

Evan and Patricia Germond

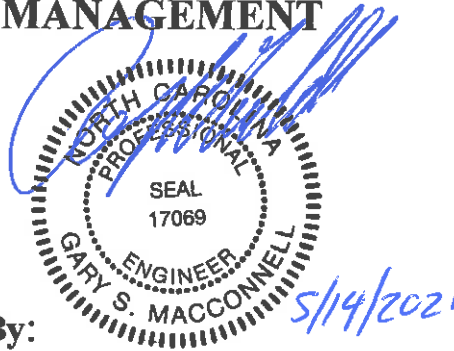
**Engineered Option Permit
Pressure Manifold**

**1594 Josey Williams Road
(Lot 3 Kemp holdings)
Harnett County, North Carolina**

Project Number: A90401.00

Date of Preparation: May 14, 2021

PROJECT MANAGEMENT



**Supporting Information &
Technical Specifications Prepared By:**
MacConnell & Associates, P.C.
Full-Service Consulting Engineers

501 Cascade Pointe Lane, Suite 103
Cary, North Carolina 27513

Post Office Box 129
Morrisville, North Carolina 27560

Telephone: (919) 467-1239

Fax: (919) 319-6510



**MacCONNELL
& ASSOCIATES, P.C.**

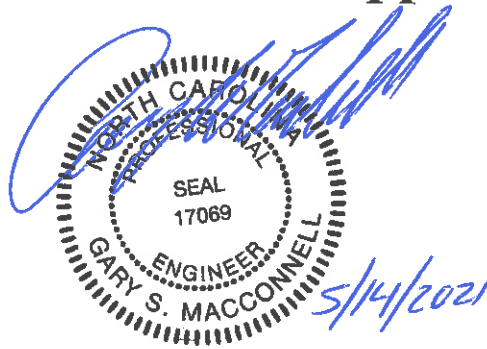
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**Evan and Patricia Germond
1594 Josey Williams Rd
(Lot 3 Kemp Holdings)**

**Engineered Option Permit
Pressure Manifold**

Application Form & Supporting Documents



**MacConnell & Associates, P.C.
501 Cascade Pointe Lane, Ste 103
Cary, North Carolina 27513**

**P.O. Box 129
Morrisville, North Carolina 27560**

Phone: (919) 467-1239

Fax: (919) 319-6510



Initial Application Date: _____

Application # _____

CU# _____

COUNTY OF HARNETT RESIDENTIAL LAND USE APPLICATION

Central Permitting 108 E. Front Street, Lillington, NC 27546 Phone: (910) 893-7525 ext:2 Fax: (910) 893-2793 www.harnett.org/permits

A RECORDED SURVEY MAP, RECORDED DEED (OR OFFER TO PURCHASE) & SITE PLAN ARE REQUIRED WHEN SUBMITTING A LAND USE APPLICATION

LANDOWNER: Evan and Patricia Germond Mailing Address: 3 Josey Williams Rd

City: Erwin State: NC Zip: 28339 Contact No: 919-771-7917 Email: tsidsm92@gmail.com

APPLICANT*: Gary S. MacConnell. P.E. Mailing Address: P.O Box 129

City: Morrisville State: NC Zip: 27560 Contact No: 919-467-1239 Email: info@macconnellandassoc.com

*Please fill out applicant information if different than landowner

ADDRESS: 1594 Josey Williams Rd, Erwin, NC 28339 PIN: 0555-93-1151

Zoning: RA-20R Flood: Minimal Flood Risk Watershed: No Deed Book / Page: 3970/0486

Setbacks - Front: _____ Back: _____ Side: _____ Corner: _____

PROPOSED USE:

SFD: (Size 60 x 60) # Bedrooms: 4 # Baths: 3 Basement(w/wo bath): _____ Garage: Deck: _____ Crawl Space: Slab: _____ Monolithic Slab: _____
TOTAL HTD SQ FT _____ GARAGE SQ FT _____ (Is the bonus room finished? () yes () no w/ a closet? () yes () no (if yes add in with # bedrooms)

Modular: (Size _____ x _____) # Bedrooms _____ # Baths _____ Basement (w/wo bath) _____ Garage: _____ Site Built Deck: _____ On Frame _____ Off Frame _____
TOTAL HTD SQ FT _____ (Is the second floor finished? () yes () no Any other site built additions? () yes () no

Manufactured Home: _____ SW _____ DW _____ TW (Size _____ x _____) # Bedrooms: _____ Garage: _____ (site built? _____) Deck: _____ (site built? _____)

Duplex: (Size _____ x _____) No. Buildings: _____ No. Bedrooms Per Unit: _____ TOTAL HTD SQ FT _____

Home Occupation: # Rooms: _____ Use: _____ Hours of Operation: _____ #Employees: _____

Addition/Accessory/Other: (Size _____ x _____) Use: _____ Closets in addition? () yes () no

TOTAL HTD SQ FT _____ GARAGE _____

Water Supply: _____ County _____ Existing Well New Well (# of dwellings using well _____) *Must have operable water before final (Need to Complete New Well Application at the same time as New Tank)

Sewage Supply: New Septic Tank _____ Expansion _____ Relocation _____ Existing Septic Tank _____ County Sewer
(Complete Environmental Health Checklist on other side of application if Septic)

Does owner of this tract of land, own land that contains a manufactured home within five hundred feet (500') of tract listed above? () yes () no

Does the property contain any easements whether underground or overhead () yes () no

Structures (existing or proposed): Single family dwellings: Manufactured Homes: _____ Other (specify): _____

If permits are granted I agree to conform to all ordinances and laws of the State of North Carolina regulating such work and the specifications of plans submitted. I hereby state that foregoing statements are accurate and correct to the best of my knowledge. **PROFESSIONAL** 5/14/2021

Signature of Owner or Owner's Agent

SEAL Date

It is the owner/applicants responsibility to provide the county with any applicable information about the subject property, including but not limited to: boundary information, house location, underground or overhead easements, etc. The county or its employees are not responsible for any incorrect or missing information that is contained within these applications.

*This application expires 6 months from the initial date if permits have not been issued**

APPLICATION CONTINUES ON BACK

strong roots • new growth

****This application expires 6 months from the initial date if permits have not been issued****

This application to be filled out when applying for a septic system inspection.

County Health Department Application for Improvement Permit and/or Authorization to Construct

IF THE INFORMATION IN THIS APPLICATION IS FALSIFIED, CHANGED, OR THE SITE IS ALTERED, THEN THE IMPROVEMENT PERMIT OR AUTHORIZATION TO CONSTRUCT SHALL BECOME INVALID. The permit is valid for either 60 months or without expiration depending upon documentation submitted. (Complete site plan = 60 months; Complete plat = without expiration)

Environmental Health New Septic System

- **All property irons must be made visible.** Place "pink property flags" on each corner iron of lot. All property lines must be clearly flagged approximately every 50 feet between corners.
- Place "orange house corner flags" at each corner of the proposed structure. Also flag driveways, garages, decks, out buildings, swimming pools, etc. Place flags per site plan developed at/for Central Permitting.
- Place orange Environmental Health card in location that is easily viewed from road to assist in locating property.
- If property is thickly wooded, Environmental Health requires that you clean out the **undergrowth** to allow the soil evaluation to be performed. Inspectors should be able to walk freely around site. **Do not grade property.**
- **All lots to be addressed within 10 business days after confirmation. \$25.00 return trip fee may be incurred for failure to uncover outlet lid, mark house corners and property lines, etc. once lot confirmed ready.**

Environmental Health Existing Tank Inspections

- Follow above instructions for placing flags and card on property.
- Prepare for inspection by removing soil over **outlet end** of tank as diagram indicates, and lift lid straight up (*if possible*) and then **put lid back in place.** (Unless inspection is for a septic tank in a mobile home park)
- **DO NOT LEAVE LIDS OFF OF SEPTIC TANK**

"MORE INFORMATION MAY BE REQUIRED TO COMPLETE ANY INSPECTION"

SEPTIC

If applying for authorization to construct please indicate desired system type(s): can be ranked in order of preference, must choose one.

- { } Accepted { } Innovative { } Conventional { } Any
 { } Alternative { } Other _____

The applicant shall notify the local health department upon submittal of this application if any of the following apply to the property in question. If the answer is "yes", applicant **MUST ATTACH SUPPORTING DOCUMENTATION**:

- { } YES { } NO Does the site contain any Jurisdictional Wetlands?
- { } YES { } NO Do you plan to have an irrigation system now or in the future?
- { } YES { } NO Does or will the building contain any drains? Please explain. _____
- { } YES { } NO Are there any existing wells, springs, waterlines or Wastewater Systems on this property?
- { } YES { } NO Is any wastewater going to be generated on the site other than domestic sewage?
- { } YES { } NO Is the site subject to approval by any other Public Agency?
- { } YES { } NO Are there any Easements or Right of Ways on this property?
- { } YES { } NO Does the site contain any existing water, cable, phone or underground electric lines?
- If yes please call No Cuts at 800-632-4949 to locate the lines. This is a free service.

I Have Read This Application And Certify That The Information Provided Herein Is True, Complete And Correct. Authorized County And State Officials Are Granted Right Of Entry To Conduct Necessary Inspections To Determine Compliance With Applicable Laws And Rules. I Understand That I Am Solely Responsible For The Proper Identification And Labeling Of All Property Lines And Corners And Making The Site Accessible So That A Complete Site Evaluation Can Be Performed.



DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH

ROY COOPER
GOVERNOR

MANDY COHEN, MD, MPH
SECRETARY

DANIEL STALEY
DIRECTOR

COMMON FORM FOR ENGINEERED OPTION PERMIT

See Instructions for Use in Appendix A

Except for "Date received", this Section to be completed by the Professional Engineer licensed in accordance with G.S. 89C

LHD USE ONLY: Initial submittal of this NOI received: _____ by _____
Date Initials

PART 1: Notice of Intent to Construct (NOI)

New Expansion

Repair – LHD Permit Number _____ Repair – EOP Permit Number _____

1. Facility Owner's name: (Owner, Company Name, Utility, Partnership, Individual, etc.): _____

Evan Germond

Mailing address: 3 Josey Williams Rd City: Erwin State: NC Zip: 28339

Telephone number: _____ E-mail Address: tsidsm92@gmail.com

2. Professional Engineer (PE) name: Gary S. MacConnell License number: 17069

Mailing address: PO Box 129 City: Morrisville State: NC Zip: 27560

Telephone number: (919) 467-1239 E-mail Address: gary.macconnell@macconnellandassoc.com

3. Licensed Soil Scientist (LSS) name: John R. Davis Jr. License number: 1028

Mailing address: PO Box 1063 City: Youngsville State: NC Zip: 27596

Telephone number: 919-818-5087 E-mail Address: soilhorizons@gmail.com

4. Licensed Geologist (LG) (if applicable) name: _____ License Number: _____

Mailing address: _____ City: _____ State: _____ Zip: _____

Telephone number: _____ E-mail Address: _____

5. On-site Wastewater Contractor name: Cory Brantley & Sons, Inc. License number: 1036

Mailing address: 37 Pine Ridge Road City: Zebulon State: NC Zip: 27597

Telephone number: (252) 478-3721 E-mail Address: 1installer@gmail.com

6. Proof of Errors and Omissions or other appropriate liability insurance for the following persons is attached that includes the name of the insurer, name of the insured and the effective dates of coverage:

PE LSS LG On-site Wastewater Contractor

WWW.NCDHHS.GOV

TEL 919-707-5874 • FAX 919-845-3972

LOCATION: 5605 SIX FORKS RD • RALEIGH, NC 27609

MAILING ADDRESS: 1642 MAIL SERVICE CENTER • RALEIGH, NC 27699-1642

AN EQUAL OPPORTUNITY / AFFIRMATIVE ACTION EMPLOYER

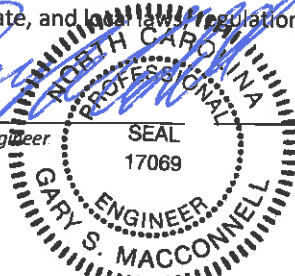
- 7. Property location (physical address, tax parcel identification number or subdivision lot, block number of the property to be permitted): 1594 Josey Williams Rd, Erwin, NC 28339 (Lot 3 Kemp Holdings); PIN: 0555-93-1151
County Name: Harnett County
- 8. Type of facility: Place of residence No. Bedrooms: 4 No. Occupants: 8
 Place of business Basis for flow calculation: 120 gpd/bedroom
 Place of public assembly Basis for flow calculation: _____
- 9. Factors that would affect the wastewater load: Domestic wastewater loading will be typical of a single family residence.
- 10. Type, location, and classification (per Rule .1961) of wastewater system: Type II, Conventional septic system (Initial & Repair) Located at rear of house as viewed from road.
- 11. Design wastewater flow: 480 gpd (For flow > 3,000 gpd and industrial process, duplicate plans shall be sent to the State.)
Design wastewater strength: domestic high strength industrial process
- 12. A plat as defined in G.S. 130A 334(7a) is attached: Yes No
- 13. Owner meets requirements of ownership or control of the system per 15A NCAC 18A .1938(j): Yes No
- 14. Easement, right of way or encroachment agreement required per 15A NCAC 18A .1938(j): Yes No
If yes, documentation filed in _____ County Register of Deeds in Deed book _____ Page _____
- 15. Multi-party agreements required, as applicable, pursuant to 15A NCAC 18A .1937(h): Yes No
If yes, agreements filed in _____ County Register of Deeds in Deed book _____ Page _____
- 16. Location of proposed or existing wells (drinking water, irrigation, geothermal, groundwater monitoring, sampling, etc.) and any potable and non-potable water conveyance lines is indicated on attached plans and complies with 15A NCAC 18A .1950: Yes No
This is a saporlite system. Yes No
- 17. Evaluation(s) of soil conditions and site features in accordance with G.S. 130A-335(a1) signed and sealed by a LSS is attached: Yes No
- 18. Evaluation of geologic and hydrogeologic conditions signed and sealed by a LG is attached Yes NA
- 19. Proposed landscape, site, drainage, or soil modifications are attached: Yes NA

Attestation by Professional Engineer licensed in North Carolina pursuant to G.S. 89C

I, Gary S. MacConnell hereby attest that the information required to be included with
Registered Professional Engineer (Print Name)
this Notice of Intent to Construct is accurate and complete to the best of my knowledge and that the proposed system shall meet applicable federal, State, and local laws, regulations, rules and ordinances in accordance with G.S. 130A-336-.1(e)(6).

Signature of Licensed Professional Engineer

Date




This section is for Owner use to either designate PE as their legal representative or to self-submit the NOI.

Designation of Registered Professional Engineer as legal representative of Owner for this Notice of Intent:

I, Evan Germond hereby designate Gary S. MacConnell, PE
Print Name of Owner *Print Name of Registered Professional Engineer*

as my legal representative for purposes of this Notice of Intent pursuant to G.S. 130A-336.1.

 5/14/2021
Signature of Owner *Date*

Owner self-submittal of NOI:

I, _____ hereby submit this NOI prepared by _____
Print Name of Owner *Print Name of Licensed PE*

pursuant to G.S. 130A-336.1.

Signature of Owner *Date*

NOTES:

LIABILITY: *The Department, the Department’s authorized agents or local health departments shall have no liability for wastewater systems designed, constructed and installed pursuant to an Engineered Option Permit. [(NC General Statute 130A-336.1(f))]*

RIGHT OF ENTRY: *The submittal of this Notice of Intent to Construct grants right of entry to the Local Health Department and the State to the referenced property.*

ISSUANCE OF BUILDING PERMIT: *Once the LHD deems that the Notice of Intent to Construct is complete via signature in the section above, the owner may apply to the local permitting agency for a permit for electrical, plumbing, heating, air conditioning or other construction, location or relocation activity under any provision of general or special law pursuant to G.S. 130A-338.*

This section for Local Health Department use only.

PART 2: LHD Completeness Review of the Notice of Intent to Construct

“(c) Completeness Review for Notice of Intent to Construct. – The local health department shall determine whether a notice of intent to construct, as required pursuant subsection (b) of this section, is complete within 15 business days after the local health department receives the notice of intent to construct. A determination of completeness means that the notice of intent to construct includes all of the required components. If the local health department determines that the notice of intent to construct is incomplete, the department shall notify the owner or the professional engineer of the components needed to complete the notice. The owner or professional engineer may submit additional information to the department to cure the deficiencies in the notice. The local health department shall make a final determination as to whether the notice of intent to construct is complete within 10 business days after the department receives the additional information from the owner or professional engineer. If the department fails to act within any time period set out in this subsection, the owner or professional engineer may treat the failure to act as a determination of completeness.”

