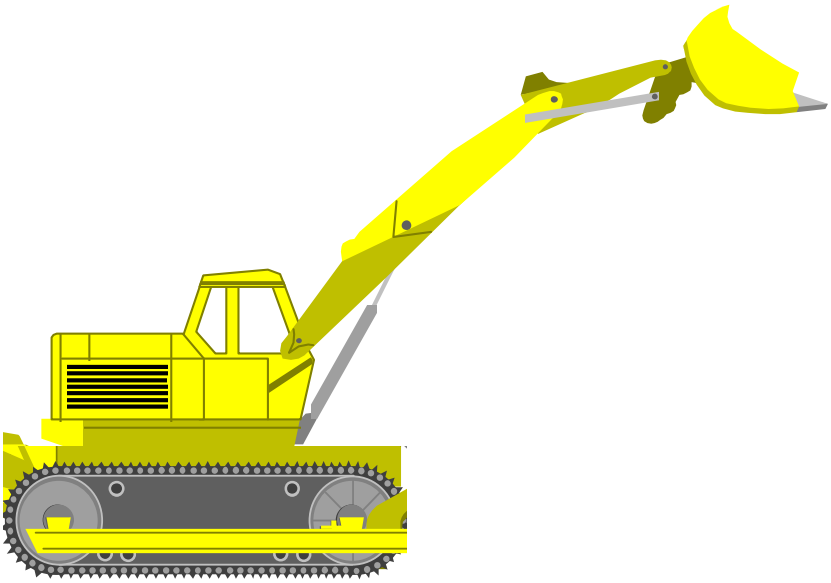
ESSEX ON-SITE SYSTEMS
DESIGN STANDARDS

ADOPTED AS LOCAL REGULATIONS BY
THE ESSEX BOARD OF HEALTH
AT A PUBLIC HEARING HELD
JANUARY 27, 1998*

AMENDED JANUARY 26, 1999*





*Section 800 was incorporated as guidance only and is not a local regulation.

January 26, 1999

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SECTION 100
SEPTIC TANKS

100.1 GENERAL

100.1.1 Description

This section sets forth the requirements for the design and construction of septic tanks for new construction and upgrades.

100.2 MATERIALS

100.2.1 General Requirements

Septic tanks shall be constructed using sulfide resistant concrete, fiberglass or high density polyethylene. The design and configuration of septic tanks shall be approved for sale in the Town by the Board of Health. No septic tank shall be installed that has not been approved by the Board of Health. Drawings for approved tank configurations can be found in the Standard Details.

Septic tanks shall be structurally sound. Designs for tanks which have not been approved by the Board of Health shall be certified by a Massachusetts registered professional engineer and show the load bearing capacity of the vessel and installation requirements.

Septic tanks and all pipe connections and openings shall be water tight and shall be tested per SECTION 500 WATERTIGHTNESS TESTING.

Pipe connections and penetrations shall be in accordance with Section 400.2.7.

Septic tanks shall be equipped with inlet and outlet tees to promote quiescent conditions, to contain scum and to provide a route whereby gas is directed to the building plumbing vent. The inlet and outlet tees shall be readily accessible to clear blockages or for inspection purposes. The outlet tee shall be equipped with a Department of Environmental Protection (DEP) approved effluent tee filter device which shall be maintained in accordance with its DEP approval document.

Compartment interconnection in two compartment tanks shall exclude the conveyance of sludge or scum from the first compartment to second. The dividing wall between compartments shall be perforated or configured to allow the venting of the second compartment through the building stack vent. The requirements for single compartment tanks shall apply to all components of the 2 compartment tanks.

Two single compartment tanks may be used in series. More than two tanks in series is

prohibited. Two compartment tanks may not be used in series.

Access openings shall be provided to all septic tank compartments to permit cleaning and maintenance. Access openings in the tank shall be a minimum of 20 inches and riser/frame/cover assemblies shall be 24 inches in diameter. The number of openings shall be sufficient to permit access to all portions of the tank using tank cleaning tools, but there shall be no less than one opening for every 10 feet of tank length or fraction thereof. Any center manhole not provided with a riser to grade shall be permanently sealed watertight. Tees and baffles shall either be visible and accessible through the access openings for inspection, repair or maintenance or they shall be provided with auxiliary access openings of sufficient dimension to permit inspection and maintenance. All openings will be provided with suitable covers. All covers shall be watertight.

At least one (two for tight tanks – See Section 300, and two for septic tanks which will be situated with the tank top below the level of the estimated seasonal high groundwater table) concrete, polyethylene, fiberglass, or other corrosion proof material riser shall be installed around the access opening**(**s**)** extending from the top of the installed septic tank to grade. Tanks requiring only one riser shall have the riser placed over the outlet tee in the tank. All risers and cleanout openings shall be watertight and affixed to the tank top with a watertight seal. The top elevation of any riser extending to grade shall be set higher than the surrounding grade so as to divert surface runoff and prevent flooding. The elevation of all tank access holes shall be set above the 100 year flood elevation or equipped with watertight covers. All risers that are visible from the surface shall be made childproof by using a bolt down cover, or other means. The risers and covers shall be designed and constructed to H-10 load criteria at a minimum. The strength of all components shall be appropriate for the location and expected loads. Lighter duty components may be approved if specifically addressed and justified by the individual system designs. Design load capacities and installation criteria shall be certified by a registered professional engineer. All fasteners, gaskets and materials shall be corrosion proof.

100.3 EXECUTION

100.3.1 Design Criteria and Fabrication

The tanks shall be designed to withstand a H-10 loading in non-traffic areas and for a H-20 loading in traffic areas. Distribution of earth loading and live loading shall be in accordance with ASTM C 857 or ASTM C 890. The units shall be designed using an equivalent fluid pressure of 83 pounds per cubic foot and a 2 foot surcharge. The units shall be designed to resist all stress encountered during casting, handling, and erection.

The tanks shall be factory cast. Concrete in the precast elements shall be continuously placed to prevent formation of seams. The finished units shall be free of voids, cracks.

All inserts shall be securely attached or embedded in their proper location.

The precast manufacturer shall insure that the specified concrete mix is utilized throughout production of the units. Mix design shall be provided on request. All precast concrete shall be air entrained. Admixtures containing calcium chloride shall not be used.

Precast concrete tanks shall be manufactured in accordance with the applicable requirements of ASTM C 858, and as modified herein except that precast concrete units manufactured by the dry cast (packerhead) process are prohibited.

Wall sleeves or gaskets for piping and access hatches and other inserts shall be cast into the structure or inserted at the place of manufacture.

Tanks shall be designed to resist buoyant forces. Buoyancy calculations shall be presented on the design plans. The groundwater elevation shall be assumed to be at the existing ground surface, unless a Title 5 soils evaluation in the general tank location is performed which indicates that the seasonal groundwater elevation is at a lower elevation. For purposes of the buoyancy calculation, the designer shall assume that the tank weighs 140 lbs per cubic foot of concrete, soil weighs 100 lbs per cubic foot, and water weighs 62.4 lbs per cubic foot. Only the weight of the soil directly above the tank shall be included in the downward force component. Friction forces are not to be included in the downward force component. The downward force component shall be 120% of the buoyant force, at a minimum.

100.3.2 Product Handling

No precast concrete tanks shall be shipped in less than 15 days from date of manufacture.

Precast sections, if stored on site, shall be transported and handled with proper equipment to protect the elements from damage. Sections shall be handled in accordance with the manufacturer's recommendations. Minor damage may be repaired in the field using a suitable mix of epoxy concrete. Repairs shall be acceptable to the Health Agent or Board of Health representative. Tanks with major damage shall be replaced.

Precast sections shall be stored on wooden blocks to hold them off the ground to prevent dirt and debris from entering the joining surfaces.

High density polyethylene and fiberglass tanks shall be handled in strict accordance with the manufacturers requirements.

100.3.3 Installation

Tanks shall be placed on a level bed of crushed stone at least 6 inches in depth. The effective stone size shall not exceed 1 ½ inches.

Tanks shall be installed level. Tanks shall be repositioned if the tank is out of level end to end by more than 1 inch.

Field modifications of precast units, such as cutting or enlarging holes or slots, are not permitted without the specific approval of the precast unit's manufacturer. Modifications shall be made in strict accordance with the manufacturer's directions and recommendations.

Mating surfaces shall be cleaned of all foreign materials such as dirt, mud, stones, etc.

SECTION 200
SEPTIC TANK EFFLUENT DISTRIBUTION BOXES

200.1 GENERAL

200.1.1 Description

This section sets forth the requirements for the design and construction of septic tank effluent distribution boxes for new construction and upgrades.

200.2 MATERIALS

200.2.1 General Requirements

Distribution boxes with multiple discharge inverts at the same elevation may be used for gravity fed absorption systems.

These boxes shall be constructed using reinforced concrete with a minimum compressive strength of 4,000 psi after a 28-day cure. Distribution boxes fabricated using high density polyethylene may be used in areas protected from vehicular access. Concrete boxes shall have a minimum of 2 inch thick walls, top, and bottom. The inside dimension of all boxes shall be at least 12 inches wall to wall in both width and length. Boxes shall be sufficient in size and design to distribute flow equally to all outlets. Inlet velocity shall be 3 feet per second or less. There shall be a minimum 2 inch elevation difference between inlet and outlet inverts.

