

**NORTH CAROLINA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH SECTION
ON-SITE WATER PROTECTION BRANCH**

INNOVATIVE WASTEWATER SYSTEM APPROVAL
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INNOVATIVE WASTEWATER SYSTEM NO: IWWS-1997-2-R10

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For: “BioDiffuser” chambered sewage effluent subsurface disposal system (Standard Model 11” High Unit, Angle Chamber Section, Bio 3, ARC 36, ARC 36HC, and ARC 24 Models; and ARC 36 Side Port Coupler (SPC) Unit)

Approval Dates:	March 21, 1997	12 Inch Cover H-10 Load Design
	August 10, 2000	6 Inch Cover (Shallow Placement) Design
	July 25, 2001	Class IV Cover
	October 5, 2001	Angle Chamber Section
	November 4, 2002	Warranty System with Revised Equivalency Factors
	April 9, 2003	Bio 3
	March 10 2006	ARC 36
	April 28, 2008	ARC 24 and ARC 36 Side Port Coupler (SPC)
	July 18, 2008	Addition of Hancor, Inc.
	February 25, 2010	ARC 36HC, ARC 24 Side Port Coupler (SPC), ARC 36HC Side Port Coupler (SPC), and Deep Installation Approval
	November 30, 2012	Change of ownership to Infiltrator Systems Inc., Elimination of Warranty Equivalency Factors and Reductions Exceeding 25%

In accordance with 15A NCAC 18A.1969, an application by Infiltrator Systems Inc. of Old Saybrook, Connecticut (formerly Advanced Drainage Systems, Inc.) for a revised approval of their chamber (gravel-less) nitrification trench system has been reviewed. The following BioDiffuser Chamber systems have been found to meet standards of an innovative system when all of the conditions of this approval are met for the following models:

- Standard Model with 6 inch cover
- Angle Chamber section
- Bio 3 with 6 inch cover
- ARC 36 with 6 inch cover
- ARC 24 with 6 inch cover

- ARC 36HC with 6 inch cover
- ARC 24 Side Port Coupler (SPC)
- ARC 36 Side Port Coupler (SPC)
- ARC 36HC Side Port Coupler (SPC)

Each of the above-listed products or systems, where applicable, shall meet the requirements of IAPMO PS 63-2005 et. seq., the International Association of Plumbing and Mechanical Officials Material and Property Standard for Plastic Leaching Chambers, and shall remain listed on the manufacturer's "Certificate of Listing". Any changes to or modifications of an approved product or system shall be reported in writing to the Department, and granted approval by the Department, prior to the use of an innovative system.

I. Permitting

Prior to the installation of the approved BioDiffuser chamber nitrification trench system at a site for which application is being made for an Improvement Permit or Construction Authorization or at a site for which an Improvement Permit or Construction Authorization has been previously issued for a system described in 15A NCAC 18A .1955, .1956, or .1957, the owner or authorized agent shall notify the local health department. The local health department shall issue an Improvement Permit or a Construction Authorization or amend the previously issued Improvement Permit or Construction Authorization allowing for the use of the proposed innovative system upon a finding that all provisions of this approval and all other applicable rules shall be met. Use of the proposed innovative system and any conditions shall be described in the Construction Authorization or amended Construction Authorization, as applicable. Such information shall also be described on the Operation Permit to be issued upon the acceptable completion of the system installation.

II. System Description

- A. Minimum pretreatment by septic tank as required in 15A NCAC 18A. 1952.
- B. The chambers must meet the following requirements as specified.
 1. BioDiffuser units consist of high-density polyethylene arch-shaped injection molded chambers.
 2. The ARC 36, ARC 36HC, and ARC 24 chamber sidewall slopes approximately 20 degrees toward the chamber center and away from the trench sidewall.
 3. Sixteen Standard BioDiffuser chamber units are approximately equal to 100 linear feet.
 4. Fourteen Bio 3 BioDiffuser chamber units are approximately equal to 100 linear feet.
 5. Twenty ARC 36, ARC 36HC, and ARC 24 units are each equal to 100 linear feet.
- C. Each chamber unit shall be properly and permanently marked in compliance with the appropriate standard, and conditions of this approval as follows:
 - Standard
 - Bio 3
 - ARC 36
 - ARC 24
 - ARC 36HC

- D. Each chamber unit is designed to mechanically interlock with the downstream chamber forming a complete nitrification trench that consists of an inlet end plate and a solid end plate to be located at the distal end of any chamber nitrification line.
- E. The Angle Chamber Section may be utilized as an accessory for the Standard and the Bio 3 models to achieve turns as necessary in all applications including but not limited to shallow cover with 6 inches of soil.
- F. The Side Port Coupler (SPC) may be utilized as an accessory for the ARC 24, ARC 36, and ARC 36HC Model chambers in series of no more than three (3) consecutive units to decrease the turning radius of a chamber line, as a drop-box in serial distribution, and for mid-line distribution pipe entry and exit in all applications where the ARC 24, ARC 36, and ARC 36HC Model chambers may be utilized.