The review for completeness of this Notice of Intent was conducted in accordance with G.S. 130A-336.1(c). This NOI is determined to be:

INCOMPLETE (If box is checked, Information in this section is required.)

Based upon review of information submitted by the PE in Part 1, the following items are missing: _____

Copies of this form listing missing items were sent to the design PE and the Owner on _____

via _____ with directions to re-submit missing items using Page 5 of this form.
Date
Email, FAX, USPS, hand-delivered

Print Name of Authorized Agent of the LHD

Signature of Authorized Agent of the LHD

Date

COMPLETE (If box is checked, information in this section is required.)

Based upon review of information submitted by the PE in Part 1 of this form, this NOI is deemed COMPLETE.

Copies of this signed form were sent to the design PE and the Owner on _____ via _____
Date *Email, FAX, USPS, hand-delivered*

A copy of this NOI and tracking information was sent to the State on _____ via _____
Date *Email, FAX, USPS, hand-delivered*

Print Name of Authorized Agent of the LHD

Signature of Authorized Agent of the LHD

Date

Re-submittal of NOI with missing items included

*This Section is for use by PE to submit items noted as missing during LHD Completeness Review above.
Resubmittals must be accompanied by a cover letter from the PE.*

LHD USE ONLY: This NOI resubmittal received: _____ by _____ <div style="display: flex; justify-content: space-around; width: 100%;"> Date Initials </div>
--

Item # from initial NOI	Resubmittal description

Attestation by Professional Engineer licensed in North Carolina pursuant to G.S. 89C

I, _____ hereby attest that the information re-submitted for this Notice of
Licensed Professional Engineer (Print Name)
 Intent to Construct is accurate and complete to the best of my knowledge and that the proposed system shall meet applicable federal, State, and local laws, regulations, rules and ordinances in accordance with G.S. 130A-336-1(e)(6).

<i>Signature of Licensed Professional Engineer</i>	<i>Date</i>
--	-------------

The section below is for Local Health Department use after submittal of items noted as missing above.

LHD Follow-up Completeness Review of Notice of Intent to Construct

This follow-up review for completeness of this Notice and Intent was conducted in accordance with G.S. 130A-336.1(c). This NOI is determined to be:

INCOMPLETE
 Based upon review of information submitted by the PE in the RESUBMITTAL above, this Notice of Intent remains INCOMPLETE because the following items from Part 1 of this form remain missing: _____

Copies of this signed form were sent to the design PE and the Owner on _____ via _____.

Date
Email, FAX, USPS, Hand-delivered

<i>Print name of authorized Agent of the LHD</i>	<i>Signature of authorized Agent of the LHD</i>	<i>Date</i>
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COMPLETE
 Based upon review of information submitted by the PE in the RESUBMITTAL above in addition to information provided in Part 1 of this form, this NOI is deemed complete.

Copies of this signed form were sent to the PE and the Owner on _____ via _____.

Date
Email, FAX, USPS, Hand-delivered

A complete copy of this form with tracking information was sent to the State: _____ via _____.

Date
Email, FAX, USPS, hand-delivered

<i>Print name of authorized Agent of the LHD</i>	<i>Signature of authorized Agent of the LHD</i>	<i>Date</i>
--	---	-------------

PART 3: Authorization to Operate (ATO)

Except for date received, the Section below is to be completed by the Owner or by the PE designated to act as their legal representative for the EOP.

LHD USE ONLY: Initial submittal of request for ATO received: _____ by _____ <div style="display: flex; justify-content: space-around; font-size: small;"> Date Initials </div> Date of Post-construction Conference: _____

The following items are included in this submittal for an Authorization to Operate under an EOP:

- | | | |
|--|------------------------------|-----------------------------|
| 1. Signed and sealed copy of the Engineer's report that includes: | | |
| a. Signed and sealed evaluation of soil conditions and site features | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| b. Drawings, specifications, plans | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| c. Reports on special inspections and final inspection | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| d. Management Program manual | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| e. On-site Wastewater Contractor's signed statement | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| f. Signed and sealed statement pursuant to 15A NCAC 18A .1938(h) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2. Fee (as applicable) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3. Notarized letter documenting Owner's acceptance of the system from the PE | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

Attestation by the Owner or the PE for Authorization to Operate

I, _____ hereby attest that all items indicated above have been provided to the
Print name of Owner or Professional Engineer

_____ County LHD and the system shall meet applicable federal, State, and local laws, regulations, rules and ordinances in accordance with G.S. 130A-336-.1(e)(6).

<i>Signature of Owner or Professional Engineer</i>	<i>Date</i>
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This section for LHD Use Only.

LHD Review of required information for the ATO

INCOMPLETE
 Based upon review of information submitted by the Owner or PE in the Section above, the following items are missing from the information required for an Authorization to Operate for an EOP: _____

Copies of this signed form were sent to the design PE and the Owner on _____ via _____
DateEmail, FAX, USPS, Hand-delivered

<i>Print name of authorized Agent of the LHD</i>	<i>Signature of authorized Agent of the LHD</i>	<i>Date</i>
--	---	-------------

COMPLETE
 Based upon review of information submitted by the Owner or PE in the Section above, this Authorization to Operate is hereby issued in accordance with G.S. 130A-336.1(m).

A copy of this complete NOI/ATO with tracking information was sent to the State on _____ via _____
DateEmail, FAX, USPS, Hand-delivered

<i>Print name of authorized Agent of the LHD</i>	<i>Signature of authorized Agent of the LHD</i>	<i>Date</i>
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ISSUANCE OF CERTIFICATE OF OCCUPANCY: Once the LHD determines completeness based upon the PE submission, the owner may apply to the local permitting agency for permanent electrical service to a residence, place of business or place of public assembly pursuant to G.S. 130A-339.

P.O. Box 129
Morrisville, NC 27560
Phone: 919-467-1239



**MACCONNELL
& ASSOCIATES, P.C**

501 Cascade Pointe Lane
Suite 103
Cary, NC 27513
Fax: 919-319-6510

May 14, 2021

Re: Evan Germond
1594 Josey Williams Rd – Conventional Septic System – EOP
MacConnell & Associates Project Number: A90401.00

To Whom it May Concern:

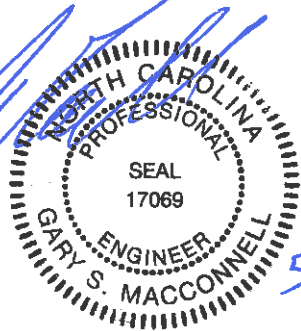
This letter accompanies an EOP Application for 1594 Josey Williams Rd. Erwin, NC 28339. To satisfy requirement 12 of the application pertaining to regulation G.S. 130A 334(7a), a plat was submitted with all application documentation. Although the submitted plat does not provide all items per regulation G.S. 130A 334(7a), in my professional opinion, it does satisfy the intent of said regulation because it is being submitted concurrently with a site plan based on information provided by the plat surveyor which includes the proposed wastewater system, water supply (when applicable), and related appurtenances.

Thank you for your consideration for this EOP Application. If you have any questions or require additional information, please contact me at (919) 467-1239.

Sincerely,

Gary S. MacConnell, PE

President



5/14/2021



MACCO-1

OP ID: CH

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

11/03/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER The Adcock Agency, Inc. 215 E. Chatham St. Suite 120 Cary, NC 27511 John W. Miller, Jr., CPCU,CIC		CONTACT NAME: John W. Miller, Jr., CPCU,CIC PHONE (A/C, No, Ext): 919-467-8126 FAX (A/C, No): 919-467-8175 E-MAIL ADDRESS: jmillier@adcockagency.com	
INSURED MacConnell & Associates PC PO Box 129 Morrisville, NC 27560-0129		INSURER(S) AFFORDING COVERAGE INSURER A: ERIE Insurance Exchange INSURER B: Continental Casualty Co (CNA) INSURER C: INSURER D: INSURER E: INSURER F:	
		NAIC # 26271	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR GENL AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PRCJECT <input type="checkbox"/> LOC OTHER:			Q97-0842712	11/04/2020	11/04/2021	EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 1,000,000 MED EXP (Any one person) \$ 5,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000
	AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO OWNED AUTOS ONLY <input checked="" type="checkbox"/> HIRED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS <input checked="" type="checkbox"/> NON-OWNED AUTOS ONLY			Q97-0842712	11/04/2020	11/04/2021	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$
A	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> EXCESS LIAB <input type="checkbox"/> DED <input checked="" type="checkbox"/> RETENTION \$ 10000			Q31-1070288	07/10/2020	07/10/2021	EACH OCCURRENCE \$ 2,000,000 AGGREGATE \$ 2,000,000
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NC) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N	N/A	Q91-1000820	07/10/2020	07/10/2021	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTH-ER E L EACH ACCIDENT \$ 1,000,000 E L DISEASE - EA EMPLOYEE \$ 1,000,000 E L DISEASE - POLICY LIMIT \$ 1,000,000
B	E&O			AEH591893132	09/17/2020	09/17/2021	E&O 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

ENGINEER; Policy forms and endorsements apply

CERTIFICATE HOLDER THIS CER This Certificate is for Informational Purposes Only. Certificate Holder Name and Address Needed to Validate.	CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE <i>Christal D Ham</i>
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THE INSURANCE COMPANY WITH WHICH THIS COVERAGE HAS BEEN PLACED IS NOT LICENSED BY THE STATE OF NORTH CAROLINA AND IS NOT SUBJECT TO ITS SUPERVISION. IN THE EVENT OF THE INSOLVENCY OF THE INSURANCE COMPANY, LOSSES UNDER THIS POLICY WILL NOT BE PAID BY ANY STATE INSURANCE GUARANTY OR SOLVENCY FUND

NEW BUSINESS BINDER

Policy #:	MKLV7ENV101953	Primary Company:	Jackson Sumner & Associates, Inc. 1886 Old U.S. Highway 421 South Boone NC United States 28607
Applicant Name:	Soil Horizons	Primary Producer:	Haley Everett
Mailing Address:	PO Box 1063 Youngsville, NC -27596-1063	Policy Period:	07/27/2020 To 07/27/2021
Insuring Company:	Evanson Insurance Company	Coverage Name:	Primary
Underwriter:	Carrie Hagin	Phone #:	(804) 525-7097
		Email:	Carrie.Hagin@Market.com

Typical Coverage:	Contractors Pollution Liability	
Limit:	Shared General Aggregate Limit	\$1,000,000
	Each Pollution Condition Limit	\$1,000,000
	Each Transportation Pollution Condition Limit	\$1,000,000
	Each Non-Dwelling Disposal Site Pollution Condition Limit	\$1,000,000
	Each Crisis Management and Emergency Response Limit	\$250,000
	Defense Expense Aggregate Limit	\$1,000,000
Deductible:	\$5,000 Each Pollution Condition	
Policy Basis:	Occurrence	
Coverage Notes:	N/A	

Typical Coverage:	Pollution Liability	
Limit:	Shared General Aggregate Limit	\$1,000,000
	Each Claim Limit	\$1,000,000
Deductible:	\$5,000 Each Claim	
Policy Basis:	Claims Made	
Retrospective Date:	07/27/2020	
Coverage Notes:	N/A	

Total Policy Limit:	
Total Policy Aggregate Limit:	\$1,000,000

Total Premium:	
Coverage Premium:	
Exposure:	
Premium Type:	
Minimum Annual Premium:	



NEW BUSINESS

4. The terms and conditions of this binder may differ materially from those requested in your submission. We will, upon request, provide sample policy forms for your review.
5. This account may be subject to inspection. The results of any inspection may impact the coverage being offered, including but not limited to, premium, deductible, rate, terms and conditions. Any recommendations arising from the inspection must be complied with in order to maintain coverage in force under this policy.
6. Authority is granted for you to issue Certificates of Insurance on our behalf subject to the following: a. Certificates must be issued using unmodified Accord Certificate of Insurance Forms. b. Certificates can not be used to any way to amend, change or alter the terms, clauses, conditions or limits of the policy to which they refer. c. We do not accept or review Certificates of Insurance issued on our behalf. Any Certificate that requires evidence of amended, changed or altered terms, clauses, conditions or limits can only be issued by you after the amended, changed or altered terms, clauses, conditions or limits have been approved by us in writing and any applicable additional premium agreed upon.
7. In the event of an emergency spill or release dial toll-free 1-855-44-CLAIM (1-855-442-5246)

CONTINGENCIES



NEW BUSINESS BINDER

COMMON POLICY FORMS

Edition	Name	Applies To
MXL 1000 08 20	Policy Jacket	Contractors Pollution Liability Professional Liability
MPEI 2000 12 15	Emergency Response Hotline	Contractors Pollution Liability Professional Liability
MPIL 1007 01 20	Privacy Notice	Contractors Pollution Liability Professional Liability
MPIL 1039 01 12	Common Policy Surplus Lines Notification Supplement To Declarations	Contractors Pollution Liability Professional Liability
MPIL 1083 04 15	U.S. Treasury Department's Office Of Foreign Assets Control ("OFAC") Advisory Notice To Policyholders	Contractors Pollution Liability Professional Liability
MDEI 2014 11 17	Environmental Common Policy Declarations	Contractors Pollution Liability Professional Liability
MDIL 1001 08 11	Forms Schedule	Contractors Pollution Liability Professional Liability
MEEI 2562 11 17	Application Warranty	Contractors Pollution Liability Professional Liability
MEIL 1200 02 20	Service of Suit	Contractors Pollution Liability Professional Liability
MEIL 1225 10 11	Changes - Civil Union	Contractors Pollution Liability Professional Liability
MEEI 0017 11 17	Common Policy Conditions	Contractors Pollution Liability Professional Liability
MEEI 2344 04 20	Exclusion - Communicable Disease	Contractors Pollution Liability Professional Liability
MEIL 1247 08 15	Minimum Earned And Minimum Retained Premium Minimum Earned Premium Percentage : 25% Minimum Retained Premium Percentage : 100% Fully Earned date : 07/27/2021	Contractors Pollution Liability Professional Liability
MIL 1214 09 17	Trade or Economic Sanctions	Contractors Pollution Liability Professional Liability

**NEW BUSINESS BINDER****Contractors Pollution Liability**

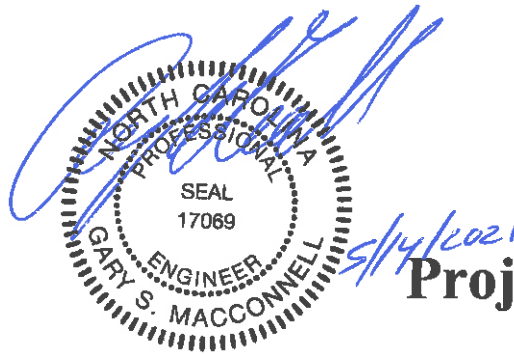
Edition	Name
NPPL 1120 01 20	Notice To Policyholders Potential Restrictions Of Terrorism
MOEL 2015 11 17	Contractor's Pollution Liability Supplemental Declarations
HEEL 0007 11 17	Contractor's Pollution Liability Coverage Form
HEEL 2291 08 19	Automatic Primary And Non-Contributory
HEEL 2592 08 19	Automatic Transfer Of Rights Of Recovery Against Others To Us
HEEL 2058 01 20	Conditional Exclusion Of Terrorism (Relating To Deregulation Of Federal Terrorism Risk Insurance Act)
HEEL 2074 12 19	Exclusion - Operations Covered By A Consolidated (Wrap-Up) Insurance Program

Professional Liability

Edition	Name
MOEL 2016 11 17	Professional Liability Supplemental Declarations
HEEL 0000 11 17	Professional Liability Coverage Form (Chime-Trade And Reported Coverage)
HEEL 2124 11 17	Amended Employer's Liability Exclusion

**Evan and Patricia Germond
1594 Josey Williams Rd
(Lot 3 Kemp Holdings)**

**Engineered Option Permit
Pressure Manifold**



Project Narrative

**MacConnell & Associates, P.C.
501 Cascade Pointe Lane, Ste 103
Cary, North Carolina 27513**

**P.O. Box 129
Morrisville, North Carolina 27560**

**Phone: (919) 467-1239
Fax: (919) 319-6510**

Project Narrative

Introduction

The Owner, Evan Germond, proposes to construct a four-bedroom single-family home and is seeking an Engineered Option Permit for the onsite wastewater system located at 1594 Josey Williams Rd, Erwin, North Carolina. MacConnell & Associates, P.C. has been contracted by the owner for the EOP design with Gary S. MacConnell as the designated PE. The scope of this project is to design an initial and repair conventional septic system based on the Soils Evaluation prepared by John R. Davis Jr., L.S.S of Soils Horizon.