Each outlet pipe shall be laid level for at least 2 feet beyond the distribution box or a dial type leveling device shall be used. There shall be at least one outlet for each effluent distribution pipe.

Pipes may be connected to concrete distribution boxes using non-shrink concrete grout in single family residential installation only. Commercial and multi-unit residential installations must employ resilient heavy duty neoprene or other approved synthetic material at pipe to box connections. Polyethylene boxes shall be equipped with pipe seals manufactured for use with the box.

All metal parts used in pipe connections shall be corrosion proof. Distribution boxes shall be of sufficient size and contain suitable baffling to prevent short circuiting and uniformly distribute sewage. The distribution box shall be equipped with an inlet tee, baffle, or splash plate extending one inch (minimum) above the outlet invert elevation to dissipate the velocity of the sewage.

200.3 EXECUTION

Distribution boxes shall be installed on foundations designed to prevent settling or tipping from loads as shown on the Standard Detail. Foundations shall consist of a minimum of 6 inches of crushed stone not exceeding 1 ½ inches in diameter.

Each distribution box shall be tested in the presence of the Health Agent or other Board of Health representative to insure that it is set level by filling the box with water to the invert of the outlet pipes. The water level must be at the same elevation as each outlet invert. If the water level is not touching an outlet, the box must be reset or the outlet pipe terminations provided with appurtenances to assure proper liquid distribution.

SECTION 300
TIGHT TANKS

300.1 GENERAL

300.1.1 Description

This section sets forth the requirements for the use, design, and construction requirements for tight tanks (holding tanks) for residential use only. All tight tanks are to be used as a temporary measure for the storage of wastewater pursuant to the Essex Final Judgment. Tight tanks shall have no outlet pipe connections save one capped pipe that allows for future use with new technology or a communal sewer system.

300.2 MATERIALS

300.2.1 General Requirements

Tight tanks shall conform to SECTION 100 SEPTIC TANKS except for the following:

1. Minimum tank capacity shall be 500% of the design flow or 2,000 gallons whichever is greater.

2. There shall be at least two access openings installed to grade. One opening shall be located over the inlet pipe and the second opening shall be located over the opposite end of the tank.

3. No outlet tee shall be provided. However, a capped, four-inch, PVC pipe shall be installed to penetrate one tank outlet for future use.

4. Access openings to grade shall be provided at both ends of the holding tank. Access openings in the tank shall be a minimum of 20 inches and riser covers shall be 24 inches in diameter. The number of openings shall be sufficient to permit access to all portions of the tank using tank cleaning tools, but there shall be no less than one opening for every 10 feet of tank length or fraction thereof. Inlet tees shall be visible and accessible through the access openings for inspection and repair. All accessways that are visible from the surface shall be made childproof by using a bolt down cover or other means. Covers shall be watertight.

5. Tight tanks shall employ the use of penetration sealing methods described in Section 400.2.7 in all cases.

6. Tight tanks shall be vacuum tested as per Section 500.3 in all cases.

300.3 EXECUTION

300.3.1 Design Criteria and Fabrication

Holding tanks shall conform to Section 100.3.1 Design Criteria and Fabrication.

300.3.2 Product Handling

Holding tanks shall conform to Section 100.3.2 Product Handling.

300.3.3 Installation

Holding tanks shall conform to Section 100.3.3 Installation.

SECTION 400
SEWER PIPE and VALVES

400.1 GENERAL

400.1.1 DESCRIPTION

This section describes requirements pertaining to the type and installation of piping and valves in new construction and upgrades. Pipe within 10 feet of the building shall meet the requirements of the Massachusetts Plumbing Code.

400.2 MATERIALS

400.2.1 Pipe shall be cast iron, ductile iron, or PVC conforming to the standards specified below.

400.2.2 Polyvinyl Chloride (PVC) Pipe

400.2.2.1 Polyvinyl (PVC) pipe and fittings shall be homogeneous throughout and free from visible cracks, bubbles, blisters, holes, foreign inclusions, cuts or scrapes on the inside or outside surfaces or imperfections which may impair the performance or life of the pipe. Each pipe shall be straight to within 1/16 inch per foot of length when uniformly supported along its entire length, and shall have a true circular cross-section to within +/- 1/64 inch.

400.2.2.2 Polyvinyl Chloride (PVC) Gravity Pipe and Fittings

a. Polyvinyl Chloride (PVC) pipe and fittings shall meet the material requirements of ASTM D 3034, wall classification SDR-35 (minimum), Schedule 40 (minimum) or ASTM F 789, wall thickness T-1.

b. Joints shall be elastomeric gasketed or solvent welded in accordance with manufacturer's recommendations and ASTM Standard D 2466.

400.2.2.3 Polyvinyl Chloride (PVC) Pressure Pipe and Fittings

a. Polyvinyl chloride (PVC) pressure pipe shall be manufactured from PVC compounds meeting the requirements of ASTM D 1784, Class 12454B. Pressure pipe shall be Schedule 40 minimum or SDR 21 minimum.

b. Solvent-cemented pipe joints shall meet the materials and workmanship requirements of ASTM D 2672. Schedule 40 pipe fittings shall have solvent-cemented joints meeting the materials, workmanship and dimensional requirements of ASTM D 2466. Primer shall meet the materials requirements of ASTM F 656. Solvent cement shall meet the materials requirements of

ASTM D 2564.

c. Rubber gaskets for gasketed joints shall meet the materials requirements of ASTM D 477. Gaskets and lubricants shall be made from materials that are compatible with the pipe material and will not support bacterial growth.

d. Pressure sewer pipe shall be pressure-rated SDR 21 pipe with a pressure rating of 200 psi meeting materials, design, test, certification, and marking requirements of ASTM D 1785. Pressure sewer mains shall have gasketed joints in accordance with ASTM D 3139. Pressure sewer pipe shall be 1-1/2 inch diameter minimum. Threaded connection to Schedule 40 pipe shall only be made using socket-by-thread adapters.

e. Pressure sewer threaded fittings shall be Schedule 40 IPS fittings conforming to the materials, design, test, certification and marking requirements of ASTM D 1795.

f. Threaded pipe and fittings shall be Schedule 80 physical dimensions and tolerances of PVC Schedule 80 pipe and shall conform to ASTM D 1875. Threaded Schedule 80 fittings shall conform to ASTM D 2464 and shall be manufactured by the same supplier as the pipe. Rubber gasketing for joints shall provide a seal between the bell and the spigot and conform to ASTM Standard D-1869. Solvent cement shall be manufactured specifically for use on PVC Schedule 80 pipe and shall meet all requirements of ASTM Standard D-2564.

400.2.3 Cast Iron Soil Pipe, Ductile Iron Pipe and Fittings

Cast iron soil pipe (CIP), ductile iron pipe (DIP) and cast iron fittings shall be sound and without defects that might impair its service.

Ductile Iron Pipe and Fittings

a. Pipe shall be manufactured in accordance with the requirements of AWWA C151 except that the metal thickness class shall be Class 52. Pipe nominal lengths may be 16 through 20 feet.

b. All pipe and fittings shall be constructed to withstand all external pressure caused by overburden as indicated on the profile and traffic loads to which the pipe may be subjected.

c. All ductile iron pipe will be designed for a minimum of 150 psi working pressure and Type 1 laying conditions. The standard thickness class shall be Class 52; minimum.

d. Joints may be flanged, mechanical or rubber gasketed push-on type. Unless otherwise noted, all joints shall be in accordance with AWWA 1111.

e. All fittings shall be manufactured in accordance with AWWA C110 or AWWA C153 for compact fittings sizes 3 inch through 12 inch.

f. Fittings shall have a minimum pressure rating of 250 psi.

400.2.4 Aggregate for Pipe Bedding

Aggregate for pipe bedding shall be screened crushed stone meeting the requirements of AASHTO M43 No. 57.

400.2.5 Check Valves

Check valves shall be gravity-operated, flapper-type with injection molded polyvinyl chloride (PVC) bodies. Flapper-type valves shall have a full ported passageway and true union joint ends. Working parts shall be made of a 300 series stainless steel and/or non-metallic synthetic resins. Ball check valves shall be used for septic tank effluent only.

400.2.6 Ball Valves

Ball valves shall be constructed of PVC material, with socket-type true union end connections and sized as shown on the Plans. Ball valves shall have Viton O-ring seals and self-lubricating Teflon seats. Ball valve shall be designed to allow disassembly of the downstream side of the piping while the upstream side remains pressurized.

400.2.7 Pipe Wall Penetration Seals

Pipe and conduit penetrations into precast concrete structures other than distribution boxes and leaching chambers shall be sealed watertight using one of the following methods unless the penetration has been demonstrated to be above the seasonal high groundwater table via a soil evaluation or other method. Tight tanks shall employ one of the following sealing methods regardless of the level of the seasonal high groundwater table (See Section 300).

a. Neoprene Boot

Pipe and conduit penetrations shall be affixed to the structure using a flexible neoprene boot. All hardware shall be stainless steel. Holes shall be core drilled or cast perpendicular to the face of the tank wall so as to produce a smooth wall hole. Boots shall be Kor-N-Seal Assembly as manufactured by National Pollution Control Systems, Inc. of Milford, New Hampshire or

equal. The boot shall be installed in accordance with the manufacturer's specifications.

b. Link Seal

The pipe to wall penetration closures shall be "Link Seal" as manufactured by Thunderline Corporation, Wayne, Michigan or equal. Holes shall be core drilled or cast perpendicular to the face of the tank wall so as to produce a smooth wall hole. Seals shall be a modular mechanical type, consisting of EPDM interlocking rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with stainless steel bolts to form a continuous rubber belt around the pipe with a corrosion resistant pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide a water-tight seal between the pipe and wall opening. The inside diameter of each wall opening shall be sized to fit the pipe and seal to assure a water-tight joint.

c. Alternative Sealing Systems

Alternative sealing systems shall be submitted to the Board of Health for approval. Submittals shall include a full description of the sealing system including materials of construction, dimensional drawings, and installation procedures.