TABLE I
BioDiffuser Chamber Dimensions

Model	Length Overall (ft)	Height (in)	Bottom Width (in)	Average Open Bottom Width (in)	Slotted Sidewall Height (in)	Invert ¹ Height (in)
Standard	6.25	11	33.5	28.9	6	6
ARC 36	5.0	13	34.5	29.2	7.13	6
Bio 3	7.14	12.38	22	19.3	8.95	6 or 11.75
ARC 24	5.0	12	22.5	19.2	7.5	6 or 12
ARC 36HC	5.0	16	34.5	29.2	10.72	10.5

¹Invert Height is for a 4-inch diameter Schedule 40 PVC Pipe

III. Siting Criteria

The BioDiffuser nitrification trench assembly may be utilized on any site that one can use rock aggregate and pipe which meet the following criteria:

- A. Sites which are classified as Suitable or Provisionally Suitable for a conventional nitrification field system in accordance with 15A NCAC 18A .1948(a) or (b).
- B. Sites which have been reclassified as Provisionally Suitable in accordance with 15A NCAC 18A .1956(1), (2), (4), (5), and (6).
- C. Sites which meet the criteria for new or existing fill in accordance with 15A NCAC 18A .1957(b). The provisions of Rule .1957(b) are applicable whenever any portion of the chamber in a BioDiffuser System extends into fill material. There shall be no reduction in trench length compared to a conventional gravel trench as computed per Rule .1955 (sizing for all models shall be based on minimum excavated trench width in Table III, Section IVc of this Approval, without the application of an Equivalency Factor). This reference to “fill material” applies to the site fill and not the backfill placed between the trench and the chamber sidewall.
- D. The required vertical separation shall be measured from the bottom edge of the chamber.
- E. Where required by soil or site conditions and approved by the local health department, chamber systems may be installed in lieu of conventional gravel trenches at depths deeper than 36 inches

up to a maximum of 60 inches, as measured from the base of the trench. There shall be **no reduction in trench length** compared to a conventional gravel trench as computed per Rule .1955 for chamber systems installed greater than three feet deep (sizing for all models shall be based on minimum excavated trench width in Table III, Section IV.C of this Approval, without the application of an Equivalency Factor). **Furthermore, for trench depths between 48 and 60 inches, only the ARC 36HC model installed in a 36-inch wide trench shall be used, unless an advanced pretreatment system is used pursuant to Rule .1970.** Deep installation details shall be in accordance with the manufacturer’s North Carolina Design and Installation manual, including special provisions to assure compliance with federal and state safety procedures for underground excavations.

IV. Biodiffuser Chamber System Sizing

- A. The maximum long-term acceptance rate (LTAR) shall be as follows:

TABLE II

Textural Group		LTAR (gpd/sq. ft.)	
		Natural Soil	Saprolite
Soil Group I (Sands)	Sands	0.8–1.0	0.6–0.8
	Loamy Sand		0.5–0.7
Soil Group II (Coarse Loams)	Sandy Loam	0.6–0.8	0.4–0.6
	Loam		0.2–0.4
Soil Group III (Fine Loams)	Silt Loam	0.3–0.6	0.1–0.3
	Other Fine Loams		NA
Soil Group IV	Clays	0.1–0.4	NA

- B. The LTAR shall be based on the most hydraulically limiting naturally occurring soil horizon within three feet of the ground surface or to a depth of one foot below trench bottom, whichever is deeper.
- C. To determine the total trench bottom area (ft²) required, the design daily sewage flow shall be divided by the applicable long-term acceptance rate shown in Table II above. The minimum linear footage for BioDiffuser Systems shall be determined by dividing the total trench bottom area by the following equivalency factors:

TABLE III

Product	Excavated Trench Width (inches)	Equivalency Factor*, ** (SF/LF)
Standard	36	4.00
ARC 36	36	4.00
ARC 36HC	36	4.00
Bio 3	24	3.00
ARC 24	24	3.00

*Reduction in nitrification trench length allowed by use of these Equivalency Factors, as compared to sizing requirements delineated in Rule .1955 for conventional systems, apply only to drainfields receiving effluent of domestic strength or better quality. Any proposed use of the system for facilities producing higher strength wastewater shall be sized in adherence with conditions set forth in Rule .1969(9).

**When advanced treatment pursuant to Rule .1970 is used to gain a trench length reduction or LTAR increase, system sizing shall be initially based on the minimum excavated trench width in this Table without use of an Equivalency Factor.

Example:

Three bedroom residence with a design daily sewage flow of 360 gallons on a sandy clay loam (Group III) soil

Total computed trench bottom area is:

$$360 \text{ gpd}/0.5 \text{ LTAR} = 720 \text{ ft}^2$$

The required linear footage of the Standard BioDiffuser system is:

$$720 \text{ ft}^2 / 4.0 \text{ ft.} = 180 \text{ linear ft}$$

Where 4.0 ft. is the equivalency factor for the Standard BioDiffuser chamber system

- D. The minimum area (without reduction or equivalency factor) for a bed system shall be determined as required in 15A NCAC 18A .1955(d) except that the chambers shall be placed in rows next to each other.
- E. The available space requirements of 15A NCAC 18A .1945 shall be met, and this approved innovative system may be designated as the required replacement system.