The design proposes a pressure manifold system with one 1,000-gallon septic tank, one 1,000-gallon pump tank to dose the wastewater, and Quick4 Standard Low Profile Chamber drain lines to dispose of the domestic wastewater from the building.

The proposed wastewater treatment and disposal system does not have any conflicts with existing utilities in the area. The system also maintains all buffer and setback requirements set in the 15A NCAC 18A .1900 rules amended January 1, 1999, and the Regulation Governing Wastewater Treatment and Dispersal Systems in Wake County amended October 27, 2011. The proposed system will meet all the requirements and specifications outlined in the On-Site Water Protection Branch's Accepted Wastewater System Approval No. AWWWS-2005-02-R6.

Proposed System Design

Design daily flows and calculations:

Daily Flow:	4 Bedrooms * 120 GPD/bedroom = 480 GPD
System Type:	Septic Tank, Pump Tank, Pressure Manifolds, and Quick4 Standard Low Profile Chambers Drain Lines.
Septic Tank Volume:	1,000-Gallons
Pump Tank Volume:	1,000 Gallons
Pump Rate:	14.2 GPM at 10.8 Feet Head
Pump Model:	Zoeller Model 53, 1/3 hp, 115 volts
Pump Dose Volume:	91 Gallons
Dose Type:	Demand Dosed ± 2 Times per Day
Drain Lines:	see calculations
Trench Type:	Quick4 Standard Low Profile Chambers
LTAR:	0.8 GPD/SF
Area Required:	$480 \text{ GPD} / 0.8 \text{ GPD/SF} = 600 \text{ SF}$
Linear Feet (with innov.):	$600 \text{ SF} / 3 \text{ SF/LF} = 200 \text{ LF}$

Septic Tank

The proposed wastewater treatment system will provide both treatment and solids removal in a new 1,000-gallon septic tank. The tank will be manufactured by David Brantley & Sons, Inc. which has been previously approved by the On-Site Water Protection Branch (OSWP) or approved equal by engineer. This tank will provide greater than 2 days of detention time for adequate treatment and solids removal from the wastewater. Septic tank effluent will drain into the pump tank as wastewater flows into the septic tank. The septic tank will contain a POLYLOK PL-68 or SIM/TECK STF-110 effluent filter to prevent solids from reaching the pump tank.

Pump Tank

The pump tank is a new 1,000-gallon tank which will also be provided by David Brantley and Sons, Inc., or approved equal. The pump tank will house the equipment required to pump the septic tank effluent to the pressure manifold two times per day.

Pressure Manifold

The pressure manifold will be as shown on the construction drawings or approved equal. The forcemain will carry wastewater to the pressure manifold where it will be distributed to the drainfield laterals.

Control Panel

The control panel will be the EZ Series Demand Dosed Simplex Control Panel by SJE Rhombus, or approved equal by engineer.

Infiltrator Systems Inc. Quick4 Standard Low Profile Chamber

The drain lines will be Infiltrator Systems Inc., Quick4 Standard Low Profile Chambers. The drain lines shall be installed per manufacturer's recommendations.

Project Contacts

Names, addresses, phone and fax numbers of the owner, soil scientist, and engineer are as follows:

Owner:

Evan Germond
3 Josey Williams Rd
Erwin, NC 28339
Phone:

Soil Scientist:

Mr. John R. Davis Jr., LLS
Soils Horizon
PO Box 1063
Youngsville, NC 27596
Phone: (919) 818-5087

Engineer:

Mr. Gary S. MacConnell, PE
MacConnell & Associates, P.C.
Physical: 501 Cascade Pointe Lane, Suite 103
Cary, North Carolina 27513
Mailing: P.O. Box 129
Morrisville, North Carolina 27560
Phone: (919) 467-1239 Cell: (919) 523-2248 Fax: (919) 319-6510

Installer:

Cory Brantley
David Brantley & Sons, Inc
37 Pineridge Rd
Zebulon, NC 27597
Phone: (919) 404-9511

**Evan and Patricia Germond
1594 Josey Williams Rd
(Lot 3 Kemp Holdings)**

**Engineered Option Permit
Pressure Manifold**

Proof of Ownership

**MacConnell & Associates, P.C.
501 Cascade Pointe Lane, Ste 103
Cary, North Carolina 27513**

**P.O. Box 129
Morrisville, North Carolina 27560**

**Phone: (919) 467-1239
Fax: (919) 319-6510**

For Registration Matthew S. Willis
 Register of Deeds
 Harnett County, NC
 Electronically Recorded
 2021 Apr 16 03:00 PM NC Rev Stamp: \$ 210.00
 Book: 3970 Page: 486 - 487 Fee: \$ 26.00
 Instrument Number: 2021008713

HARNETT COUNTY TAX ID #
 120555 0096 08

04-16-2021 BY: MT

NORTH CAROLINA GENERAL WARRANTY DEED

Excise Tax: \$210.00

Parcel ID: 120555 0096 08

Mail/Box to: GRANTEE

This instrument was prepared by: Harris & Hilton, P.A., 7320 Six Forks Road, Suite 100, Raleigh, NC 27615

Brief description for Index: TR#3 KEMP HOLDINGS LLC MAP#2020-230

THIS DEED made this 25 day of March 2021, by and between

GRANTOR	GRANTEE
Kemp Holdings, LLC A North Carolina limited liability company 105 High Slope Dr. Cary NC 27518	Evan Germond, and spouse Patricia Germond 0003 Josey Williams Road Erwin, NC 28339

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in Harnett County, North Carolina and more particularly described as:

BEING all of Tract #3, Kemp Holdings LLC, consisting of 11.39 acres, more or less, as shown on plat entitled Exempt Subdivision Plat for Kemp Holdings LLC, recorded in Plat Book 2020, Page 230, Harnett County Register of Deeds.

Parcel ID # 120555 0096 08

PIN # 0555-93-1151.000

The property described above was acquired by Grantor by instrument recorded in Book 3799, Page 694-696. A map showing the above described property is recorded in Book of Maps 2020, Page 230.

All or a portion of the property conveyed is not a principal residence of the Grantor.

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

Submitted electronically by "Harris & Hilton, P.A."
 in compliance with North Carolina statutes governing recordable documents
 and the terms of the submitter agreement with the Harnett County Register of Deeds.

Grantor covenants with Grantee, that Grantor is seized of the premises in fee simple, has the right to convey the same in fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant and defend the title against the lawful claims of all persons whomsoever, other than the following exceptions:

Ad valorem taxes for the current year; utility easements and unviolated covenants, conditions or restrictions that do not materially affect the value of the Property.

IN WITNESS WHEREOF, the Grantor has duly executed the foregoing the day and year written above.

Kemp Holdings, LLC,
a North Carolina limited liability company

By: *WR* (SEAL)
Name: WILLIAM R. KEMP
Title: Manager/Member

STATE OF North Carolina COUNTY OF Wake

I, the undersigned Notary Public, certify that the following person(s) personally appeared before me this day and that I have personal knowledge of the identity of the principal(s) and/or I have seen satisfactory evidence of the principal's identity by a current state or federal identification with the principal's photograph in the form of a Drivers License and that he/she/they acknowledged to me that he/she/they voluntarily signed the foregoing document for the purpose stated therein and in the capacity indicated: WILLIAM R. KEMP

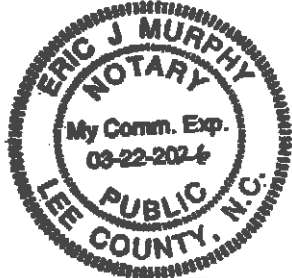
Date: 03/25/21

(Official Seal)

[Signature]

Printed Name: Eric J Murphy

My commission expires: 03/22/2026



**Evan and Patricia Germond
1594 Josey Williams Rd
(Lot 3 Kemp Holdings)**

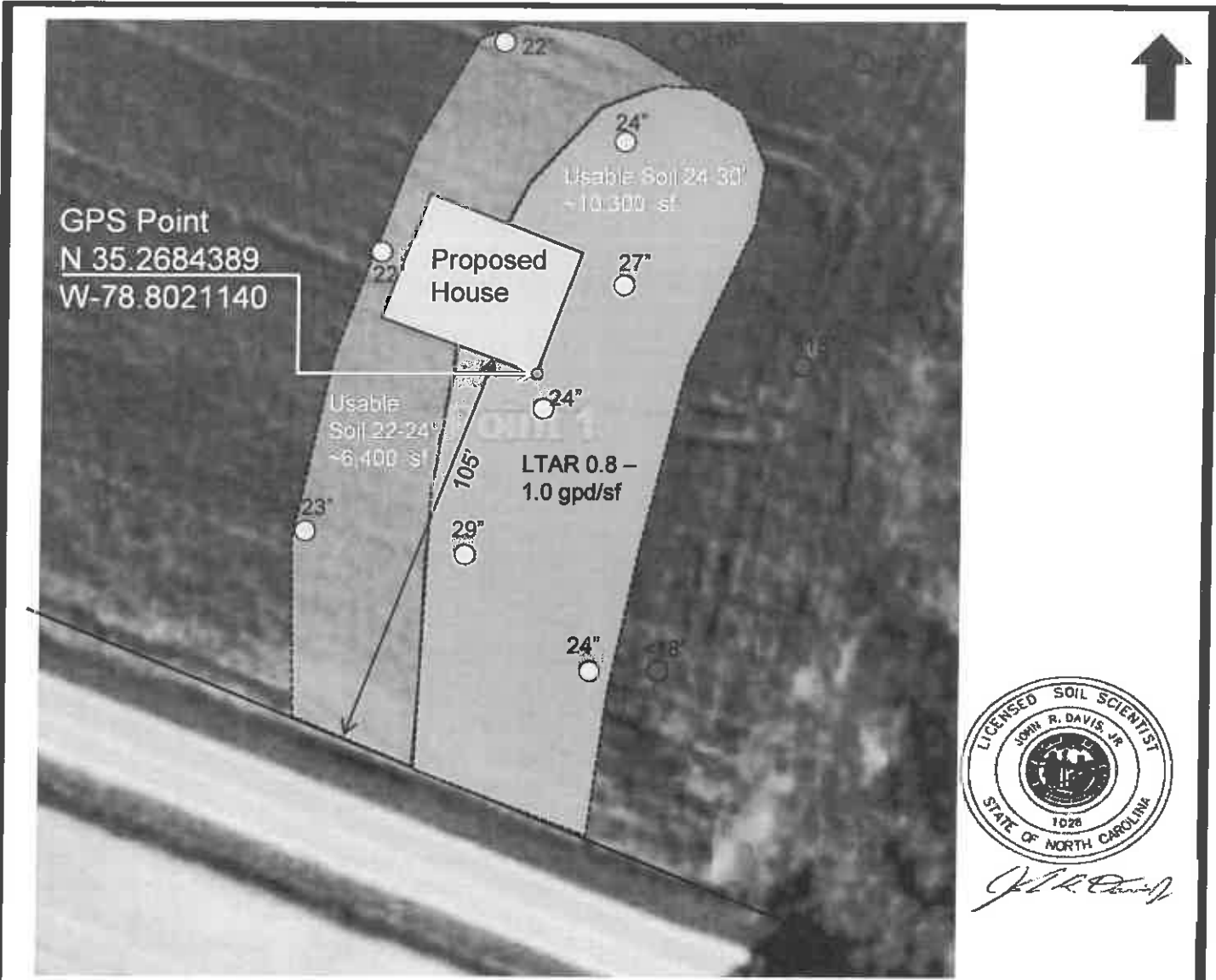
**Engineered Option Permit
Pressure Manifold**

Soils Evaluation

**MacConnell & Associates, P.C.
501 Cascade Pointe Lane, Ste 103
Cary, North Carolina 27513**

**P.O. Box 129
Morrisville, North Carolina 27560**

**Phone: (919) 467-1239
Fax: (919) 319-6510**

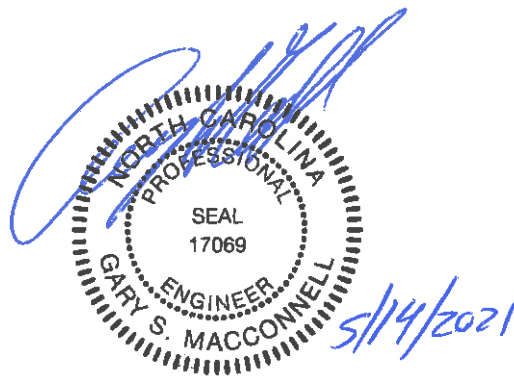


Hand auger soil borings were taken at various locations across the property for the purpose of determining septic system suitability. The "Usable" soil found on this site consists of sandy topsoil over a clayey subsoil. The best area is shown in "Orange" shading with soil depths to wetness or unsuitable clay between 24 to 30 inches. The soil loading rate in this area ranges from 0.8 to 1.0 gpd/sf. The other usable soil area shown in "Green" shading has depths between 22 and 24 inches with a similar soil loading rate. Both areas are usable for ultra shallow and low profile gravelless trenches for a single family dwelling with 3 or 4 bedrooms. The best area for a septic system appears to be the southeast corner of the house. Remaining soil area can be designated as repair area soil.

1" ~ 40'	 <p>SOIL HORIZONS PO Box 1063 Youngsville, NC 27596</p>	<p>Lot 3 Kemp Holdings Soil Map for Septic System Suitability Harnett County, North Carolina</p>
Date: Jan, 2021		<p>Figure 1</p>

**Evan and Patricia Germond
1594 Josey Williams Rd
(Lot 3 Kemp Holdings)**

**Engineered Option Permit
Pressure Manifold**



Project Specifications

**MacConnell & Associates, P.C.
501 Cascade Pointe Lane, Ste 103
Cary, North Carolina 27513**

**P.O. Box 129
Morrisville, North Carolina 27560**

**Phone: (919) 467-1239
Fax: (919) 319-6510**

Project Specifications

Excavation and Backfilling

1. Excavated materials acceptable as backfill shall be stockpiled in a location approved by the Owner. The materials shall be located away from the edge of any excavations. Excavated materials shall not be stored where existing trees are located.
2. All open excavations shall be barricaded when construction in the area has stopped. Night barricading should include posted warning lights.
3. Protect existing structures, utilities, sidewalks, pavement, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations. Protect root systems from damage or dry-out to the greatest extent possible.
4. Soil materials shall be free of boulders, roots, sod, organic matter, and frozen material.
5. Bedding materials for pre-cast concrete structure installation shall be #57 washed stone to the dimensions and depth shown on the construction drawings.
6. All excavation is unclassified and includes excavation to subgrade elevations indicated on the construction drawings regardless of character of materials and obstruction encountered. In the event that rock is encountered, the Contractor shall remove it at no additional cost to the owner.
7. Stability of excavations shall be maintained by sloping of the sides and shall comply with local codes, ordinances, and requirements of agencies having jurisdiction. Where space restrictions prevent sloping of the sides, shoring and bracing of the walls shall be employed in full compliance with OSHA requirements. In the case of pipe installations, sheeting shall remain in place until backfilling progresses to a stage where no damage to the pipe will result from removal.
8. The Contractor shall attempt to prevent surface and subsurface water from flowing into excavations. The Contractor shall provide equipment, materials, and work necessary to dewater any accumulation of water in the excavation to prevent softening of the soils, undercutting of footings, and changes to the soils detrimental to the stability of the improvements.
9. Excavations for structures shall conform to dimensions and elevations shown on the construction drawings within a tolerance of plus or minus 0.10 feet and to the standards of ASTM C891-90.
10. Backfill shall be installed to excavated spaces in 8-inch lifts and tamped by hand or pneumatically around pipe or structures. Tamping shall be performed evenly on both sides

of pipe and around sides of structures to a depth such that damage to the pipe or structures is avoided as a result of subsequent methods of compaction. Extreme care shall be exercised in backfilling operations to avoid displacement of pipe and structures either horizontally or vertically. Backfill consolidation by ponding water is not permitted. Compaction of each layer of backfill and the top 6 inches of subgrade shall achieve a 90 percent maximum dry density as measured by AASHTO method T-99.

11. Remove all waste materials including unacceptable excavated material, trash, and debris and legally dispose of it off Owner's property. Where settling is measurable or observable at excavated areas during project warranty period, the Contractor shall remove surface finish, add backfill material, compact, and replace surface treatment to a quality and appearance matching adjacent areas of previous work.