400.3 EXECUTION

400.3.1 Trench Excavation for Pipe Installation

All work shall be performed in accordance with OSHA requirements.

DigSafe shall be contacted and buried utilities located prior to the start of excavation.

The trench subgrade shall be such as to provide a uniform and continuous bearing and support for the pipe for the full length of each pipe, except for that portion at the bell connection. Any part of the bottom of the trench excavated below subgrade shall be backfilled with suitable material and thoroughly compacted.

Trench sides shall be vertical to a distance of at least one (1) foot above the top of the pipe.

400.3.2 Sewer

Building sewer construction and installation shall be in accordance with 310 CMR 15.222, Building Sewer.The location and depth of the septic tank shall be confirmed

prior to installation of the building sewer.

The building sewer connection to the building drain and its connection to the septic tank inlet shall be made with rigid couplings. The building sewer shall be laid straight from the foundations to the septic tank wherever possible. The distance between the septic tank and the building foundations shall be as short as possible. A manhole terminated at grade shall serve as access to all ninety degree bends.

When two forty-five degree bends are placed in series (close proximity) in a building sewer the pair shall be preceded by a single cleanout extended to grade and plugged. When any single bend less than 90 degrees is placed in a building sewer it shall be preceded by a cleanout extended to grade and plugged. A cleanout extended to grade and plugged shall be provided for each 100 feet of house service.

Backfill material around and over pipelines for a distance of two (2) feet above the top of the pipe shall consist of clean unfrozen earth, free of ash, putrescible refuse, stones over six inches in diameter, or any other material of an unsatisfactory character. Sewer pipe shall be laid on six inches of suitable material and backfilled with suitable material to a depth of six inches above the pipe. The remainder of the trench may be backfilled in layers.

All pipe shall be installed in accordance with the recommendations of the pipe manufacturer and as specified herein:

a. Trench, backfill, compaction, pipe bedding and haunching shall be as required by the pipe manufacturer.

b. The pipeline trench excavation shall be dewatered sufficiently to allow pipe construction under dry conditions. No joint shall be made under water.

c. No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when there is danger of ice formation or frost penetration at the bottom of the excavation. In freezing weather, open trench length shall be kept to a minimum and the excavation promptly backfilled after the pipe has been installed.

d. Each pipe shall be bedded on a solid foundation. Bell holes shall be dug sufficiently large to ensure that joints are properly made and the pipe is firmly supported for the full length of the barrel.

e. Proper and suitable tools and appliances for safe and convenient handling and joining of pipes and fittings shall be used. Slings shall not damage the exterior and/or coating of the pipe, and shall be wide canvas or rubber-coated belts.

f. Pipe and fittings shall be carefully handled and lowered into the trench. Pipe

shall be installed with special care to ensure that each length abuts against the next to produce no shoulder or unevenness of any kind along the inside bottom half of the pipeline. No wedging or blocking will be permitted in installing any pipe.

g. No pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Care shall be used to secure watertightness and prevent damage to, or disturbing of, the joints during the refilling process. After pipes have been installed and joints have been made, there shall be no walking on or working over the pipe, except as may be necessary in tamping the backfill material, until the backfill is at least 4 feet over the top of the pipe or backfill is completed.

h. The pipes shall be thoroughly cleaned before being installed and shall be kept clean until acceptance of the completed work. Open ends of all pipelines shall be provided with a stopper carefully fitted to keep dirt and other substances from entering. This stopper shall be kept in the end of the pipeline at all times when installation is not in progress.

i. Pipes shall be furnished in standard laying lengths. Random short lengths shall not be permitted. Whenever a pipe requires cutting to fit into the line or bring it to the required location, the work shall be done in a manner that leaves a smooth, square end. Cut PVC pipe ends shall have burrs removed and the end beveled to match factory bevel. Field spigots shall be stop-marked with a felt tip marker or wax crayon for the proper length of assembly insertion.

The alignment and subgrade of all trenches and excavations shall be determined from bench marks provided in the Plans. All bench marks shall be preserved, and a complete and accurate record maintained of the pipe location, grade, depth, bends, and cleanouts.

Solvent-cemented polyvinyl chloride (PVC) pipe joints shall be assembled only by personnel knowledgeable and experienced in properly making solvent type joints in accordance with the solvent cement manufacturer's recommendations, as specified is ASTM D 2855, and as detailed herein:

a. Ends shall be cut square with the pipe axis using a fine-tooth hand or power saw. Pipe cutters not specifically designed for cutting pipe shall not be used. Cut ends shall be chamfered and deburred prior to joint assembly.

b. Surfaces to be joined shall be cleaned and free of dirt, moisture, oil and other foreign material. Cleaning shall be accomplished by wiping with a clean dry cloth, a chemical cleaner, or mechanical means. The surface temperature of the mating surfaces shall not exceed 100^{o} F at the time of assembly.

c. The inside socket surfaces and the male end of the pipe shall be softened by application of one or more coats of primer. After the surfaces have been softened, and while still wet with primer, cement shall be applied to both surfaces in a uniform and even manner, taking care to keep excess cement out of the socket. Immediately after applying the last coat of cement to the pipe, and while both the inside socket surface and the outside surface of the male end of the pipe are soft and wet with solvent cement, forcefully bottom the male end of the pipe in the socket. Turn the pipe or fitting one-quarter turn during assembly to distribute the cement evenly. Hold the joints firmly together until the cement has received its initial set.

d. Handle newly assembled joints carefully until the cement has gone through the set period. Set time shall be in accordance with the manufacturer's recommendations or the following, whichever is longer:

Minimum Time	Ambient Temperature
30 minutes	60 to 100^{o} F
1 hour	40 to 60^{o} F
2 hours	20 to 40^{o} F
4 hours	0 to 20^{o} F

Pressure testing shall not be conducted until at least 24 hours after solvent cement joints have been assembled.

When threaded polyvinyl chloride (PVC) joints are called for, the following procedures shall be followed:

a. Male and female threaded areas shall be clean and free of sand and dirt.

b. Joints shall be lubricated and sealed with non-hardening pipe dope or Teflon tape.

c. Special care shall be taken when starting threads to prevent cross threading.

d. Hand tighten joint first, then wrench tighten only enough to produce a leak-free joint.

SECTION 500
WATERTIGHTNESS TESTING

500.1 GENERAL

500.1.1 Description

This section presents methods of water tightness testing acceptable to the Board of Health. The section presents acceptable methods for testing tanks, gravity pipelines, and pressure pipelines.

500.2 MATERIALS

Not applicable.

500.3 EXECUTION

500.3.1 Use of These Methods

All septic tanks shall be tested for water-tightness unless it can be demonstrated that no part of the tank is below the level of seasonal high groundwater. All tight tanks shall be tested for water-tightness regardless of the seasonal high groundwater elevation (See Section 300). All gravity and pressure pipes located within 6 inches of the seasonal high water table may require testing for water-tightness at the discretion of the Board of Health . Unless specifically waived by the Board of Health, all tests shall be performed in the presence of the Health Agent or other Board of Health representative.

500.3.2 Septic Tanks, Holding Tanks, Manholes, Dose Chambers, and Pump Chambers

These structures shall be vacuumed tested in accordance with the following procedures:

Testing for all holding tanks and for septic tanks/pump chambers which require two risers shall be performed after the structure has been set and all penetrations have been installed including all access risers, pipes, and conduits. Testing for all other tanks/pump chambers must be performed after penetrations and conduits have been installed but may be performed before risers have been installed.

All lift holes or similar penetrations shall be filled and completely repaired before the test.

All risers, pipe, and conduit penetrations shall be plugged with pneumatic or mechanical plugs.

Install vacuum line and inflate compression band to effect an air tight seal.

Connect the vacuum pump to the outlet port with the valve open.

Draw a vacuum of at least 4 inches mercury and close valve.

The structure shall maintain the vacuum for at least ten (10) minutes. If the vacuum falls more than 0.5 inch in two minutes, the structure must be repaired and the test repeated.

500.3.3 Gravity Pipe Line Low Pressure Air Test

The low pressure air test may be required by the Board of Health and shall consist of the following:

Test plugs shall be supplied and installed within the pipeline at each terminus or structure. Each plug shall be securely braced.

Air shall be added slowly to the portion of the pipe being tested until the internal pressure is raised to 10 psig. No one shall be allowed to enter any structure connected to the pipeline under pressure during the test. No adjustment of any plugs is allowed while the pipeline is under pressure.

The air temperature shall be allowed to stabilize for at least 2 minutes by adding only the amount of air required to maintain the specified pressure. After this time period, the hose and air compressor shall be disconnected from the pipe section under test.