V. Design and Installation Criteria

- A. The BioDiffuser chamber system used in nitrification trenches shall be installed according to the minimum and maximum dimensions in Table IV.

Table IV
BioDiffuser Chamber Systems

Model	Maximum Trench Width (in)	Minimum Trench Depth* (in)	Minimum Trench Spacing (ft on center)	Minimum Soil Cover (in)	Maximum Soil Cover (in)
Standard	36	17	9	6	36
ARC 36	36	19	9	6	36
ARC 36HC	36	22	9	6	60
Bio 3	24	18.4	7	6	36
ARC 24	24	18	7	6	36

*Minimum trench bottom depth below finished grade. Shallow installations to a minimum of 12-inches below natural grade are acceptable where needed, with approved imported backfill added to achieve the required 6-inches of cover. Manufacturer's installation procedures for shallow placed systems shall be followed.

- B. The inlet to the BioDiffuser chamber shall be through the provided cutout in the uppermost portion of the inlet panel. For dosed systems receiving effluent from a pump or siphon, manufacturer's installation procedures shall be followed, including provisions to dissipate inflow rate so as to minimize soil scouring, venting of each line, and modifications that enable the presence and effectiveness of these provisions to be field-verified.
- C. Clean Group I, II, III, or IV soil backfill (soil normally found in the upper 10 inches of the trench excavation) shall be placed along the chamber sidewall area to a minimum compacted (walked-in) height that is equal to the height of the top of the chamber louvers. Backfill shall be free of

trash or debris. Backfill placed adjacent to the louvered sidewalls shall be free of large (8" or greater) clods that do not break apart during the walk-in procedure. The latest version of the manufacturer's installation instructions shall be followed. Additional soil backfill (Group I, II, III, or IV) shall be placed above the chambers to a minimum compacted height according to the following conditions:

1. to achieve H-10 load rating capability, a minimum of 12 inches of adequately compacted cover must be installed above the BioDiffuser units;
2. for shallow placement installations, a minimum of 6 inches of adequately compacted cover must be installed above the BioDiffuser units; and
3. the person installing the system shall be certified (in writing) by Infiltrator Systems Inc. or its authorized representative as specially trained and qualified to install the BioDiffuser chamber units and be a Level I installer.

Vehicular traffic or construction equipment may traverse the chamber system only when the load is bridged over the trench so as not to disturb the chambers. The load may be bridged with a minimum of six inches of compacted soil over the Standard model, ARC 36, ARC 24, and Bio 3.

- D. Individual chamber trenches shall be constructed level in all directions with a plus or minus ½-inch tolerance from side-to-side and shall follow the contour of the ground surface elevation (uniform depth). Trenches shall be constructed with continuous interlocking chambers, including the Angle Chamber Section, without any dams, stepdowns, or other water stops, with a plus or minus 1-inch tolerance of trench levelness for any linear contoured segment.
- E. The BioDiffuser systems installed on a sloping site may use distribution devices or stepdowns as described in 15A NCAC 18A .1955(j) and (l) when it is necessary to change level nitrification line segments from upper to lower elevations. However, the requirement to fully utilize the upstream nitrification trench applies to an elevation at least equal to the top of the chamber louvers.
- F. After installation of chambers in trench or bed configuration, a filter fabric barrier shall be installed to cover the chambers if chambers are installed in uncompacted, fine, or very fine uniform sand and at least one of the following are present:
1. Installations are left uncovered and subject to a major rain event.
 2. Systems are subject to not being sodded (or stabilized) in a timely manner after final cover-up has occurred.
 3. The drainfield is not protected from surface drainage.

The filter fabric shall be non-woven, weight 0.35 oz./s.y. to 1 oz./s.y., have apparent opening size (AOS) 20-30 U.S. Sieve (ASTM D-4571), or alternate with equal or better performance characteristics. An alternate fabric may be approved in writing by the manufacturer on a case-by-case basis.

- G. Manufacturer's installation instructions for the BioDiffuser system used in septic tank systems shall be followed except as required herein or 15A NCAC 18A.1900 et.seq.
- H. The system shall be installed by a contractor appropriately certified in writing by the manufacturer.

VI. Operation and Maintenance Requirements

The BioDiffuser chamber system shall have a minimum classification as a Type III g. System (other non-conventional trench systems) in accordance with Table V(a) of 15A NCAC 18A .1961(b).

VII. Repair of Systems

The provisions of 15A NCAC 18A .1961(c) shall apply to the use of the BioDiffuser chamber system for repairs to existing malfunctioning septic tank systems.

Approved By: _____ Date: _____