Septic and Field Dosing Tank Installation and Testing

1. Septic tanks shall conform to criteria in 15A NCAC 18A .1952-.1954. The septic and field dosing tanks should be installed on a 6-inch minimum layer of No. 57 washed stone aggregate.
2. Place bell ends of pre-cast sections or the groove end of the concrete facing down. In preparation for making joints, all surfaces of the portion of the section to be jointed and the factory-made jointing materials shall be clean and dry. Each joint, seam, and pipe penetration inside and outside of joints shall receive liberal applications of non-shrink grout as well as liberal amounts of bitumastic waterproof sealant.
3. Lifting holes and other penetrations of the pre-cast structure wall shall be sealed with nonshrinking grout. Pipe connections shall be made so that the pipe does not project beyond the inside wall of the structure. Grout connections as necessary to make smooth and uniform surfaces on the inside of the structure.
4. Before placing any tank into operation, remove any dropped grout, sand or other imperfections and obstructions from the interior of the structure. Specifically, the inside walls of the tank shall be smooth and uniform. Smooth-finish inverts so that wastewater flow is confined and directed through the inlet and outlet pipes with easy transition.
5. Tanks shall be backfilled in accordance with the applicable specifications herein before described.
6. All pipe penetrations shall be through Press-Seal Cast-A-Seal 402 rubber connectors or approved equal.
7. All joints (mid-seam, top-seam) shall be sealed using Concrete Sealants butyl sealant #CS-102 meeting ASTM C-990.

8. All service access openings will be a minimum of 24 inches. Exceptions may be made on a case by case basis with E-Z Treat's and engineer's prior written approval. All access openings shall be fitted with E-Z Set riser assemblies.
9. A 24-hour static water test, in accordance with ASTM standards, shall be performed on all precast tanks in order to insure they are water tight.
 - a. The testing shall be performed in the presence of the engineer or his representative.
 - b. Each tank shall be filled with water and the initial water level shall be measured.
 - c. At the end of the 24-hour period, the level of the water shall be measured again.
 - d. The engineer shall pass the tank if the water level did not drop more than 0.5 inches or if the total volume of the displaced water is less than 1 percent of the total effective liquid capacity of the tank.
 - e. Tanks may also be leak-tested by applying a vacuum of 5-inches of Hg with riser assemblies in place.
 - f. Each failed tank shall be tested again. In the event that the tank does not pass the second test, the Contractor shall remove and replace the tank at no additional cost to the owner.
10. Septic Tank and Field Dosing Tank shall meet the following additional criteria:
 - a. Minimum liquid depth of 36 inches.
 - b. Minimum airspace of 8 inches.
 - c. Length shall be at least twice as long as the width.
 - d. Septic tank shall be constructed with a baffle wall dividing the tank interior $2/3^{\text{rd}}$ to $1/3^{\text{rd}}$. The baffle wall shall be constructed to permit passage of effluent through a slot or holes located between 45 and 55 percent of the interior depth.
11. Septic tank shall be fitted with a POLYLOK PL-122 effluent filters, or engineer approved equal, that extends down to 50 percent of the liquid depth of the tank.
12. Septic and field dosing tank model shall be as shown on the construction drawings or approved equal by engineer.

Piping Installation and Testing

1. Piping shall be PVC and of type and size as shown on the construction drawings. Piping shall be installed with a minimum of three (3) feet of cover unless shown otherwise on the construction drawings.
2. Piping shall be installed to be able to meet a pressure test whereby the pressure remains constant for a minimum of two hours, and the allowable leakage is not more than 10 gpd/inch of pipe diameter/mile.
3. Any line installed under a driveway shall be sleeved in Class 52 Ductile Iron Pipe or encased in concrete and extend a minimum of 5 feet on either side and as shown on the construction drawings.
4. Forcemains installed under streams shall be sleeved in Class 52 Ductile Iron Pipe as shown on the construction drawings.

Manifold Control Panel and Pumps

1. The control panel shall be by the EZ Series Demand Dosed Duplex Control Panel by SJE Rhombus, or approved equal by engineer. The control panel will have the dose volume to be set as shown on the construction drawings.
2. The control panel shall be as specified on the construction drawings and installed per manufacturer's recommendation.
3. Manifold pumps will be Zoeller 53 Series, 1/3 HP, 115 Volts or approved equal by engineer.
4. Disposal field is designed to receive 91-gallon adjusted daily design flow from the dwelling. The flow will be controlled with the use of a simplex control panel as shown on the construction drawings.

Infiltrator Systems Inc. Quick4 Standard Low Profile Chambers

1. The trench lines shall be the Standard Low Profile (LP) Chamber.
2. The Standard Low Profile (LP) Chamber trench lines shall be installed per manufacturer's recommendations unless shown otherwise on the construction drawings.

**Evan and Patricia Germond
1594 Josey Williams Rd
(Lot 3 Kemp Holdings)**

**Engineered Option Permit
Pressure Manifold**

Design Calculations

**MacConnell & Associates, P.C.
501 Cascade Pointe Lane, Ste 103
Cary, North Carolina 27513**

**P.O. Box 129
Morrisville, North Carolina 27560**

**Phone: (919) 467-1239
Fax: (919) 319-6510**

MacConnell & Associates, P.C.

Project: 1594 Josey Williams Road
Project Number: A90401.00
Location: Harnett County
Subject: Tank Sizing Calculations
Date: May 12, 2021

Notes:
Input
Calculated

Assumptions And Calculations:

1. Treatment flow is based on unadjusted flow.
2. Irrigation flow is based on reduced flow

Number of Bedrooms:	4.0 Rooms	Given
Average Daily Flow per Bedroom:	120 GPD	
Unadjusted Design Flow:	480.0 GPD	
Flow Reduction (House Fixtures):	0 %	15A NCAC 18A .1949
Adjusted Flow:	480.0 GPD	

SEPTIC TANK SIZING

Minimum Septic Tank Volume Required:	1000 Gallons	per 15A NCAC 18A .1952
Septic Tank Volume Provided:	1000 Gallons	

Septic Tank storage and effective volume calculations:

Septic Tank Total Void Volume = L * W * D:

Tank length:	8.0 foot
Tank Width:	3.8 foot
Tank Depth:	5.2 foot
Total Void Volume:	1172.3 Gallons

Septic Tank Effective Volume = L * W * Lowest Invert To Tank Bottom:

Tank length:	8.0 foot
Tank Width:	3.8 foot
Lowest Invert:	4.5 foot
Effective Volume:	1021.0 Gallons

Septic Tank Storage/Detention:	2.13 Days	Effective Volume / ADF
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FIELD DOSING TANK SIZING:

Minimum Field Dosing Tank Volume Required:	1000.0 Gallons	per 15A NCAC 18A .1952
Field Dosing Tank Provided:	1000.0 Gallons	

Field Dosing Tank storage and effective volume calculations:

Field Dosing Tank Total Void Volume = L * W * D:

Tank length:	7.3 foot
Tank Width:	4.5 foot
Tank Depth:	4.2 foot
Total Void Volume:	1013.2 Gallons

Field Dosing Tank Effective Volume To Tank Bottom = L * W * Lowest Invert To Tank Bottom:

Tank length:	7.3 foot
Tank Width:	4.5 foot
Lowest Invert To Tank Bottom:	3.4 foot
Effective Volume:	830.8 Gallons

Field Dosing Tank Effective Volume To Pump Off = L * W * Lowest Invert To Pump Off:

Tank length:	7.3 foot
Tank Width:	4.5 foot
Lowest Invert To Pump Off:	1.9 foot
Effective Volume:	466.1 Gallons
Effective Volume Storage:	1.0 Days

Total System Effective Storage =	1487.1 Gallons
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MACCONNELL AND ASSOCIATES, P.C.
1594 JOSEY WILLIAMS ROAD
PRESSURE MANIFOLD DESIGN - INITIAL

Name: Evan and Patricia Germond **P.I.N. #:** 0555-93-1151 **D#:** N/A

Address: 1594 Josey Williams Road **Subdiv:** **Lot#:**
Harnett County

of BDR: 4 **Daily Flow:** 480 gal/day **L.T.A.R.:** 0.80 gal/day/sq.ft

Septic Tank: 1000 gals **Pump Tank:** 1000 gals **Sq. Foot:** 630 **Stone Depth:** N/A

Number of Taps: 3 **Length of Trenches:** 210 ft(See Tap Chart for Details)

Depth of Trenches: 12 in **Manifold Length:** 36 in (see comments below)

Manifold Diameter: 4 **Tap Configuration:** 1/2 in spacing 1 side(s) of manifold

Supply Line: length: 40 ft **Diameter(Supply Line):** 1-1/2 in SCH40 PVC Pipe **ID (Inch)** 1.61

Friction Loss + Fitting Loss: 3.51 ft(supply line length + 70' for fittings in pump tank)

Design Head: 2 ft **Elevation Head:** 7.10 ft

Total Head: 12.61 ft **Pump to Deliver:** 21.3 gals/min at 12.6 ft head

Dosing Volume: 96 gals,

Pump Selection: Drawdown: 96 gals divided by 20.3 gals/in = 4.7 inches head

Pump Selection: As shown on the construction drawings.

TAP CHART

Bench Mark	100.0						Design Head:	2	
Pump tank elev.	120.6			Pump elev.	113.4		Manifold elev.	120.5	
line	color	rod read	Elevation**	length	hole size	flow/tap	gal/day	trench area	LINE LTAR
1	Red	10.3	99.7	70	1/2in SCH 40	7.11	160	210	0.762
2	Orange	10.5	99.5	70	1/2in SCH 40	7.11	160	210	0.762
3	Red	10.5	99.5	70	1/2in SCH 40	7.11	160	210	0.762
		total	feet =	210	gal/min =	21.33		LTAR =	0.80
% of Dose Vol.		70.00%		Des. Flow	480			(Itar + 5%)	0.84
Dose Volume		96		Pump Run=	22.50	Ezflow		(Itar W/ INOV)	1.07
Dose Pump Time		4.50		Tank Gal/IN	20.3			(Itar + 5%)	1.12
Drawdown in Inches		4.7		Elev. Head	7.1				
Supply Line Length		40		Velocity fps	3.36				

Comments: **at grade

Hydraulic Profile

Manifold Elevation 120.5
Pump tank elev. 120.6
Pump elev. 113.4

MACCONNELL AND ASSOCIATES, P.C.
1594 JOSEY WILLIAMS ROAD
PRESSURE MANIFOLD DESIGN - REPAIR

Name:	<u>Evan and Patricia Germond</u>	P.I.N. #:	<u>0555-93-1151</u>	D#:	<u>N/A</u>
Address:	<u>1594 Josey Williams Road</u> <u>Harnett County</u>	Subdiv:	<u>0</u>	Lot#:	<u>0</u>
# of BDR:	<u>4</u>	Daily Flow:	<u>480</u> gal/day	L.T.A.R.:	<u>0.80</u> gal/day/sq.ft
Septic Tank:	<u>1000</u> gals	Pump Tank:	<u>1000</u> gals	Sq. Foot:	<u>630</u>
				Stone Depth:	<u>N/A</u>
Number of Taps:	<u>3</u>	Length of Trenches:	<u>210</u> ft	(See Tap Chart for Details)	
Depth of Trenches:	<u>12</u> in	Manifold Length:	<u>36</u> in		
Manifold Diameter:	<u>4 inches</u>	Tap Configuration:	<u>1/2 in spacing</u>	<u>1</u> side(s) of manifold	
Supply Line: length:	<u>125</u> ft	Diameter(Supply Line):	<u>1-1/2 in. SCH40 PVC Pipe</u>	ID (Inch)	<u>1.61</u>
Friction Loss + Fitting Loss:	<u>6.23</u>	ft(supply line length + 70' for fittings in pump tank)			
Design Head:	<u>2</u> ft	Elevation Head:	<u>7.10</u> ft		
Total Head:	<u>15.33</u> ft	Pump to Deliver:	<u>21.3</u> gals/min at	<u>15.3</u>	ft head
Dosing Volume:	<u>96</u> gals,				
Pump Selection: Drawdown:	<u>96</u> gals divided by	<u>20.3</u> gals/in =	<u>4.7</u>	inches head	

TAP CHART

Bench Mark	<u>100.0</u>			Design Head:	<u>2</u>
Pump tank elev.	<u>120.6</u>	Pump elev.	<u>113.4</u>	Manifold elev.	<u>120.5</u>
line	color	rod read	Elevation**	length	hole size
flow/tap	gal/day	trench area	LINE	LTAR	
<u>4</u>	<u>Red</u>	<u>11.0</u>	<u>99.0</u>	<u>70</u>	<u>1/2in SCH 40</u>
<u>5</u>	<u>Orange</u>	<u>11.0</u>	<u>99.0</u>	<u>70</u>	<u>1/2in SCH 40</u>
<u>6</u>	<u>Red</u>	<u>11.0</u>	<u>99.0</u>	<u>70</u>	<u>1/2in SCH 40</u>
		total	feet =	210	gal/min =
% of Dose Vol.	<u>75.0%</u>			Des. Flow	<u>480</u>
Dose Volume	<u>96</u>			Pump Run=	<u>22.50</u>
Dose Pump Time	<u>4.82</u>			Tank Gal/IN	<u>20.26</u>
Drawdown in Inches	<u>4.7</u>			Elev. Head	<u>7.10</u>
Supply Line Length	<u>125</u>			Velocity fps	<u>3.36</u>
				LTAR =	0.80
				(tar + 5%)	0.84
				(tar W/ INOV)	1.07
				(tar + 5%)	1.12

Comments: **at grade

Hydraulic Profile

Manifold Elevation	<u>120.5</u>
Pump tank elev.	<u>120.6</u>
Pump elev.	<u>113.4</u>

Septic Tank (1,000 ST-502)

Basic Dimensions		
Lid Thickness (L)	0.33	(feet)
Lid Hole Diameter (H1)	24.00	(inches)
Lid Hole Diameter (H2) - If tank has only one hole, leave blank.	24.00	(inches)
Lid Hole Diameter (H3) - If tank has only one hole, leave blank.	0.00	(inches)
Length of Tank (A)	8.88	(feet)
Width of Tank (B)	4.29	(feet)
Height of Tank Excluding Lid (C) - This value includes the base thickness but excludes the lid thickness.	5.50	(feet)
Depth of Bury (Y) - This measurement extends from the ground level to the top of the lid.	1.50	(feet)
Wall Thickness (T)	0.25	(feet)
Base Thickness (E)	0.33	(feet)
Distance to Groundwater (GW)	0.00	(feet)

Customizations To Add Ballast		
Add Concrete Inside the Tank:		
Initial Inside Height of Tank - This measurement is the value of C - E.	5.17	(feet)
Add concrete inside the tank to make thicker base?	0.00	(feet)
If yes, how much? (U) If no, enter a value of 0. Please note: The value entered must be less than the inside height of the tank.		
Increase Thickness of the Base:		
Initial Base Thickness - This measurement is the value of E.	0.33	(feet)
Add concrete below the base of the tank to make thicker base?	0.00	(feet)
If yes, how much? (F) If no, enter a value of 0.		
Create Lip:		
Extend the base horizontally to create a lip? - The lip will be the thickness of E plus F, below, and it will extend this horizontal distance, P, from all four tank walls.	0.00	(feet)
If yes, how much? (P) If no, enter a value of 0.		