No pressure drop is allowed for a 5 minute period. Pipelines which fail to maintain the stipulated pressure for a period equal to or greater than this shall be deemed to have failed the low pressure air test and shall be repaired.

500.3.4 Pressure Pipe Testing

Pressure pipe testing may be required by the Board of Health and the pipe must be filled with water, all air eliminated from the system, and the system pressurized to 80 psig at the highest point under test. Valves in the line shall be opened full and closed while the line is under test pressure. The pipeline shall be deemed acceptable if it can hold 80 psig for 5 minutes without losing pressure.

SECTION 600
DESIGN and AS-BUILT PLANS

600.1 GENERAL

600.1.1 DESCRIPTION

This section addresses requirements for submitting design plans prior to obtaining a Disposal System Construction Permit. This section also addresses requirements for submitting as-built plans prior to obtaining a Certificate of Compliance following system installation. "Plans" shall include all drawings related to original designs and design modifications for the following:

a. New systems: single-unit, multi-unit, and commercial properties.

b. Existing systems: repair, replacement, upgrade or expansion of existing septic systems for single-unit, multi-unit and commercial properties.

600.2 DISPOSAL WORKS CONSTRUCTION PERMIT APPLICATIONS

600.2.1 Applications for disposal works construction permits shall be considered incomplete pursuant to M.G.L. Ch. 111, s. 31E and will not be reviewed unless all applicable items listed below are provided at the time of original submittal:

a. DEP approved application form (yellow and white form) – *required for all*
b. Three complete copies of design plans in accordance with section 600.3.1 below – *required for all*
c. Appropriate plan review fee – *if applicable*
d. Official soil evaluation report on DEP approved form – *required for all unless submitted previously*
e. Local upgrade approval form 9A – *if applicable*
f. Variance request letter (see Section 2000) – *if applicable*
g. Copies of any septic system easements with official Essex County Registry of Deeds proof of recording – *if applicable*

600.3 EXECUTION

600.3.1 The designer shall submit design plans for the new system or system replacement, upgrade or expansion to the Board of Health. The design plans and design report shall bear the original stamp and signature of the designer and shall be prepared in accordance with 310 CMR 15.220, Preparation of Plans and Specifications, 310 CMR 15.221, General Construction Requirements for All System Components, and

the Town of Essex checklist found in SECTION 2400. **All plans shall be presented on one, 24" x 36" sheet unless a) an innovative/alternative active treatment device is part of the system or b) multiple dwellings are being served by the system. In cases (a) and (b) the plan shall be presented on no more than two, 24" x 36" sheets.** In addition, the plans shall include:

a. Property tax identification number;
b. Property owner name, address, telephone number(s);
c. Name of property owner's agent, including address and telephone number;
d. Plan of existing improvements (buildings, utilities, storm drain systems, wells, individual sewage disposal treatment systems, etc.);
e. Plan showing proposed location of new dwelling or building to be served;
f. approximate Location of existing system components;
g. Number of bedrooms;
h. Location and test results from a minimum of two (2) percolation tests, one (1) of which shall be located in the primary system location and one (1) of which shall be located in the first reserve area;
i. Location and soil profiles from at least two (2) deep test pits in the disposal field area are required for a repair. For new construction at least two deep test pits are required in the primary disposal area and at least two deep test pits are required in the reserve area. The pits shall be sufficient in number to thoroughly describe the surface soils in the leaching system and reserve area.
j. Details for proposed equipment or structures;
k. Calculations to support the size of expanded facilities;
l. Reference points for maintaining horizontal and vertical location control during construction;
m. A note on the plan listing all variances applied for;
n. The holder identification and location of any easements appurtenant to or which could impact the system;
o. All tanks and dosing chambers that are at or below the groundwater table shall be designed with counter weights, anchors or ballasts if necessary. Buoyancy calculations shall be in conformance with section 100.3.1.
p. For systems with a projected flow of 5,000 gallons per day or greater, a site hydraulic analysis including geohydrologic testing, mathematic and graphic calculations of groundwater impacts shall be prepared and submitted for approval.

600.3.2 The designer shall submit as-built plans of the new system, repair, replacement, upgrade or expansion as installed to the Board of Health. As-built plans shall consist of the approved design plan resubmitted to the Board of Health with any changes, including changes in final grading, clearly indicated in red ink or readily discernable line and font weights and styles superimposed on the original drawing.

The original design submission date, revision date(s), and the heading “As-built” shall be clearly indicated on the plan along with ties from two permanent reference points to

the center of the septic tank or tight tank inlet manhole cover.

600.3.3 As-built plans for any type of system other than a temporary tight tank shall bear the following signed statement from the System Designer:

> *I certify that the sewage disposal system depicted hereon is installed in accordance with the provisions of 310 CMR 15.00 (Title 5), the most recent revision of the Essex On-site Systems Design Standards, and the originally approved design plan as amended by this as-built plan.*

_____ _____
(Signature of Designer) *(Date)*

600.3.4 As-built plans for any temporary tight tank shall bear the following signed statement from the System Designer:

> *I certify that, pursuant to the Essex Final Judgment, the temporary tight tank depicted hereon is installed in accordance with the most recent revision of the Essex On-site Systems Design Standards and the originally approved design plan as amended by this as-built plan.*

_____ _____
(Signature of Designer) *(Date)*

600.3.5 Design plans shall bear the following signed statement:

> *I certify the locations, elevations and ties shown on this plan result from an actual survey made on the ground.*

_____ _____
(Signature of Designer) *(Date)*

600.3.6 All documents, plans and testing shall be prepared under the supervision, signature and seal of a Massachusetts registered sanitarian or licensed professional engineer.

600.3.7 Either a valid Order of Conditions from the Essex Conservation Commission or a written statement from the Essex Conservation Commission that a particular septic system installation is not within the jurisdiction of that commission must be provided to the Board of Health by the septic system installer prior to the issuance of any Disposal Works Construction Permit. Installations for which Orders of Conditions do exist will not be permitted unless the design plans for such systems include or are revised to include any Essex Conservation Commission Order of Conditions requirements which effect the design or specifications of the septic system.

600.3.8 Manufacturer's Certification of Conformance to Installation Requirements:

The design drawings for any innovative/alternative treatment device installation shall be reviewed and approved by the device manufacturer (if proprietary) and shall contain the following statement, signed by a representative of the manufacturer:

This drawing has been reviewed for conformance with the installation requirements for the (name of device) proposed and the design has been found to meet the installation requirements for said (name of device).

_____

Name, Title, Date

SECTION 700
LEACH FACILITY CONSTRUCTION

700.1 GENERAL

700.1.1 Description

This section describes the installation requirements for leach facility construction.

700.2 MATERIALS

700.2.1 Pipes and Valves

See SECTION 400 SEWER PIPE AND VALVES.

700.2.2 Aggregate

Aggregate used in soil absorption systems shall be double washed stone with a diameter ranging in size from 1/8" to ½" (for peastone) and ¾" to 1 ½" (for leach stone) and shall comply with 310 CMR 15.247. All aggregate shall either be certified as mechanically cleaned (as defined below) or shall be certified to meet the following size-requirements:

	Size, inch or sieve	Percent Passing
Leach Stone	2.0 inch	100%
	¾ inch	<50%
	200 sieve	<0.5%
Peastone	¾ inch	100%
	½ inch	<50%
	200 sieve	<0.5%

Mechanically cleaned shall be defined as a separate material handling process designed specifically to wash fine material off of aggregate. The washing process shall include full emersion of the aggregate in water, mechanical or hydraulic agitation, and sufficient water backwash velocity to remove soil particles less than 100 sieve size.

Certifications from the supplier that the aggregate meets the size requirements or that the aggregate is mechanically cleaned shall be available to the Board of Health with the first delivery of aggregate to the site. The Board of Health may require that the aggregate be tested to determine if it meets the size requirements.

The Board of Health may require the removal and replacement of any aggregate that does not meet the size requirements.

Aggregate shall be protected from the introduction of fines at all times. Stockpiled aggregate shall be stored so as to avoid the possible introduction of fines. The Board of Health may require that stockpiled material be analyzed to determine if the aggregate meets the size requirements. If the stockpiled aggregate does not meet the size requirements, the aggregate shall not be installed in a disposal system.

700.2.3 Leaching Devices

All prefabricated leaching devices shall be approved by the DEP for use in Massachusetts. Such devices shall include leaching galleries, ammeration chambers, Infiltrators, Cultech and any DEP approved manufactured system for the subsurface application or distribution of wastewater.

700.3 EXECUTION

700.3.1 Clearing, Grubbing and Topsoil Removal

Construction equipment shall be selected and operated so as to protect any operating disposal systems.

All stumps, brush, shrubs, and other vegetation shall be cut flush to the ground. Stumps shall be removed. Cleared material shall be disposed of properly.

700.3.2 Leach Facility Construction

A. Stakeout

Stakes and offsets for control of elevation and location of the disposal system and its structures shall be set prior to construction and maintained until a Certificate of Compliance has been issued by the Board of Health.