Summary of Final Measurements after Ballast Customizations		
Final Base Thickness - This measurement is the sum of E and F.	0.33	(feet)
Lip Thickness - This measurement is the sum of E and F.	0.33	(feet)

Total Height of the Tank from the Top of the Lid to the Bottom of the Base - This measurement is the sum of L, C, and F. This is equivalent to the sum of L, C - E, E, and F.	5.83	(feet)
Final Inside Height of Tank - This measurement is the value of C - E - U.	5.17	(feet)
Final Volume of Tank	164.17	(cf)
Final Volume of Tank	1228.11	(gallons)

Unit Weights		
Unit Weight of Water	62.40	(lb/cf)
Unit Weight of Dry Soil	110.00	(lb/cf)
Unit Weight of Submerged Soil	47.60	(lb/cf)
Unit Weight of Saturated Soil	120.00	(lb/cf)
Unit Weight of Concrete	150.00	(lb/cf)

Changes in Total Concrete Weight Due to Customizations		
Weight of extra concrete inside tank used to create thicker base (Weight of extra concrete due to U)	0	(lb)
Weight of extra concrete on bottom of tank used to create thicker base (Weight of extra concrete due to F)	0	(lb)
Weight of extra concrete due to lip (Weight of extra concrete due to P)	0	(lb)
Weight of concrete removed due to lid hole	311	(lb)

Soil and Concrete Weights		
Weight of Soil on Lid	2720	(lb)
Weight of Soil on Lip	0	(lb)
Weight of Lid Alone	1574	(lb)
Weight of Empty Tank - This value is the sum of weights of the body of the tank, the tank lid, the lip (P, if applicable), the thickened base (F, if applicable), and the extra concrete inside tank (U, if applicable), minus the weight of the concrete removed due to the hole in the lid.	8371	(lb)

Water in Tank		
Water Level in Tank - Please note: The value entered must be less than the final inside height of the tank.	0.00	(feet)
Weight of Water in Tank	0	(lb)

Weight of System Components		
Total Weight of Soil on Tank	2720	(lb)
Total Weight of Concrete	8371	(lb)
Total Weight (Tank, Water in Tank, and Soil)	11091	(lb)

Sliding Resistance		
Specific Gravity of Soil, SG	2.75	
Friction Factor (Found in Table 1), f	0.30	
Void Ratio (Found in Table 3), e	0.85	
Ratio of Lateral to Vertical Earth Pressure (Found in Table 2), Ka	0.33	
Sliding Resistance	16577	(lb)

Uplift Force		
Uplift Force	13856.31	(lb)
Safety Factor	1.50	
Uplift Force with Safety Factor	20784.46	(lb)

Additional Ballast Required		
Additional Ballast Required	NONE	(lb)

Pump Tank (1,000 PT 237)

Basic Dimensions		
Lid Thickness (L)	0.33	(feet)
Lid Hole Diameter (H1)	24.00	(inches)
Lid Hole Diameter (H2) - If tank has only one hole, leave blank.	24.00	(inches)
Lid Hole Diameter (H3) - If tank has only one hole, leave blank.	0.00	(inches)
Length of Tank (A)	7.79	(feet)
Width of Tank (B)	4.96	(feet)
Height of Tank Excluding Lid (C) - This value includes the base thickness but excludes the lid thickness.	4.50	(feet)
Depth of Bury (Y) - This measurement extends from the ground level to the top of the lid.	1.50	(feet)
Wall Thickness (T)	0.25	(feet)
Base Thickness (E)	0.33	(feet)
Distance to Groundwater (GW)	0.00	(feet)

Customizations To Add Ballast		
Add Concrete Inside the Tank:		
Initial Inside Height of Tank - This measurement is the value of C - E.	4.17	(feet)
Add concrete inside the tank to make thicker base?	0.00	(feet)
If yes, how much? (U) If no, enter a value of 0. Please note: The value entered must be less than the inside height of the tank.		
Increase Thickness of the Base:		
Initial Base Thickness - This measurement is the value of E.	0.33	(feet)
Add concrete below the base of the tank to make thicker base?	0.00	(feet)
If yes, how much? (F) If no, enter a value of 0.		
Create Lip:		
Extend the base horizontally to create a lip? - The lip will be the thickness of E plus F, below, and it will extend this horizontal distance, P, from all four tank walls.	0.00	(feet)
If yes, how much? (P) If no, enter a value of 0.		

Summary of Final Measurements after Ballast Customizations		
Final Base Thickness - This measurement is the sum of E and F.	0.33	(feet)
Lip Thickness - This measurement is the sum of E and F.	0.33	(feet)

Total Height of the Tank from the Top of the Lid to the Bottom of the Base - This measurement is the sum of L, C, and F. This is equivalent to the sum of L, C - E, E, and F.	4.83	(feet)
Final Inside Height of Tank - This measurement is the value of C - E - U.	4.17	(feet)
Final Volume of Tank	135.45	(cf)
Final Volume of Tank	1013.26	(gallons)

Unit Weights		
Unit Weight of Water	62.40	(lb/cf)
Unit Weight of Dry Soil	110.00	(lb/cf)
Unit Weight of Submerged Soil	47.60	(lb/cf)
Unit Weight of Saturated Soil	120.00	(lb/cf)
Unit Weight of Concrete	150.00	(lb/cf)

Changes in Total Concrete Weight Due to Customizations		
Weight of extra concrete inside tank used to create thicker base (Weight of extra concrete due to U)	0	(lb)
Weight of extra concrete on bottom of tank used to create thicker base (Weight of extra concrete due to F)	0	(lb)
Weight of extra concrete due to lip (Weight of extra concrete due to P)	0	(lb)
Weight of concrete removed due to lid hole	311	(lb)

Soil and Concrete Weights		
Weight of Soil on Lid	2758	(lb)
Weight of Soil on Lip	0	(lb)
Weight of Lid Alone	1601	(lb)
Weight of Empty Tank - This value is the sum of weights of the body of the tank, the tank lid, the lip (P, if applicable), the thickened base (F, if applicable), and the extra concrete inside tank (U, if applicable), minus the weight of the concrete removed due to the hole in the lid.	7361	(lb)

Water in Tank		
Water Level in Tank - Please note: The value entered must be less than the final inside height of the tank.	0.00	(feet)
Weight of Water in Tank	0	(lb)

Weight of System Components		
Total Weight of Soil on Tank	2758	(lb)
Total Weight of Concrete	7361	(lb)
Total Weight (Tank, Water in Tank, and Soil)	10120	(lb)

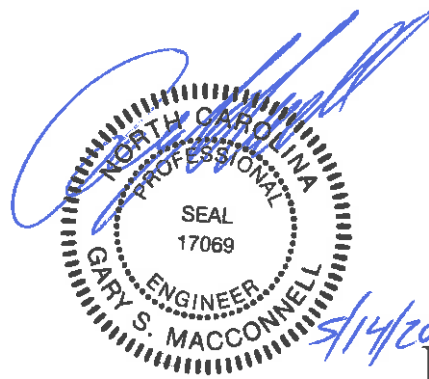
Sliding Resistance		
Specific Gravity of Soil, SG	2.75	
Friction Factor (Found in Table 1), f	0.30	
Void Ratio (Found in Table 3), e	0.85	
Ratio of Lateral to Vertical Earth Pressure (Found in Table 2), Ka	0.33	
Sliding Resistance	11971	(lb)

Uplift Force		
Uplift Force	11643.88	(lb)
Safety Factor	1.50	
Uplift Force with Safety Factor	17465.82	(lb)

Additional Ballast Required		
Additional Ballast Required	NONE	(lb)

**Evan and Patricia Germond
1594 Josey Williams Rd
(Lot 3 Kemp Holdings)**

**Engineered Option Permit
Pressure Manifold**

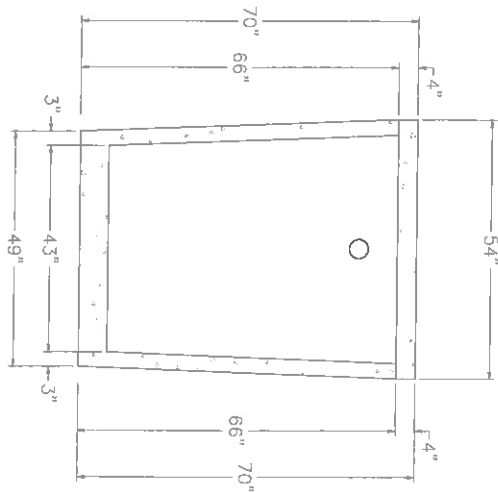
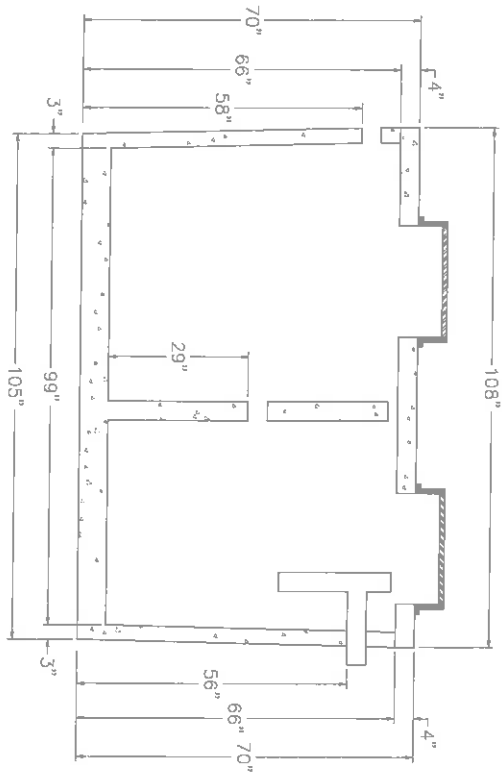


Equipment

**MacConnell & Associates, P.C.
501 Cascade Pointe Lane, Ste 103
Cary, North Carolina 27513**

**P.O. Box 129
Morrisville, North Carolina 27560**

**Phone: (919) 467-1239
Fax: (919) 319-6510**



1,000 ST 502
NTS

NON TRAFFIC BEARING

DAVID BRANTLEY & SONS

37 Pine Ridge Rd.
Zebulon, NC 27597
Office 252-478-3721
Fax 919-573-0443

installer@gmail.com

PREPARED FOR : David Brantley & Sons
37 Pine Ridge Rd.
Zebulon, NC 27597

DATE : April 11, 2014

CONTACT:
CORY BRANTLEY

REVISION NO.

Original Submitted

Revision 1

Revision 2

Revision 3

Master Set

DATE

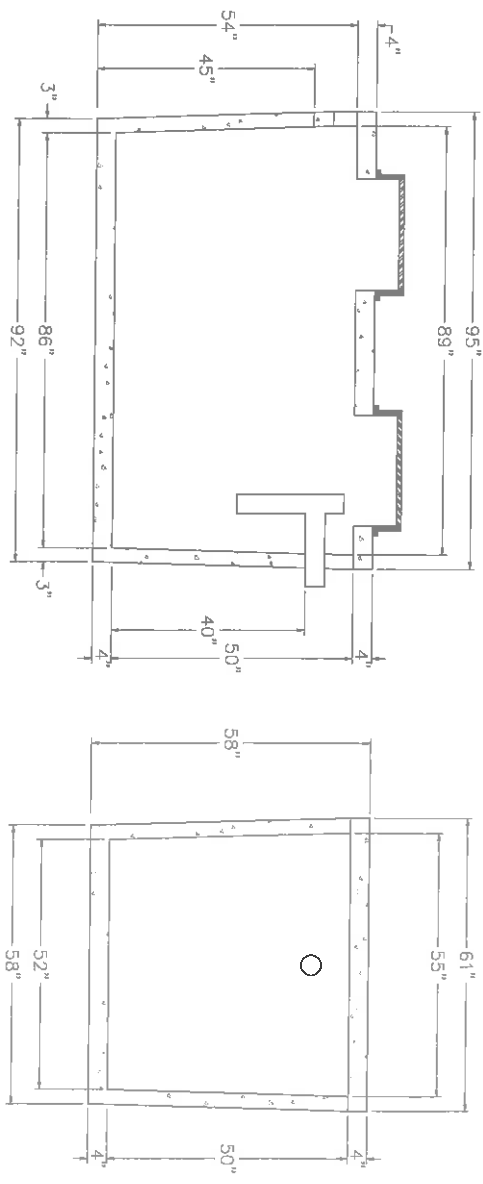
April 11, 2014

BRANTLEY TANK MODEL

1,000 ST 502

SHEET NUMBER

1 of 1



1,000 PT 237
 NTS

NON TRAFFIC BEARING

<p>DAVID BRANTLEY & SONS 37 Pine Ridge Rd. Zebulon, NC 27597 Office 252-478-3721 Fax 919-573-0443 installer@gmail.com</p>	PREPARED FOR : David Brantley & Sons 37 Pine Ridge Rd. Zebulon, NC 27597	REVISION NO. Original Submit	DATE April 11, 2014	BRANTLEY TANK MODEL 1,000 PT 237 SHEET NUMBER 1 of 1
	DATE : April 11, 2014	Revision 1		
	CONTACT: CORY BRANTLEY	Revision 2		
		Revision 3		
		Master Set		



Submittal Specification

A flexible pipe-to-structure connector shall be employed in the connection of the sanitary sewer pipe to precast structures. The connector shall be CAST-A-SEAL® 402/402F as manufactured by Press-Seal Corporation, Fort Wayne, Indiana, or approved equal. The connector shall be the sole element relied on to assure a flexible, watertight seal of the pipe to the precast structure. The connector shall consist of a rubber gasket and an external take-up clamp.

The rubber gasket element shall be constructed solely of synthetic or natural rubber, and shall meet or exceed the physical property requirements of ASTM C 923.

The external take-up clamp shall be constructed of Series 300 non-magnetic stainless steel and shall utilize no welds in its construction. The clamp shall be installed by torquing the adjusting screw using a

torque-setting wrench available from the connector manufacturer.

Selection of the proper size connector for the structure and pipe requirement, and installation thereof, shall be in strict conformance with the recommendations of the connector manufacturer. Any dead end pipe stubs installed in connectors shall be restrained from movement per ASTM C 923.

The finished connection shall provide sealing to 13 psi (minimum) and shall accommodate deflection of the pipe to 7 degrees (minimum) without loss of seal.

Vacuum testing shall be conducted in strict conformance with ASTM C 1244 prior to backfill. Other testing shall be conducted in strict conformance with the requirements of the connector manufacturer.

CAST-A-SEAL 402	PIPE SIZE	PIPE O.D. RANGE	WALL THICKNESS*	APPLICATION
452.0250	1.25" - 2" (31 - 51 mm)	1.5" - 2.75" (38 - 70 mm)	2.5" - 6" (64 - 150 mm)	STANDARD
452.0402	4" (100 mm)	4.2" - 4.7" (107 - 119 mm)	2.5" - 4.0" (64 - 102 mm)	STANDARD
452.0402F1	4" (100 mm)	4.2" - 4.7" (107 - 119 mm)	2.5" - 4.0" (64 - 102 mm)	Closed Face
452.0650	6" (150 mm)	6.2" - 6.7" (157 - 170 mm)	2.5" - 6" (64 - 150 mm)	STANDARD
CAS ADAPTER	3" (75 mm)	3.2" - 3.6" (81 - 91 mm)	--	Use with 4" CAST-A-SEAL

PRODUCT PERFORMANCE

CAST-A-SEAL 402/402F meets and/or exceeds all requirements of ASTM C 923, including physical properties of materials and performance testing, including:

- 13 psi minimum in straight alignment
- 10 psi at minimum 7° angle
- 10 psi minimum under shear load of 150 lbs/in. pipe diameter

CAST-A-SEAL 402/402F meets and/or exceeds the requirements of the following Standards, Specifications, Codes, and Test Methods:

- ASTM C 923 *Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals*
- ASTM C 1644 *Standard Specification for Resilient Connectors Between Reinforced Concrete On-Site Wastewater Tanks and Pipes*
- ASTM C 1478 *Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Storm Sewer Structures, Pipes and Laterals*
- ASTM C 1244 *Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test*
- IAPMO/ANSI Z1000 *Standard for Prefabricated Septic Tanks*
- IAPMO/ANSI Z1001 *Standard for Prefabricated Gravity Grease Interceptors*
- NPCA *Best Practices Manual for Precast Concrete On-Site Wastewater Tanks*
- NOWRA *Model Code Framework*

TYPICAL TEST RESULTS for CAST-A-SEAL 402/402F (as in ASTM C 1644, C 923, and C 1478)			
Test	ASTM Test Method	Test Requirements	Typical Result
CHEMICAL RESISTANCE; 1N SULFURIC ACID and 1N HYDROCHLORIC ACID	D 534, AT 22°C FOR 48 HRS	NO WEIGHT LOSS NO WEIGHT LOSS	NO WEIGHT LOSS NO WEIGHT LOSS
TENSILE STRENGTH	D 412	1200 PSI, MIN.	2100 PSI
ELONGATION AT BREAK	D 412	350%, MIN.	525%
HARDNESS	D 2240 (SHORE A DUROMETER)	±5 FROM THE MANUFACTURER'S SPECIFIED HARDNESS	<2
ACCELERATED OVEN-AGING	D 573, 70± 1°C FOR 7 DAYS	DECREASE OF 15%, MAX. OF ORIGINAL TENSILE STRENGTH, DECREASE OF 20%, MAX. OF ELONGATION	-13% TENSILE CHANGE, -14% ELONGATION CHANGE
COMPRESSION TEST	D 385, METHOD B, AT 70°C FOR 22 HRS	DECREASE OF 25%, MAX. OF ORIGINAL DEFLECTION	13%
WATER ABSORPTION	D 471 IMMERSE 0.75 BY 2-IN. SPECIMEN IN DISTILLED WATER AT 70°C FOR 48 hrs	INCREASE OF 10%, MAX. OR ORIGINAL BY WEIGHT	3.50%
OZONE RESISTANCE	D 1171	RATING 0	PASS
LOW-TEMP. BRITTLE POINT	D 746	NO FRACTURE AT -40°C	PASS
TEAR RESISTANCE	D 624, METHOD B	200 LBF/IN. (MIN.)	450 LBF/IN.

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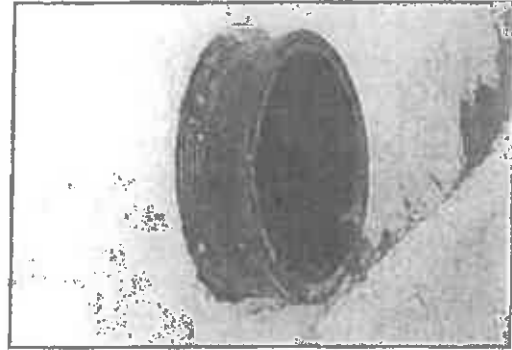


CAST-A-SEAL® 402/402F

CAST-IN BOOT-TYPE CONNECTOR
for 1-1/4" to 6" PVC Pipe
(32 mm - 150 mm)

What It Is

CAST-A-SEAL 402/402F is a watertight flexible connector that is cast into the structure when the concrete is poured. The connector is folded into the casting position and placed on the reusable heavy-duty solid plastic mandrel that is installed directly to the form. After the concrete is cured, the form is opened, removing the mandrel from the gasket, but leaving the **CAST-A-SEAL 402/402F** connector embedded in the concrete. The gasket is then simply unfolded at the jobsite and is tightened around the pipe using the supplied stainless steel take-up clamp.



How It Performs

CAST-A-SEAL 402/402F meets or exceeds all requirements of the following Standards, Codes, Specifications and/or Test Methods:

ASTM C 1227

ASTM C 1644

ASTM C 923

ASTM C 1244

IAPMO Z1000

IAPMO Z1001

NPCA Best Practices

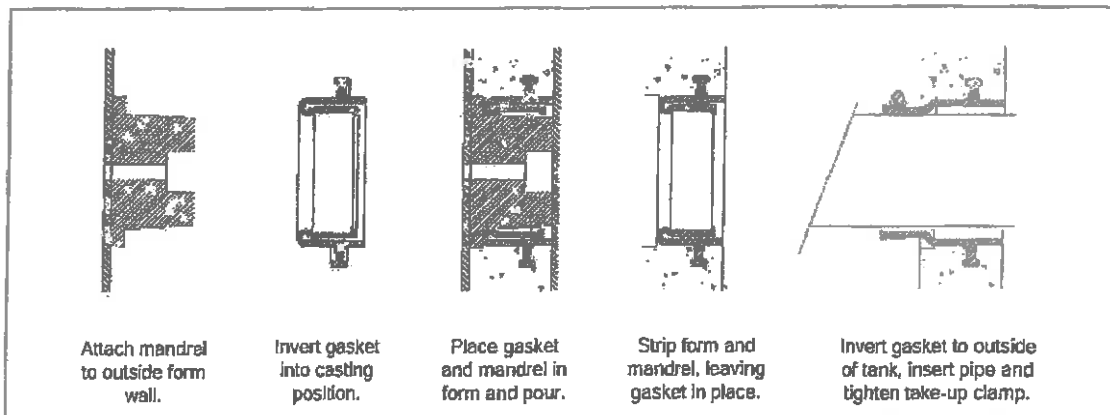
NOWRA Model Code

ASTM C 1478

Why It's Better

- Simple cast-in design provides flexible watertight connection.
- Eliminates infiltration and exfiltration.
- Improves on-site system performance and minimizes maintenance.
- Protects groundwater from unintended discharges.
- Use in on-site treatment structures, grease interceptors, manholes, wet wells, pump and lift stations, stormwater structures, or any application requiring a flexible watertight connector.

Scan (or click) Here To View More Info On This Product On The Web!



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EZset by Infiltrator risers and lids are made from glass reinforced polypropylene, providing superior strength and durability. They come in green or black and in 20", 24", and 30" diameters making them ideal for use with any concrete or plastic tank. The slip resistant lids are fastened using stainless steel screws and can be further secured by installing locking rings.

20" Riser System

- 20" x 6" Risers (Green or Black)
- 20" x 12" Risers (Green or Black)
- 20" Lids (Green or Black)



20" x 6" Riser



20" x 12" Riser



20" Lid



Adapter Flange

24" Riser System

- 24" x 6" Risers (Green or Black)
- 24" x 12" Risers (Green or Black)
- 24" x 18" Risers (Green or Black)
- 24" Lids (Green or Black)



24" x 6" Riser



24" x 12" Riser



24" x 18" Riser



24" Lid

30" Riser System

- 30" x 12" Risers (Green or Black)
- 30" Lids (Green or Black)



30" x 12" Riser

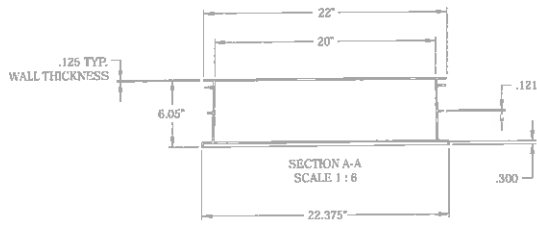


30" Lid

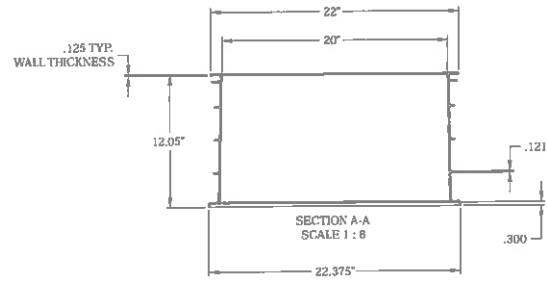
- Adhesive Sealant
- 20" Locking Rings
- 20" Safety Pans
- 24" Locking Rings
- 24" Safety Pans
- 24" Adapter Rings
- 30" Locking Rings



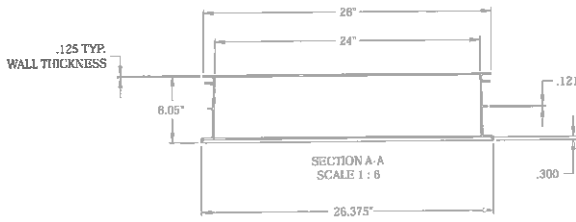
Riser Specifications



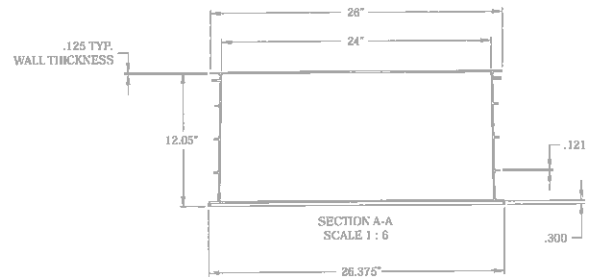
20" x 6" Riser Cutaway



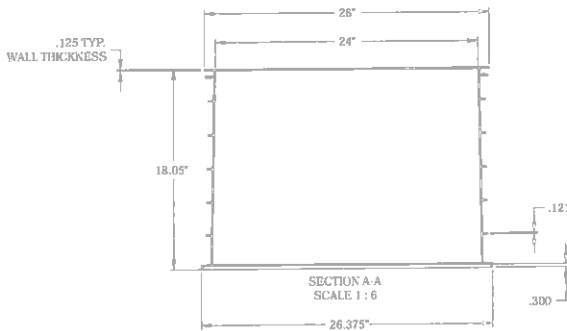
20" x 12" Riser Cutaway



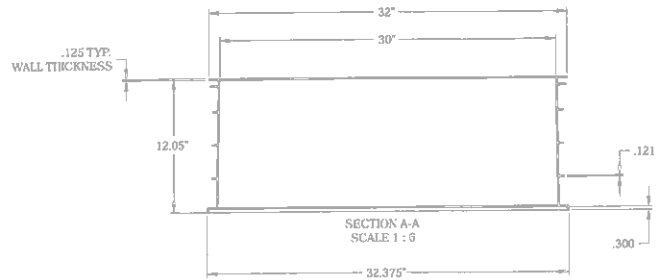
24" x 6" Riser Cutaway



24" x 12" Riser Cutaway



24" x 18" Riser Cutaway



30" x 12" Riser Cutaway

INFILTRATOR WATER TECHNOLOGIES, LLC ("Infiltrator")
EZset by Infiltrator LIMITED WARRANTY
ONE (1) YEAR MATERIALS AND WORKMANSHIP LIMITED WARRANTY

(a) This limited warranty is extended to the end user of an EZset by Infiltrator riser and lid system and other accessories. An EZset system manufactured by Infiltrator, when installed and operated in accordance with Infiltrator's installation instructions and local regulation by a licensed installer, is warranted to you: (i) against defective materials and workmanship for one (1) year after installation. Infiltrator will, at its option, (i) repair the defective product or (ii) replace the defective materials. Infiltrator's liability specifically excludes the cost of removal and/or installation of the EZset system.

(b) In order to exercise its warranty rights, you must notify Infiltrator in writing at its corporate headquarters in Old Saybrook, Connecticut within fifteen (15) days of the alleged defect.

(c) YOUR EXCLUSIVE REMEDY WITH RESPECT TO ANY AND ALL LOSSES OR DAMAGES RESULTING FROM ANY CAUSE WHATSOEVER SHALL BE SPECIFIED IN SUBPARAGRAPH (a) ABOVE. INFILTRATOR SHALL IN NO EVENT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY KIND, HOWEVER OCCASIONED, WHETHER BY NEGLIGENCE OR OTHERWISE. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THIS LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

(d) THIS LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY GIVEN BY INFILTRATOR AND SUPERSEDES ANY PRIOR, CONTRARY, ADDITIONAL, OR SUBSEQUENT REPRESENTATIONS, WHETHER ORAL OR WRITTEN. INFILTRATOR DISCLAIMS AND EXCLUDES TO THE GREATEST EXTENT ALLOWED BY LAW ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND ANY IMPLIED WARRANTIES OTHERWISE ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE. NO PERSON (INCLUDING ANY EMPLOYEE, AGENT, DEALER, OR REPRESENTATIVE) IS AUTHORIZED TO MAKE ANY REPRESENTATION OR WARRANTY CONCERNING THIS PRODUCT, EXCEPT TO REFER YOU TO THIS LIMITED WARRANTY. EXCEPT AS EXPRESSLY SET FORTH HEREIN, THIS WARRANTY IS NOT A WARRANTY OF FUTURE PERFORMANCE, BUT ONLY A WARRANTY TO REPAIR OR REPLACE.

(e) YOU MAY ASSIGN THIS LIMITED WARRANTY TO A SUBSEQUENT PURCHASER OF YOUR HOME.

(f) NO REPRESENTATIVE OF INFILTRATOR HAS THE AUTHORITY TO CHANGE THIS LIMITED WARRANTY IN ANY MANNER WHATSOEVER, OR TO EXTEND THIS LIMITED WARRANTY.

CONDITIONS AND EXCLUSIONS

There are certain conditions or applications over which Infiltrator has no control. Defects or problems as a result of such conditions or applications are not the responsibility of Infiltrator and are NOT covered under this warranty. They include failure to install the EZset system in accordance with instructions or applicable regulatory requirements or guidance, altering the EZset system contrary to the installation instructions and disposing of chemicals or other materials contrary to normal EZset system usage.

The above represents the Standard Limited Warranty offered by Infiltrator. A limited number of states and counties have different warranty requirements. Any purchaser of an EZset system should contact Infiltrator's corporate headquarters in Old Saybrook, Connecticut, prior to such purchase to obtain a copy of the applicable warranty, and should carefully read that warranty prior to the purchase of an EZset system.



4 Business Park Road
P.O. Box 768
Old Saybrook, CT 06475
860-577-7000 • Fax 860-577-7001
1-800-221-4436
www.infiltratorwater.com

U.S. Patents: 4,759,861; 5,017,041; 5,156,488; 5,336,017; 5,401,116; 5,401,459; 5,511,903; 5,716,163; 5,588,778; 5,839,844 Canadian Patents: 1,329,959; 2,004,564 Other patents pending. Infiltrator, Equalizer, Quick4, and SideWinder are registered trademarks of Infiltrator Water Technologies. Infiltrator is a registered trademark in France. Infiltrator Water Technologies, is a registered trademark in Mexico. Contour, MicroLeaching, PolyTuff, ChamberSpacer, MultiPort, PosiLock, QuickCut, QuickPlay, SnapLock and StraightLock are trademarks of Infiltrator Water Technologies. PolyLok is a trademark of PolyLok, Inc. TUF-TITE is a registered trademark of TUF-TITE, INC. Ultra-Rib is a trademark of IPEX Inc.

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SET01 0613IS1

Contact Infiltrator Water Technologies' Technical Services Department for assistance at 1-800-221-4436



TOLL FREE: 888-999-3290

Bristle Filter Instructions For STF-110 4" (Installation & Maintenance)

Instructions for installation in standard 4" outlet "Tee" of septic tank.

- Orient the filter so that the wire handle faces opposite the discharge outlet.
- Push filter into top of "Tee" until the 90 degree wire handle touches the top of the "Tee". The filter is now "installed", as shown in the picture to the right.
- The flexibility of the STF-110 bristle filter allows it to be used in just about any situation. If you need help with a custom installation please call Sim/Tech Filter toll free at 888-999-3290.



Installed Filter

RECOMMENDED MAINTENANCE SCHEDULE

For maximum protection, it is recommended that the filter be replaced annually. If not, it should be inspected at least once per year. The filter is capable of lasting three years under normal conditions. Such factors as garbage disposals, pets, laundry, etc. may cause the need for more frequent inspection or service.

Instructions for performing maintenance in standard 4" outlet "Tee" of septic tank.



STF-130
Maintenance
Sleeve

- Before removing filter, one of two options must be performed. These options need to be performed to prevent any outflow of unfiltered effluent from the tank while the filter is removed.

Option 1

Insert a STF-130 maintenance sleeve (sold separately) with the handle coupling on the same side of the "Tee" as the outlet hole. Push the sleeve into the "Tee" until the handle coupling hits the top of the "Tee". Do not remove the sleeve until a filter has been put back in the "Tee".

Option 2

Have the tank pumped down by a professional septic service company.

- After performing one of the options above, remove filter by pulling up on the filter handle.
- Place the used filter in the provided plastic bag for proper disposal.
- Install a new replacement filter as described in the installation instructions at the top of the page.
- If a maintenance sleeve was used (option 1), remove the sleeve from the outlet "Tee".



Maintenance
Sleeve partially
inserted into
"Tee"

U.S. Patent #
6,811,692

The STF-110 series Effluent Filters

STF-110
4" dia.

It's Superior
Superior to slotted, uniform designs.

It's Flexible
Flexible basket design, is easily installed.

It's Versatile
Versatile - residential, commercial and industrial applications.

STF-110-6W
6" dia.

It's Economical
Economical - a fraction of the cost of inferior designs.

It's Easy
Easy to service or replace.

It's The Best
The best passive effluent filtration for the most common debris.

STF-110-7R
7" dia.

It's Simple
Simply the only choice in effluent filters.

STF-110-8B
8" dia.

SIM/TECH FILTER

simple solutions for technical problems
www.simtechfilter.com - 888-999-8298

STF-110 series Effluent Filers

STF-110-8B
STF-110-7R
STF-110-6W
STF-110

- **Superior filtration of the most common solids found in today's wastewater systems**
- **Versatile design has applications for residential, commercial and industrial systems and fit many different types of tees and housings**
- **Flexible bristle-design is simple to install and service, even in systems with limited access**
- **Self-locking bristles hold the filter firmly in place with no need for receivers or canisters and eliminate filter float-up**
- **Debris separation area naturally sorts solids according to size and mass for longer filter life**
- **Allows biological maturing necessary in wastewater treatment systems**
- **Durable enough to be serviced and economical enough to be replaced**
- **Economical solution for protecting and servicing all types of wastewater systems at a fraction of the cost of inferior designs**

Designed after our proven STF-110 effluent filter that currently protects residential septic systems all over the world, the latest additions to this series of filters were designed with more demanding residential, commercial and industrial systems with larger housings and pre-cast tanks with built in square baffles in mind.

We achieve superior filtration of the most common solids found in today's wastewater systems with our non-uniform bristle design. This design is much more efficient than uniform / slotted designs which can pass larger more harmful debris into the system.