B. Soil Moisture

Mechanical excavation of a leaching facility when soil moisture is high results in smeared soils (particularly in Class II, III or IV soils) with reduced capacity to absorb wastewater. Conditions, therefore, are most favorable for leach facility construction during the drier times of the year (June to October). Leaching facilities constructed in Class II, III, or IV soils during the wet season (October through May) or during wet periods during the remainder of the year, shall have infiltrative surfaces prepared by hand. Soil in the effective absorption area on the sides of excavations shall be removed by digging fork. Soil in the effective absorption area on the bottom of the leaching facility shall be removed manually by shovel. The work shall progress from the far end of the leaching facility to the near end. The infiltrative surface shall not be walked on or driven on by any equipment.

C. Construction Equipment

Construction equipment shall be selected in order to avoid compaction of the subsoil beneath the leaching facility and to protect existing facilities during the construction.

Whenever possible, construction equipment shall not be allowed within the disposal facility boundaries in order to prevent compaction of the naturally occurring pervious soil beneath the disposal system. If it is not possible to construct a leaching facility without having equipment within the boundaries of the leaching system, the Installer shall, prior to construction, obtain permission from the Health Agent to construct the system using equipment within the leaching facility boundaries and shall construct the facility according to the following:

(1) Excavation shall be accomplished by starting at the furthest end of the disposal area and working backwards towards the staging area so that at no time will construction equipment travel over the exposed soils of the leaching facility (the infiltrative surface).

(2) Smeared or compacted soils in the effective absorption area shall be removed by hand using digging forks and/or shovels. Walking on the infiltrative surface and driving over the surface shall not be allowed.

(3) Sand fill and/or gravel shall be installed from the staging area to the furthest end of the disposal system so that the construction equipment travels over the installed sand and/or gravel above the bottom of the leaching facility. Only tracked vehicles shall be allowed to place sand, gravel, and soil within the boundaries of the leaching facility. The tracks on the vehicles shall be kept free of mud and soils during the filling operation. A ramp of sand or gravel shall be used for the tracked vehicle between the disposal system and the sand or gravel stockpile or truck.

D. Frozen Conditions

No frozen soils, sand, or gravel shall be used for construction or backfill.

E. Cover

Soil cover over disposal systems shall be graded to direct surface water away from the system. Disposal systems shall be backfilled with between 9 and 36 inches of cover material and the finished grade, including system side slopes, shall be sufficiently stabilized with loam and seed, hay (temporarily if grass cannot be grown), or mulch to prevent soil erosion.

F. Trenches

Trenches shall conform to 310 CMR 15.251.

G. Beds

Leaching beds or fields shall conform to 310 CMR 15.252.

H. Pits, Galleries, or Chambers

Pits, galleries, and chambers shall meet 310 CMR 15.253.

I. Distribution Lines

Effluent distribution line shall have ends capped or connected together by solid pipe of the same materials specifications.

Distribution lines connecting the distribution box or pump chamber to the soil absorption system distribution lines shall be solid with watertight connections and joints.

J. Geotextile Material as An Alternative to "Choke" Stone

A porous geotextile material may be placed over a leaching system under the following conditions:

(1) Two (2) inches of double washed leach stone is installed above the distribution pipes in place of peastone.

(2) The geotextile material is permeable to water.

(3) The leach facility is vented in accordance with 310 CMR 15.241.

SECTION 800
RECIRCULATING SAND FILTERS

(NOTE: Section 800 is offered as a guidance document only and its content will not be a required element of design plan reviews. Designers will however be expected to adhere to 310 CMR 15.000 and the DEP Guidance for Recirculating Sand Filters. All other sections of the Essex On-site Systems Design Standards are required elements).

800.1 GENERAL

800.1.1 Description

This section includes suggested guidance for the design and construction of recirculating sand filters for residential service only and for less than 10,000 gpd.

800.2 MATERIALS

800.2.1 General Requirements

Piping shall conform to the requirements of SECTION 400 SEWER PIPE AND VALVES. Distribution piping shall be pressure pipe and drain pipe shall be gravity pipe.

Filter sand shall consist of washed sand with an effective size of 2 mm to 5 mm and a uniformity coefficient of less than 3.5. The sand shall conform to the following sieve analysis:

Size or Gradation	Percent Passing by Weight
1/2"	100%
No. 4	95% minimum
No. 10	10% maximum
No. 200	0.5% maximum

At least one gradation analysis for each filter should be performed by a geotechnical laboratory and the results submitted to the Board of Health. The sand sample shall be taken directly from the sand filter after placement. Should the filter fail to meet the specification, the sand shall be removed and replaced with a suitable sand. Sand samples shall be collected in accordance with ASTM D75 and analyzed in accordance with ASTM D422.

The underdrain and distribution layer material shall be 1/8" to 1/2" double washed crushed stone or gravel suitable for leach facilities and in conformance with 310 CMR 15.247.

Geotextile material shall be non-woven pervious fabric of polyester, nylon, or polypropylene and shall have an equivalent opening size no finer than U.S. Standard Sieve No. 100. The fabric shall have a tensile strength of 120 lbs. (minimum), a puncture strength of 80 lbs. (minimum), a burst strength of 270 psi (minimum), and an air flow rate of 226 cfm per sf (minimum).

Hardwood chips shall be free from clay, stone, or any plant parts or foreign substances.

The liner shall be 40 mil PVC, hypalon, polyethylene or other synthetic membrane approved by the Board of Health. Liners that are exposed to sunlight shall be resistant to UV light damage. Seams and pipe penetrations shall be made in accordance with he manufacturer's recommendations and shall be water tight.

Above ground recirculating sand filter structures shall be free standing and without outside braces. The walls shall be constructed of precast concrete, poured in place concrete, or pressure treated timbers. Precast concrete shall conform to the requirements of SECTION 100 SEPTIC TANKS. Poured in place concrete shall be reinforced and designed to contain filter media with a design weight of 120 lbs per cubic foot. Timbers shall be pressure treated and be 6 inch by 6 inch minimum, fastened with spikes and lag bolts.

800.3 EXECUTION

800.3.1 RSF Location

Recirculating sand filters shall be located to maintain the same off-set distances as are required for septic tanks per CMR 15. Sand filters shall be installed in-ground, if practicable. If the filter cannot be installed in-ground without dewatering and/or rock removal, the filter may be installed partially above ground extending no more than 30 inches above grade.

The surface underneath the sand filter shall be smooth and free of all rocks, stones, sticks, roots, sharp objects, or debris of any kind. The surface shall provide a firm, unyielding foundation for the membrane with no sudden, sharp, or abrupt changes or breaks in grade.

800.3.2 RSF Dose Chambers

Recirculating sand filter dose chambers shall meet the following design requirements:

a. The minimum volume of water in the chamber at all times shall be equal to the daily design flow volume, at a minimum.

b. The working volume between the pump-on and pump-off float shall be sufficient for a 10-minute pump run time. Calculations estimating the pump run time per pump cycle shall be shown on the drawing including the return flow from the filter.

c. The dose volume shall be sized such that the filter is dosed at least six (6) times per day based on the design flow.

800.3.3 RSF Dose Pump

Dosing pumps shall be sized to pump the return flow in addition to the design flow. The pump shall be sized to pump at a flowrate and pressure which ensures that the back pressure at each discharge orifice is at least 2 ft (water).

800.3.4 RSF Recirculation Ratio

The filter shall be designed for a recirculation ratio of at least 25:1. The recirculation ratio is defined as follows:

$$\text{Recirculation Ratio} = \frac{\text{(Total Flow Pumped in One Day) - (Design Flow)}}{\text{(Design Flow)}}$$

(All flows are expressed as gallons per day.)

800.3.5 RSF Filter Loading

The filter shall be sized based on loading the filter at a rate not exceeding 3 gallons per day per square foot based on the design flowrate as calculated in accordance with CMR 15.

800.3.6 RSF Filter Cross Section

The filter shall be constructed with a gravel underdrain layer, a filter sand layer, a distribution layer, and a cover layer of hardwood chips. The layers shall each be the following thicknesses, at a minimum.

1.	Underdrain	10 inch minimum
2.	Filter sand	30 inch minimum
3.	Distribution	10 inch minimum
4.	Hardwood chips	6 inch minimum

A geotextile fabric shall separate the distribution layer from the hardwood chip layer.

800.3.7 RSF Liner

The liner shall be securely fastened to the wall of the above ground structures or terminated in an anchor trench constructed in accordance with the manufacturer's recommendations for below-ground structures. Pipe penetrations through the liner shall be made watertight by use of liner boots manufactured and installed per the liner manufacturer's instructions. All hardware shall be stainless steel or other corrosion proof material acceptable to the Board of Health, including bands to secure boots onto pipes.

Wherever sheets of liner material are joined, and where the sheets are cut and overlapped to shape the liner to the excavation, the seams shall be constructed and sealed water tight in accordance with the recommendations of the liner manufacturer. The liner shall be overlapped a minimum of four (4) inches prior to seaming. Extreme care shall be taken by the installer in the preparation of the areas to be seamed. The area to be seamed shall be clean and dry.

No "fish mouths" shall be allowed within the seam area. Where "fish mouths" occur, the material shall be cut, overlapped and seamed.

800.3.8 RSF Liner Seams

Seams may be constructed using double faced hyperstick tape as a bonding agent where the procedure is described in detail and included in the specifications or on the plans.

Filter components may be installed after the liner system installation. All aggregate materials shall be hauled, stored, and installed in a manner to prohibit damage to the liner and its seams.