The flexible self-locking bristles make it simple to install and service, even in systems with limited access. They also hold the filter firmly in place with no need for receivers or canisters and eliminate filter float-up.

The filters employs a debris separation space which naturally sorts solids according to size and mass. This makes the filter function more efficiently and greatly increases its life-span. It also allows for biological maturing which is necessary in all wastewater treatment systems.

The STF-110 series filters use triangular polypropylene bristles wound together with a 316 stainless-steel core. This makes them durable enough to be serviced and economical enough to be replaced. This provides an economical solution for protecting and servicing all types of wastewater systems at a fraction of the cost of inferior designs.

STF-110-7R in 4'-6" sanitary Tee (cut-a-way)

STF-110-7R in pre-cast septic tank with square baffle.



STF-130 changing sleeve is required to block effluent flow while servicing without the need to pump down the tank.

STF-110 in 4' sanitary Tee (cut-a-way view)

Solutions

We offer free CAD detail drawings in DXF format to cover our complete product line.

For the protection and performance of wastewater systems by

proudly made in the USA

www.gag-simtech.com
888-999-3290

US Patent # 6,811,692

**SIM/TECH
FILTER**

FEATURES

- ❖ Easy, affordable solution for servicing septic tanks
- ❖ Designed with non-directional bristles for unrestricted flow of effluent
- ❖ Allows biological maturing and sloughing to maximize septic tank efficiency
- ❖ Provides well over 1/2 mile of filtration media with over 319 cu. in. of open area to eliminate clogging
- ❖ 2,215 sq. in. of filtering surface allow a flow rate of over 1200 GPD, filtering to 1/16" diameter
- ❖ Filtering surface is achieved with unique triangular bristle that more than doubles the filtering surface, with no uniform holes or slots to plug
- ❖ 90 degree handle for easy installation and removal
- ❖ Adapts to all types of 4" pipe
- ❖ Self-locking bristles hold the filter firmly in place, eliminating 'filter float up'
- ❖ Flexible design makes it easy to install in hard to reach places and makes replacing the filter a breeze
- ❖ Constructed of polypropylene bristles, wound together with a 316 S.S. core
- ❖ The filters designed shape creates a debris separation space which naturally sorts debris according to size and mass, ensures even filter usage for a long lifespan and maximizes circular flow



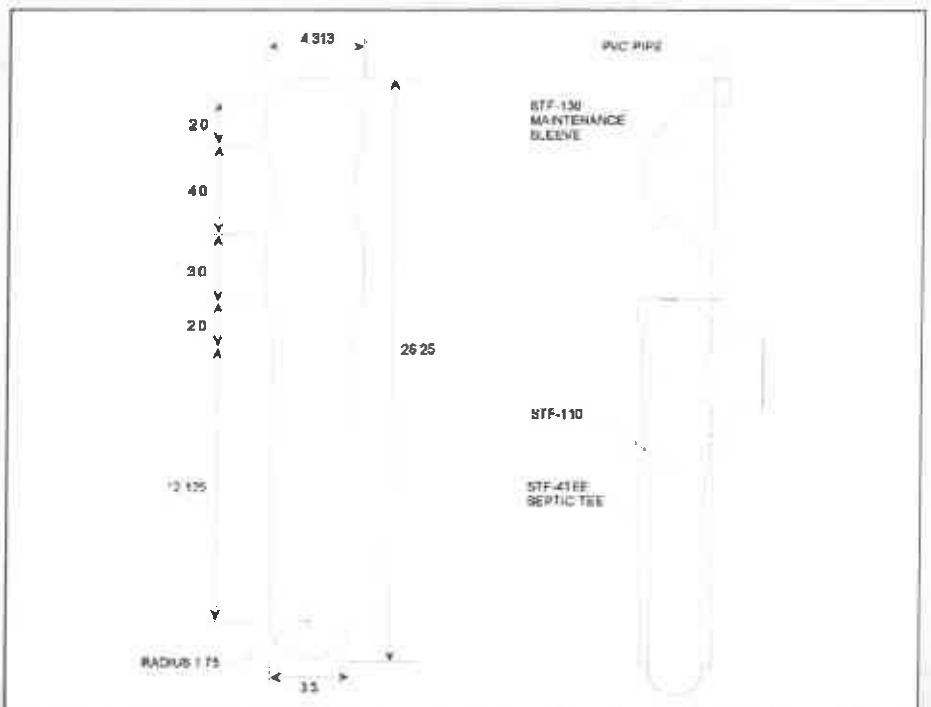
Order part No. STF-110
STF-130

CAD detail drawing available in DXF format

RELATED PRODUCTS

STF-110-6W page 4
STF-110-7R page 4
STF-110-8B page 4
STF-130 page 14
STF-4TEE page 14

U.S. Patent # 6, 811, 692





THIRD PARTY VERIFICATION
 GARY B. JOHNSON
 MICHIGAN # 32831
 WISCONSIN # E-25985
 MINNESOTA # 41217

SIM/TECH FILTER

**NEW STF-110 DISPOSABLE SEPTIC TANK FILTER
 THIRD PARTY VERIFICATION**

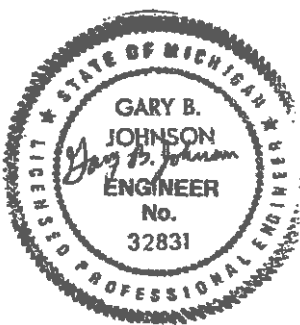
The Disposable Septic Tank Filter is constructed as a twisted-in-wire brush with 26" long brush body, 1/4" tip and 2 3/4" long handle end with 90 degree bend. Brush body will have a major diameter of 4.313" for a length of 9 1/2" starting 1/2" from the 90 degree handle bend, then will transition down to 3 1/2" diameter over the next 2 1/2" and held at 3 1/2" diameter for the next 14".

There will be a scallop cut into the O.D. in the major diameter beginning 2 1/2" from the top, transitioning down to 3 1/2" over the next 2", and then transitioning up to the major diameter over the next 2".

The stem will be 11-gauge stainless steel and the fill material will be .012 yellow polypropylene.

The filter has a total of 2,962 lineal feet of bristle equaling 35,544 lineal inches of bristle. By calculating the total length x the total perimeter of Sim/Tech's uniquely shaped bristle, it gives us a filtering surface of 2,215 square inches.

Volume of a 4"x26" Septic Tee	326.7 cubic inches
Volume of the STF-110 Filter	4.265 cubic inches
Volume as open for fluid	322.435 cubic inches





**THIRD PARTY VERIFICATION OF FILTRATION ON THE STF-110
AND THREE OTHER GRAVITY SEPTIC TANK FILTERS**

- Test was checking for filtering qualities with particulate that could be found in septic tank effluent
- This test used five types of particulate added to a clean tank
- The five types of particulate were hair, seeds, tissue paper, lint, and chain saw chips (see table A below)
- Test tank was riled manually every five minutes while performing tests to represent a large influx of water
- Water was introduced into the test tank at 210 gallons per hour
- Test was run to a 2" head height above outlet flow
- Recorded length of time to achieve a 2" head height (see table B below)
- Recorded what was caught in a 1500 micron sieve during the total run time (see table B below)
- Recorded what was caught in a 600 micron sieve below the 1500 micron sieve during total run time (see table B below)
- Recorded particulate caught while changing filters 15 minutes after ending test using manufacturers recommended instructions (see table B below)
- Recorded particulate removed with filters themselves (all filters were removed slowly) (see table B below)
- All particulate was recorded in grams using a OHAUS Scout II Scale (Serial #BJ380398) with capacity 400 times 0.1g (purchased scale 11/17/01)

TABLE A	Grams
Human hair	2
Horse hair	2
Dog hair	1
Cat hair	1
Tomato seeds	2
Pepper seeds	2
Cucumber seeds	2
Dill seeds	2
Charmin tissue paper	2
Scott tissue paper	2
Northern tissue paper	2
Lint	2
Chainsaw chips	4

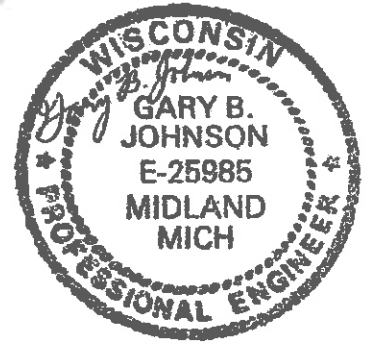
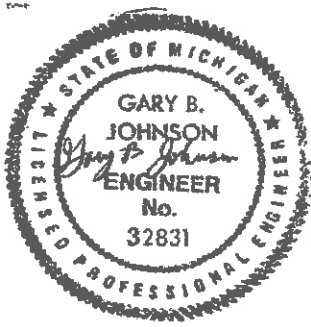


TABLE B	Sim/Tech	Tuff-Tite	Zabel	Zoeller
Time to achieve 2" head height	1 hr. 40 min.	7 min.	6 min.	* 2 hrs.
Particulate caught in 1500 micron sieve	0	0	0	0
Particulate caught in 600 micron sieve	0	0.2	0.3	1.2
Particulate caught while changing filter	0	0.3	0	0
Particulate contained within or on filter itself	15.0	6.3	2.2	2.3

*Ended test at 2 hours, total head height was at 1 3/4"
 Note: All filters except Sim/Tech caught seeds in 1500 micron sieve but was not recordable in 1/10g scale

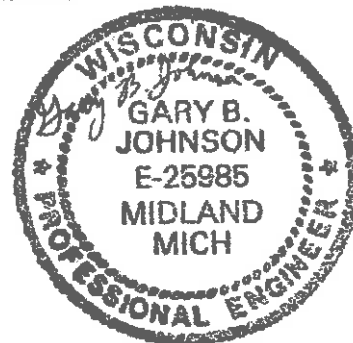
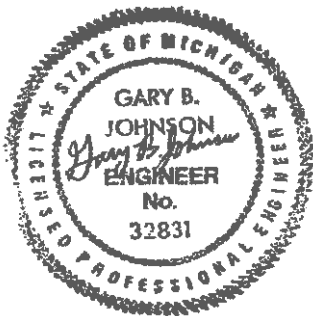


**THIRD PARTY VERIFICATION OF FLOW RATES ON THE STF-110
AND THREE OTHER GRAVITY SEPTIC TANK FILTERS**

- Test done with clean water and no particulate
- Filters placed in a standard outlet tee of S & D type with a 17" tailpiece to outlet level
- Test tank was a plastic 55 gallon drum
- There was an accurate method to measure head height above outlet level
- Test was done for a 1/2" and 1" head height above outlet level
- All filters tested using the above conditions

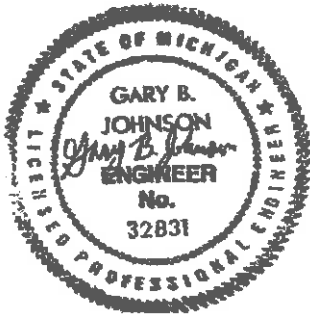
FILTER FLOW RATES

	Sim/Tech	Tuff-Tite	Zabel	Zoeller
1/2" head height above outlet flow	1, 800 GPD	1, 440 GPD	1, 195 GPD	900 GPD
1" head height above outlet flow	5, 040 GPD	4, 680 GPD	4, 858 GPD	1, 800 GPD



It is my opinion that the Sim/Tech filter will prove to be a superior septic tank filter because of its basic design; bristles to catch any "paper like" debris on the outside surface (guided there because of the bristle's bending at the ends under pressure of the flow). A dead zone near the center to collect small particles as they fall out of the flow. Plus the incalculable water paths through, and around, the filter fibers.

Gary B. Johnson P.E.
363 Silver Creek Rd
Petoskey, Mi 49770



PL-68 Filter and Tee

PL-68 is much more than just an effluent filter. The housing can also be used as an inlet baffle (tee) or an outlet baffle. The housing is designed to accept Polylok's snap in gas deflector to deflect gas bubbles away from the tee and to keep the solids in the tank.

Features:

- Offers 68 linear feet of 1/16" filter slots, which significantly extends time between cleaning.
- Accepts 3/4" PVC handle.
- Locks in any 360° position when used with PL-68 Tee.
- PL-68 Housing can be used as an inlet or outlet tee.
- Gasket prevents bypass.

PL-68 Installation:

Ideal for residential waste flows up to 800 gallons per day (GPD). Easily installs in any new or existing 4" outlet tee.

1. Locate the outlet of the septic tank.
2. Remove the tank cover and pump tank if necessary.
3. Glue the filter housing to the outlet pipe, or use a Polylok Extend & Lok if not enough pipe exists.
4. Insert the PL-68 filter into tee.
5. Replace and secure the septic tank cover.

PL-68 Maintenance:

The PL-68 Effluent Filter will operate efficiently for several years under normal conditions before requiring cleaning. It is recommended that the filter be cleaned every time the tank is pumped, or at least every three years.

1. Do not use plumbing when filter is removed.
2. Pull PL-68 out of the tee.
3. Hose off filter over the septic tank. Make sure all solids fall back into septic tank.
4. Insert filter back into tee/housing.

Related Products:

PL-68 Filter Concrete Baffle
 Extend & Lok™



Extend & Lok™
 Easily installs
 into existing tanks.