800.3.9 RSF Distribution Piping

Effluent distribution piping shall be PVC with orifices drilled into the pipe for distribution. The orifices shall be sized and the orifice spacing shall be set in order to affect an even distribution. The orifices shall be 1/4 inch (minimum) and the spacing 2.5 feet center to center, or less.

The ends of the pressure distribution pipe in the filter shall be installed with an elbow and made flush to the top of the cover surface and capped.

800.3.10 RSF General

The pressure line between the dose chamber and the filter shall be installed to drain either to the filter or the dose chamber. The pipe shall be laid at a slope of at least 1/8

inch to the foot for positive drainage.

The sand filter shall be equipped with at least one observation port which extends from the top of the cover layer to the upper surface of the sand layer.

Plans for recirculating sand filters shall include the following:

a. Recirculation Tank Volume
b. Recirculation Ratio
c. Dose Volume
d. Number of Doses per Day
e. Drainback Volume
f. Sand Filter Loading Rate (gpd/sf)
g. Pump Design Flowrate/TDH
h. Expected Pump Run Time at Design Flow
i. Pump Horsepower
j. Pump Manufacturer and Model Number
k. Float Elevations from Tank Bottom

Plans shall include a plan view and a section view detailing distribution pipe layout, observation port location, gravel layer thickness, sand layer thickness, cover layer thickness, wall construction, liner attachment, pipe penetrations through liner, hydraulic profile, sand specifications, sand supplier, orifice size, and orifice spacing.

SECTION 900
BIOCLERE TREATMENT UNITS

900.1 GENERAL

900.1.1 Description

This section includes the requirements for the design and construction of residential service Bioclere treatment units that have a treatment capacity of less than 10,000 gpd. These requirements are in addition to the requirements set forth by the Department of Environmental Protection's Certification letters.

900.2 MATERIALS

900.2.1 General Requirements

Bioclere treatment units shall be in strict conformance with the Massachusetts Department of Environmental Protection Certification For General Use, Provisional Use, or Remedial Use as presented in the Certification letters with the design documents on file with the DEP.

Piping shall conform to the requirements of SECTION 400 SEWER PIPES AND VALVES unless otherwise allowed by the Board of Health.

Bioclere treatment units shall consist of an insulated, double-walled fiberglass shell with filter media consisting of randomly packed plastic material. The unit shall also have a submersible pump for dosing the plastic material. The unit shall be sized by the manufacturer for the wastewater flow calculated in accordance with 310 CMR 15.

The double walled fiberglass shell shall consist of an inner wall 4 mm thick (minimum), an outer wall 3 mm thick (minimum), and 1 inch (minimum) of polyurethane foam insulation between the two fiberglass walls. The fiberglass floor shall be 5 mm thick (minimum) and integral to the unit. The fiberglass access hatch shall be mounted on top of the shell and shall have a neoprene seal, or equivalent, and be equipped with heavy duty lockable catches.

The filter media shall consist of randomly packed plastic spheres approximately 1 1/4-inches diameter. The media shall be manufactured from poly-vinyl chloride (PVC) or light-stabilized polypropylene.

The dosing pump used to irrigate the media shall be a submersible effluent pump as recommended by the Bioclere manufacturer. The pump shall be capable of running dry without damage to its components. Pump body shall be stainless steel with a glass filled thermoplastic impeller and volute and stainless steel shaft with ball bearings. The pump shall be sized by the Bioclere manufacturer. The pump shall be equipped

with an audible and visual alarm for pump failure.

The Bioclere shall be equipped with a weather-proof NEMA 4 control panel. The pump controls shall be located in the NEMA 4 control panel. The Bioclere unit pumps and fans shall be powered by at least one dedicated electrical circuit with a separate fuse or breaker. A fuse (or breaker) shall be located in the control panel. A power shut-off switch shall be located in the control panel.

900.3 EXECUTION

900.3.1 Bioclere Location

Bioclere treatment units shall be located to maintain the same offset distances as required for septic tanks per 310 CMR 15. Bioclere units shall be installed in ground to the maximum extent possible consistent with the manufacturer's installation guidelines.

900.3.2 Bioclere Installation Requirements

Bioclere units and aggregate base shall be installed on a dry, compact subbase. The aggregate base shall be a six inch layer (minimum) of sand or small gravel. The aggregate shall be compacted and hand raked to form a true level base.

The Bioclere shall be installed such that the unit is installed level and the internal baffle and pipe work is secure and correctly positioned.

Bioclere units shall be installed with anti-flotation devices. The anti-flotation devices shall be designed with a 1.2 factor of safety. The groundwater level shall be assumed to be at the seasonal high water table as determined by soils evaluation. If the seasonal high water table has not been determined by soils evaluation in the immediate area of the Bioclere, the designer shall assume that the groundwater is at the existing ground surface. The Bioclere unit shall be assumed to be empty in calculating the floatation forces. Calculations to size the anti-flotation device shall be presented on the same drawing as the Bioclere unit detail. The calculations shall indicate the seasonal high groundwater level, the assumed groundwater level for the floatation calculation, and the anti-buoyancy force required. The anti-floatation device shall be detailed on the drawings.

Inlet and outlet piping shall be installed on a minimum of 6 inches of aggregate bedding from the point of interconnection to the exterior wall of the treatment unit.

Refill shall be placed around the unit so as to provide uniform support. Refill shall be compacted to insure firm support around the unit.

900.3.3 Venting

Bioclere units shall be equipped with vents. Bioclere units shall not be vented through house or building vents.

900.3.4 Manufacturer's Certification of Conformance to Installation Requirements

The design drawings for the Bioclere installation shall be reviewed and approved by the Bioclere manufacturer and shall contain the following statement, signed by a representative of the Bioclere manufacturer:

This drawing has been reviewed for conformance with the installation requirements for the Bioclere unit proposed and the design has been found to meet the installation requirements for the Bioclere unit.

Name, Title, Date

900.3.5 The Bioclere system shall be started by a representative of the Bioclere manufacturer. The Bioclere representative shall submit to the Health Agent certification that the system was installed in accordance with manufacturer's requirements or a notice of non-certification within 14 days of start-up.

SECTION 1000
F.A.S.T. TREATMENT UNITS

1000.1 GENERAL

1000.1.1 Description

This section includes the requirements for the design and construction of residential service F.A.S.T. treatment units that have a treatment capacity of less than 10,000 gpd. These requirements are in addition to the requirements set forth by the Department of Environmental Protection's Certification letters.

1000.2 MATERIALS

F.A.S.T. treatment units shall be in strict conformance with the Massachusetts Department of Environmental Protection Certification For General Use, Provisional Use or Remedial Use as presented in the Certification letters with the design documents on file with the DEP.

Piping shall conform to the requirements of SECTION 400 SEWER PIPE AND VALVES. Distribution piping shall be pressure pipe (PVC SCH 40 or 80; SDR 21 or 26) and drain pipe shall be gravity pipe (PVC, ABS, or polyethylene).

F.A.S.T. treatment units shall consist of a fiberglass treatment insert with media, a settling tank, a blower system, and a leaching facility. The unit shall be sized by the manufacturer for the wastewater flow calculated in accordance with 310 CMR 15. The unit shall be designed to be installed into the proposed settling tank. The unit shall be equipped with a neoprene seal to form a water-tight seal between the seal and the unit.

The settling tank shall conform to the requirements of SECTION 100 SEPTIC TANKS except as noted herein. The settling tank shall be a two compartment tank or two tanks in series. The first compartment of a two compartment tank shall have a minimum liquid volume of 500 gallons. The first compartment shall be equipped with inlet and outlet tees that conform to the requirements of SECTION 100 SEPTIC TANKS. An access way (minimum 20 inch diameter) shall be located over the inlet tee. If two tanks are used, the first tank shall conform to all requirements of SECTION 100 SEPTIC TANKS and 310 CMR 15 for septic tanks.

The second compartment of a two compartment tank (or the second tank, if two tanks are used) shall have a liquid volume of at least 1,000 gallons. The tank shall have a minimum depth of soil cover of 12 inches. The second compartment or tank shall be equipped with an access port constructed to grade suitable for pumping out accumulated solids in the second compartment.

Air compressors installed to supply air to the treatment unit shall be muffled so as to reduce the impact of noise. Air compressors shall be located within 100 feet of the treatment unit. Air compressors must be accessible for maintenance and inspection. Air compressors shall be sheltered from the weather and shall be in a lockable enclosure. Air compressors shall be equipped with alarms (audio or visual) which detect overpressure in the air lines.

Pipe penetrations through the tank walls shall conform to the requirements of SECTION 400 SEWER PIPE AND VALVES.

1000.3 EXECUTION

1000.3.1 F.A.S.T. System Location

F.A.S.T. System treatment units shall be located to maintain the same offset distances as required for septic tanks per 310 CMR 15. F.A.S.T. System units shall be installed in ground to the maximum extent possible consistent with the manufacturer's installation guidelines. Provisions shall be incorporated into the design, such as shrubbery or bollards, to insure that below grade units are protected from vehicles driving over the unit.

13300.3.3 F.A.S.T. System Installation Requirements

The F.A.S.T. System shall be installed such that the unit is installed level and the unit pipe work is secure and correctly positioned. The unit shall be installed in accordance with the manufacturer's directions.

1000.3.3 Venting

F.A.S.T. System units shall be equipped with vents. The unit shall not be vented through house or building vents.

1000.3.4 Manufacturer's Certification of Conformance to Installation Requirements

The design drawings for the F.A.S.T. System installation shall be reviewed and approved by the F.A.S.T. System manufacturer and shall contain the following statement, signed by a representative of the F.A.S.T. System manufacturer:

This drawing has been reviewed for conformance with the installation requirements for the F.A.S.T. System unit proposed and the design has been found to meet the installation requirements for the F.A.S.T. System unit.

Name, Title, Date

1000.3.5 Start-up

The F.A.S.T. System shall be started by a representative of the F.A.S.T. System manufacturer. The F.A.S.T. System representative shall submit to the Health Agent certification that the system was installed in accordance with the manufacturer's requirements or a notice of non-certification within 14 days of start-up.

SECTION 1100
EFFLUENT PUMPING SYSTEMS

1100.1 GENERAL

1100.1.1 DESCRIPTION

This section addresses requirements for septic tank effluent pumps for single dwellings. Pumps may be used for individual disposal systems, recirculating sand filters, or other treatment systems.

1100.2 MATERIALS

Dosing pump installations shall include a submersible sewage effluent pump, level controls, complete control panel, discharge piping and valves, lifting rope, and power/control/alarm wiring.

Stainless steel nameplates giving the name of the manufacturer, the serial number, model number, horsepower, speed, voltage, amperes and any other pertinent data shall be attached to each motor. The nameplate ratings of the motor shall not be exceeded.

The equipment furnished shall be designed and constructed and installed in accordance with the best practice and methods. The pumps shall operate satisfactorily when installed.

The impeller shall be manufactured from cast iron, stainless steel, or bronze; be of non-clogging design; and be dynamically balanced. The pump shall be able to pass 3/4 inch solids. The pump volute shall be made of cast iron or stainless steel with smooth internal surfaces free of rough spots or flashing.

Motors shall have integral thermal overload protection and shall be able to sustain ten starts per hour.

Power cables shall be continuous from the pumps to the junction box and suitable for constant emersion in sewage. Strain relief shall be provided at each cable entry into the pump and from the junction box. Cable hangers shall be provided in conjunction with the pump access cover with strain relief on the cable.

Pump control boxes shall be located as close as possible to the pump dose chamber. There shall be a clear and unobstructed view from the control panel to the pump accessway or lock out – tag out procedures must be adhered to.

Each septic tank effluent pump shall be installed with a waterproof and lockable

control box. The box shall include back panel mounting provisions**,** shall be rated NEMA 1, minimum, and shall include the following:

a. Hand-Off-Auto Switch
b. Magnetic Contactor
c. Circuit Breaker
d. "Pump-on" Pilot Light
e. Running Time Meter
f. Flashing Alarm Light
g. Audible Alarm Buzzer
h. Test and Silence Switches
i. Dead Front Interior Shield
j. Event Counter

To record actual pump run time, the running time meter shall be a minimum of three digits and be wired to the pump power circuit, not the pump control circuit.

The alarm light for the pump control box shall be a flasher type. The alarm light shall be located above or mounted on top of the control box. The light shall be red. If the alarm light is mounted to the box, it shall be mounted utilizing the necessary gaskets to maintain the weatherproof integrity of the box. The alarm shall be powered by a circuit separate from the pump power circuit and shall be located in the building served.

Each control box shall include a separate audible alarm buzzer. The horn shall be mounted to the box insuring that the weatherproofing integrity of the box is maintained.

The control box shall be provided with a front mounted silence/test switch. The push button type switch shall have the ability to be pushed once to silence the audible alarm and activate the lighted button, and to be pushed twice to reset the alarm conditions.

Each control box shall be supplied with a dead front interior shield. This shield shall be of adequate size to restrict access into the open control box. However both the running time meter and the Hand-Off-Auto switch should be mounted such that they are accessible and visible.

The electrical junction boxes used for the installation of the septic tank effluent pumps shall be mounted on the inside wall of the septic tank riser and shall be in accordance with National Electric Code Requirements for Class 1, Division 1, Group D hazardous locations.

Each box shall have four (4) 1/2-inch holes drilled and tapped to accept pump power cord and float cables. The box shall be fitted with proper seals for power and control cables.

Float mast, if provided, shall be Schedule 80 PVC of sufficient length to be installed as indicated on the Plans.

1100.3 EXECUTION

Effluent Pumps

Leachfield and sand filter dosing pumps shall be sized to pressurize the distribution system sufficiently to affect an even distribution. The pumps shall be sized such that a minimum of pressure of two (2) feet water column is maintained in the distribution pipe system.

All pumps and piping within the chamber shall be corrosion proof. Corrosion proof check valves, antisiphon valves, manual shutoff valves and unions shall be provided as required by the operating conditions. Electrical wiring shall meet applicable electrical codes.

Pump on/off operation shall be automatic.

The pump(s) shall be tested with the following procedure:

1. Upon completion of the pump installation, the pump operation shall be checked for automatic operation by manually lifting the float switch or filling the dose chamber with clean water and observing the pump operation.

2. Pump drawdown rate shall be measured during a set time period. The volumetric flowrate shall be calculated and compared to design requirements.

3. The system designer shall determine if the actual flowrate is sufficient to meet design requirements.

All covers shall be located as required by the pump manufacturer for removal of the pumps using the guide rails and lifting chain, if provided.

All pipe shall be cut accurately to size and installed without forcing. Piping shall be installed so that it can expand or contract without damage. Pipes shall be carefully fitted to the equipment and care shall be used not to force either the pipe or equipment into place. After the piping has been placed, the equipment shall be checked for level and alignment.

All interior valves and accessories must be placed for easy operation, inspection and removal. Unless otherwise called for, valves shall be set normal to the walls or floor. Whenever valves or other equipment are located in or connected to a pipe line, the connections must be such that the valves or equipment can be removed without

disturbing the rest of the piping.

Supports for the piping shall be provided throughout its length and shall be able to support the pipe lines entirely independent of other equipment. Pipe support, hangers and brackets shall be of a type and design to carry all loads imposed upon them with an appropriate safety factor.

Dosing Chambers

Dosing chambers shall be designed and constructed in accordance with the requirements of SECTION 100 SEPTIC TANKS.

a. The pump tank installation shall be designed such that floatation will not occur when the tank is empty.

b. The pump tank shall have sufficient capacity above alarm level to contain a minimum of one day's storage.

The dosing chamber shall be designed to contain a volume sufficient to dose the entire leachfield.

The volume of effluent that drains back to the chamber shall be calculated and noted on the Plans.

SECTION 1200
PRESSURE DISTRIBUTION SYSTEMS

1200.1 GENERAL

1200.1.1 Description

This section describes the material and installation requirements for pressure distribution systems.

1200.2 MATERIALS

1200.2.1 Piping

Piping shall be as specified in SECTION 400 SEWER PIPE AND VALVES.

1200.2.2 Aggregate

Base aggregate for leaching structures shall be provided from below the elevation of the crown of the distribution line(s) to the bottom elevation of the soil absorption system and shall consist of double-washed stone ranging from 3/4 to 1 1/2 inches in diameter and shall be free of iron, fines and dust in place.

Washed aggregate shall be AASHTO M43 No. 57.

Washed concrete sand for trench backfill shall be ASTM C-33 natural concrete sand. The sand shall meet ASTM C-33-90 regarding gradation, organic impurities, deleterious substances and soundness.

1200.3 EXECUTION

Trenches and pressure laterals and manifolds shall be installed in accordance with SECTION 700 LEACH FACILITY CONSTRUCTION.

1200.3.1 The following hydraulic calculations shall be submitted with the plans in fulfillment of the design criteria for sizing the distribution laterals unless alternate calculations and specifications have been approved by the Department of Environmental Protection as part of an existing Use Approval or a site-specific I/A Approval:

a. Distal in-line pressure or the residual pressure at the orifice at the end of the lateral shall be designed to be a minimum of 2 feet.

b. Lateral discharge rate, given by the formula $q = 11.79d^2h_d^{1/2}$, where q is the

lateral discharge rate, d is the perforation diameter in inches, and h_d is the selected distal in-line pressure in feet. The selected perforation diameter shall be a minimum of 1/4 inch.

c. Total lateral discharge rate, given by the formula (q x N), where q is the lateral discharge rate and N is the total number of perforations in the lateral.

d. Residual pressure shall not vary by more than 10% between the closest lateral and the farthest lateral.

e. Design total dynamic head (TDH) and pump discharge rate. The design TDH shall account for backpressure and pumping through the manifold. A Hazen-Williams correction factor of C=120 (smooth PVC pipe) shall be used in calculating friction losses due to the pipe. The pump discharge rate shall allow for the in-line pressure at the distal end of the pipe to be a minimum of 2 feet. This is determined by the total lateral discharge rate.

f. Dosing volume shall be determined by dividing the daily design flow by the number of dosing cycles per day (number of dosing cycles shall be determined by soil type). The dosing volume shall be at least 10 times the volume of water that is drained from the distribution pipe between dosing, but must not exceed the volume required for the dosing cycle.

Pressure distribution systems shall consist of a central manifold with a number of PVC laterals. The discharge orifices shall be 1/4 diameter (min.). The distribution laterals shall be designed in accordance with the DEP guidance for pressure distribution systems. Orifices shall be installed in a single line either at the pipe invert or at the pipe crown. The holes shall be drilled by hand and cleaned of all burrs prior to installation.

All pressure distribution laterals shall be laid level and covered with 2 inches of double washed gravel.

1200.3.2 All pressure distribution systems shall be installed and tested (in the presence of the Health Agent or other Board of Health representative) as follows:

a. The leach facility shall be excavated and filled with stone to the invert of the distribution pipe.

b. The distribution pipes shall be laid level and at the specified elevation.

c. The laterals shall be rotated so that discharge orifices are oriented along the crown of the pipe if the design specifies downward facing orifices.

d. The distribution pipes should be joined to each other and to the manifold with glue and solvent to permit testing without coming apart.

e. The pump chamber or compartment shall be filled with clean water to the normal level specified for the pump to start.

f. The pump will then be started either automatically or manually. The water shall squirt to the height specified in the design (two feet minimum) above the pipe for the test to be found acceptable. There shall not be more than a ten percent drop in the height of the discharge from the discharge hole closest to the manifold to the hole farthest away.

g. Following a successful test the distribution pipes shall be cut and turned down if the design requires downward facing holes. Stone cover, geotextile, and backfill shall be installed in accordance with the plan.

1200.3.3 All distribution piping with less than 3 feet of cover must drain completely between doses.

SECTION 2000
PROCEDURE FOR OBTAINING A VARIANCE

2000.1 Description

This section sets forth the proper procedure to seek a variance from the Essex Board of Health.

2000.2 Procedure

2000.2.1 Provide a letter to the Essex Board of Health formally requesting all variances applied for. The letter must be submitted at the time of original plan submittal and must demonstrate how the applicant meets the criteria of 310 CMR 15.410.

2000.2.2 Get verbal verification from the Wastewater Management Sanitarian (978-768-7614), that the plan is ready for a Board meeting (i.e. the provisions to be varied are the only aspects of the plan not consistent with Title 5 and/or local regulations).

2000.2.3 Contact the Administrative Clerk (978-768-7614), to ascertain the next feasible Board of Health meeting date.

2000.2.4 Ensure that abutters are notified by certified mail at least 10 days prior to the agreed upon meeting date in keeping with the following items:

2000.2.4.1 Abutters to be notified include all direct abutters (i.e. all lots in any way touching the applicant's lot) and abutters across any street(s) bordering the applicant's lot (arrived at by extending the applicant's lot lines across the street(s) and including any lots which are all or in part within that zone).

2000.2.4.2 Abutter notices must take the form detailed in 310 CMR 15.411(1)(b).

2000.2.4.3 The certified mail return receipt cards ("green cards") shall list the applicant's name c/o Essex Board of Health, 30 Martin Street, Essex, Massachusetts, 01929 as the return address (i.e. "green cards" will come directly to the Board of Health).

2000.2.5 Failure to properly complete any portion of this procedure may result in a postponement of the variance meeting date.

SECTION 2100
PROCEDURE TO REQUEST WAIVER OF SOIL TESTING

2100.1 Description

This section sets forth the reporting requirements which must be met in order for a property owner to install a temporary holding tank without performing soil testing.

2100.2 Procedure

2100.2.1 The property owner of record must complete a "Request for Waiver of Soil Testing Requirements" form (attached).

2100.2.2 An agent of the Board of Health must visit the site and complete a "Soil Evaluation Waiver Form" (attached).

2100.2.3 Based on the actions outlined above the Board of Health must conclude that the property in question does not have any feasible way to support an on-site waste disposal system.

2100.2.4 Property owners who cannot meet the requirements listed in 2100.2.1-3, at the discretion of the Board of Health, may be allowed to install temporary holding tanks if credible evidence is offered which demonstrates that the cost of installing an on-site waste disposal system is beyond reasonable expectations.

SECTION 2200
PROCEDURE TO VOLUNTARILY FAIL & UPGRADE A SEPTIC SYSTEM

2200.1 Description

This section sets forth the procedure which must be completed in order for a property owner to fail their septic system without performing a Title 5 septic system inspection.

2200.2 Procedure

2200.2.1 The property owner of record must complete an "Agreement to Upgrade a Septic System" form (attached).

2200.2.2 An agent of the Board of Health must visit the site to ensure that the system does not pose an imminent health or environmental hazard.

2200.2.3 Based on the actions outlined above the Board of Health must issue an enforcement order for the upgrade of the septic system.

2200.2.4 The deadline for the upgrade shall be up to two years from the date that the form was signed or any applicable date pursuant to the Essex Final Judgment, whichever is sooner.

2200.2.5 If the site visit referenced above or any other official record or complaint documents that the septic system in question poses an imminent health or environmental threat the Board of Health shall issue an enforcement order to abate the hazard within 30 days.

SECTION 2300
REPORTING REQUIREMENTS FOR SEPTAGE HAULERS

2300.1 Description

This section sets forth the reporting requirements for all septic system pumping performed in Essex.

2300.2 Requirements

2300.2.1 All Town of Essex licensed septage haulers must report every pumpout performed in Essex to the Board of Health on a form approved by the Board of Health.

2300.2.2 Pumpout forms for a given month must be submitted to the Board of Health office within twenty working days of the end of that month.

2300.2.3 Failure to report any pumpout performed in Essex may be grounds for a hearing before the Board of Health and/or a vote by the Board of Health to revoke a septage hauler's license.

SECTION 2400
CHECKLIST FOR REVIEW OF SEPTIC SYSTEM DESIGN PLANS

2400.1 Description

The Board of Health staff will use the attached checklist(s) to review septic system design plans as they are submitted. New checklists may be developed and existing checklists may be revised as changes in Title 5 and local design standards occur. All checklists will be circulated to all persons on the Essex design standards mailing list as they are added or modified.

SECTION 2500
CERTIFICATES OF COMPLIANCE

2500.1 Description

This section sets forth the requirements for obtaining a certificate of compliance.

2500.2 Requirements

2500.2.2 It shall be the responsibility of the property owner to obtain a certificate of compliance for any new septic system or septic system upgrade within 90 days of completion of the septic system or by deadlines set forth by the Essex Final Judgment or the Essex Seven Year Inspection Program, whichever is sooner. Completion shall be defined as the date of the final field inspection by Board of Health staff and shall be determined solely by the Board of Health and/or its agent(s).

2500.2.3 Certificates of compliance shall not be issued until the Board of Health and/or its agent(s) have determined that no outstanding issues exist with the septic system installation. Issues which must be resolved include but are not limited to the following:

a. All fees must have been paid.
b. Installation have been completed including all piping, stone, fill, tankage, and backfilling. Final construction and grading of new contours must have been completed and the finished grade must be smooth and continuous.
c. All field inspections must have been completed by an agent of the Board of Health.
d. All pump and alarm systems must have been tested to the satisfaction of an agent of the Board of Health.
e. Any retaining wall must have been personally inspected by the Professional Engineer whose stamp and signature appeared on the original approved design plan.
f. A qualifying sieve analysis report for any leach sand (or any stone as required by SECTION 700 LEACH FACILITY CONSTRUCTION) used in the system must have been submitted to the Board of Health. Any sieve report must include a statement that the material it represents (whether sand or stone) is the material delivered to the particular job site and the statement must be signed by the supplier of the material.
g. Where required, a qualifying vacuum test must have been conducted and the results submitted to or recorded by an agent of the Board of Health.
h. In every case an as-built plan which conforms to the standards outlined in SECTION 600 DESIGN and AS-BUILT PLANS must be submitted.
i. All required contracts for system maintenance, monitoring, pumping, and financial security must have been submitted and must be legally in force. Maintenance contracts for any innovative/alternative treatment device which discharges to a pressure dosed leach facility shall include a cursory inspection

for proper dosing pump operation during each maintenance visit.

j. All conditions of local and/or State variances or any of the DEP use approvals for innovative/alternative technologies must have been determined by an agent of the Board of Health to be met.

k. The septic system designer and the septic system installer shall both sign the certificate of compliance after items a-j above have been satisfied but prior to signature of the certificate by an agent of the Board of Health.

2500.2.4 The original copy of the certificate of compliance shall only be issued to the property owner of record for the property which the system is constructed on, or to the owner's legal power of attorney, or to the owner's authorized agent when the owner identifies said agent in a signed letter to the Board of Health.

2500.2.5 New structures shall not be occupied and the septic system(s) serving them shall not be used until the certificate of compliance for said septic system(s) is issued to the property owner.

SECTION 2600
SEPTIC SYSTEM INSTALLATION WEATHER CONDITION MORATORIUM

2600.1 Description

This section authorizes the Essex Board of Health to declare a septic system installation moratorium when weather conditions are inappropriate for proper installation of septic systems.

2600.2 Requirements

2600.2.1 The Essex Board of Health, through its agent(s), shall have the authority to declare a septic system installation weather condition moratorium if weather conditions (i.e. snow, ice, rain, sub-freezing temperatures, or other weather conditions) warrant. A weather condition moratorium, when declared, shall not apply to the installation of temporary tight tanks, septic tanks, pump chambers, or emergency repairs as defined in 310 CMR 15.353.

2600.2.2 During a weather condition moratorium the Board of Health will not issue any disposal works construction permits except for those items excluded above. Septic system installations already permitted and underway at the time of the declaration of the weather condition moratorium, at the discretion of the Board and/or its agent(s), may also be required to cease.

Attested by: _____

Sally Soucy, Town Clerk

February XXX, 1999
Date