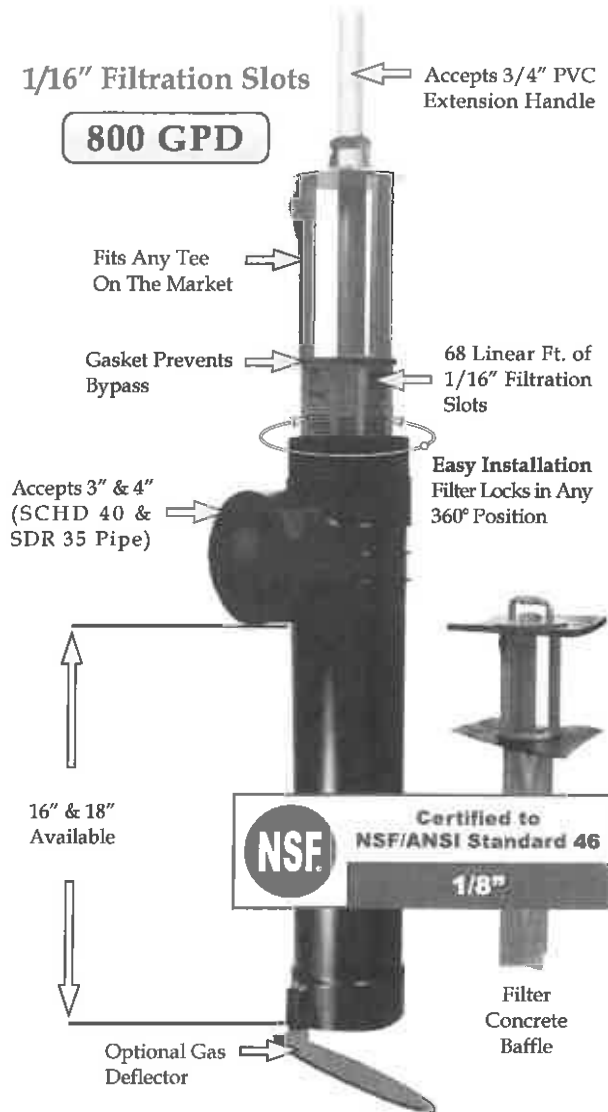
Spacer Bushing
 4" SCHD 40
 to SDR 35

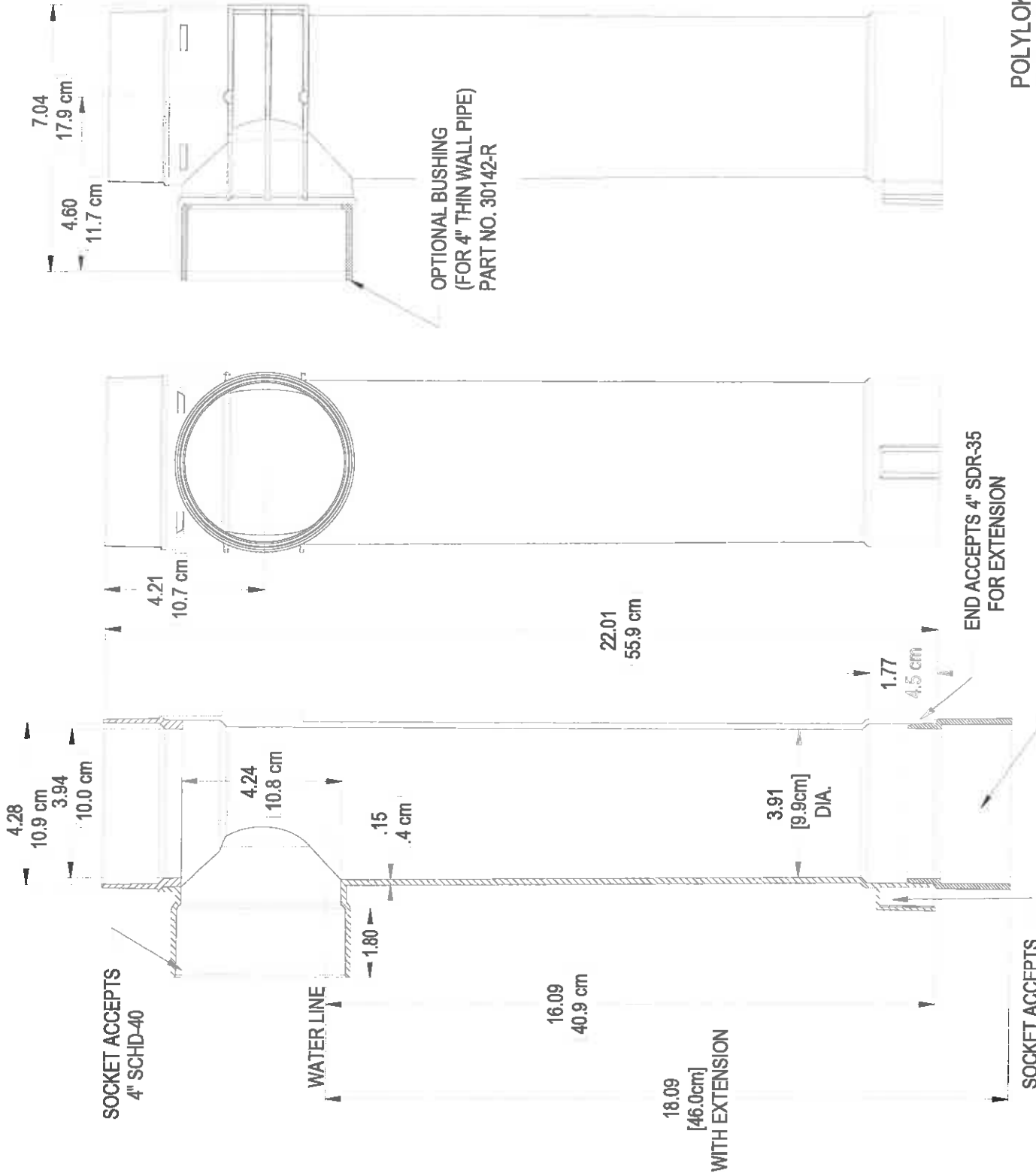


Spacer Bushing
 4" SCHD 40
 to 110mm Pipe



2" Extender





SOCKET ACCEPTS
4" SCHD-40

WATER LINE

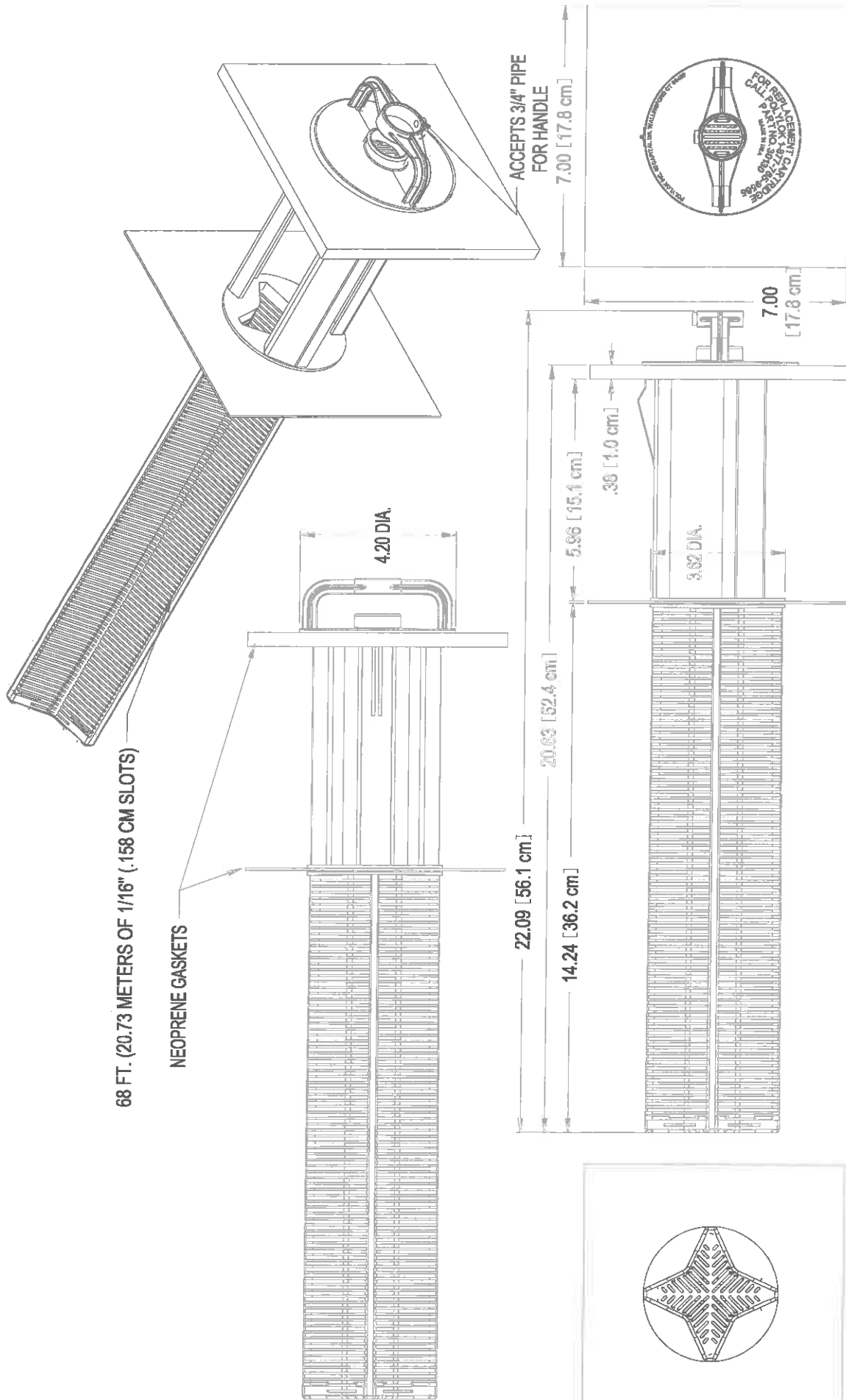
OPTIONAL BUSHING
(FOR 4" THIN WALL PIPE)
PART NO. 30142-R

END ACCEPTS 4" SDR-35
FOR EXTENSION

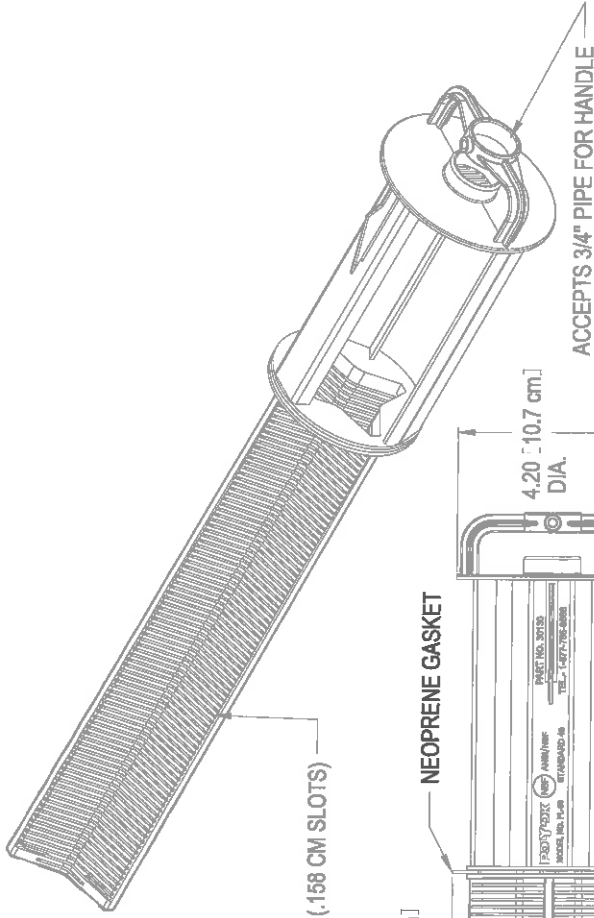
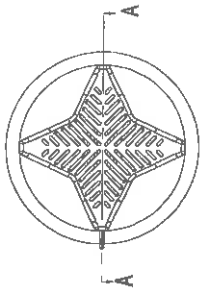
OPTIONAL 2" EXTENSION
PART NO. 30142-68X

SOCKET ACCEPTS
OPTIONAL GAS
DEFLECTOR
PART NO. 3025

POLYLOK PL-68 HOUSING 4"
PART NO. 30142-68-4
MATERIAL - ABS
COLOR - BLACK



PL-68 FILTER CARTRIDGE (FOR USE IN A CONCRETE BAFFLE)
PART NO. - 30130-CB
MATERIAL - POLYPROPYLENE



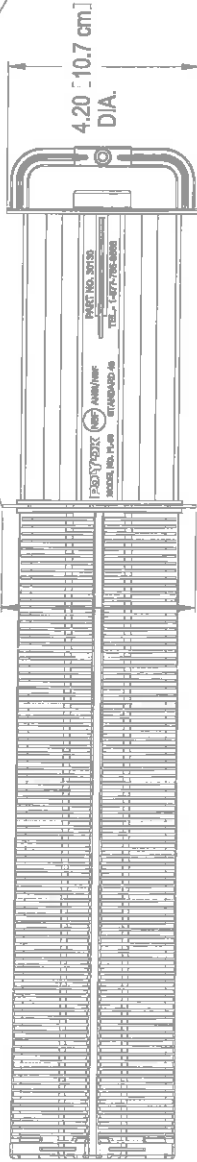
68 FT. (20.73 METERS OF 1/16" (.158 CM SLOTS)

ACCEPTS 3/4" PIPE FOR HANDLE

4.25 [10.8 cm]
DIA.

NEOPRENE GASKET

4.20 [10.7 cm]
DIA.

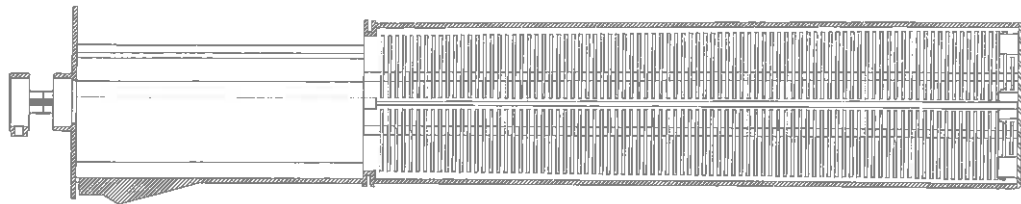
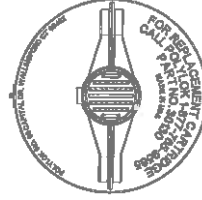
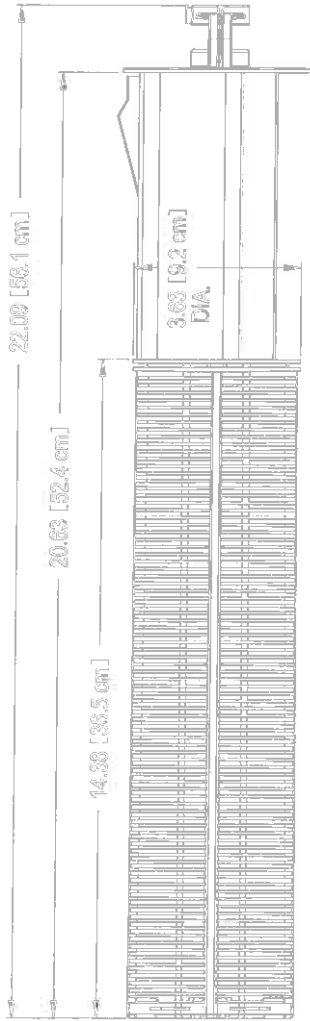


22.09 [56.1 cm]

20.63 [52.4 cm]

14.38 [36.5 cm]

3.63 [9.2 cm]
DIA.



SECTION A-A

PL-68 FILTER CARTRIDGE
PART NO. - 30130
MATERIAL - POLYPROPYLENE
COLOR - RED
TOTAL FILTER AREA - 1.1 SQ. FT.(1021 SQ. CM)



The Public Health and Safety Organization

NSF Product and Service Listings

These NSF Official Listings are current as of **Wednesday, April 06, 2016** at 12:15 a.m. Eastern Time. Please [contact NSF International](#) to confirm the status of any Listing, report errors, or make suggestions.

Alert: NSF is concerned about fraudulent downloading and manipulation of website text. Always confirm this information by clicking on the below link for the most accurate information: <http://info.nsf.org/Certified/Wastewater/Listings.asp?Standard=046&Company=79580&>

NSF/ANSI 46 Evaluation of Components and Devices Used in Wastewater Treatment Systems

Polylok Inc.
3 Fairfield Boulevard
Wallingford, CT 06492
United States
877-765-9565
203-265-6340

Facility : Cheshire, CT

Septic Tank Effluent Filters[1]

PL-122 PL-250 PL-525 PL-625 PL-68

[1] Performance tested using bead size 0.338 cm ± 0.005 cm (1/8" ± 0.002"). Meets the full requirements of NSF/ANSI 46-2010.

Facility : Evansville, IN

Septic Tank Effluent Filter Components[1]

A101-12x20 A101-12x28 A101-12x36 A101-8x18 A101-8x26
A101-8x32 A1801-4x18[4] A1801-4x22[4] [5] A301-12x20 A301-12x28
A301-12x36 A301-8x18 A301-8x26 A301-8x32

[1] Septic Tank Effluent Filter Components are exempt from bearing the NSF Component Mark and shall bear the NSF Unit Mark.

- [4] Filter cartridges Certified in ABS and PVC materials.
 [5] Failure sensing and signaling equipment of this product not evaluated by NSF.

Septic Tank Effluent Filters[2] [3]

A100-12x20	A100-12x20-VC	A100-12x20/BALL	A100-12x28-VC	A100-12x36-VC
A100-8x18-VC	A100-8x26-VC	A100-8x32-VC	A1800-4x18-30142-68	A1800-4x18-VT-B35
A1800-4x18-VT-B40	A1800-4x18-VTF-B35	A1800-4x18-VTF-B40	A1800-4x22-30142-68	A1800-4x22-VT-B35
A1800-4x22-VT-B40	A1800-4x22-VTF-B35	A1800-4x22-VTF-B40	A300-12x20	A300-12x20-VC
A300-12x20/BALL	A300-12x28-VC	A300-12x36-VC	A300-8x18-VC	A300-8x26-VC
A300-8x32-VC	A600-12x20	A600-12x20/BALL	A600-12x28-VC	A600-12x36-VC
A600-8x18-VC	A600-8x26-VC	A600-8x32-VC		

- [2] Suffix VC denotes a filter cartridge with Versa-Case assembly.
 [3] Performance tested using bead size 0.338 cm ± 0.005 cm (1/8" ± 0.002"). Meets the full requirements of NSF/ANSI 46-2010.

NOTE: All filters come Smartfilter ready.

Number of matching Manufacturers is 1
 Number of matching Products is 52
 Processing time was 0 seconds

PRESSURE MANIFOLD DESIGN
FOR GROUND ABSORPTION SEWAGE SYSTEMS

Steven J. Berkowitz
February, 1986

Large subsurface wastewater systems are being used more frequently as alternatives to discharging systems for many public and private facilities.

Dosing effluent periodically and uniformly throughout the drain field improves absorption field performance and increases field longevity (Otis et al. 1977, Harget et al. 1982). Low-pressure distribution of effluent in small diameter, perforated laterals has become a popular design alternative for achieving uniform distribution. Over 2,000 low-pressure pipe systems are now in use at single-family homes in North Carolina. A comprehensive design and installation manual for residential low-pressure pipe systems is available (Cogger et al. 1982). Design criteria and a simplified design procedure have also been published (Otis 1982). Available information, however, does not adequately address some key design parameters for the more extensive low-pressure pipe networks being planned and installed in North Carolina.

Pressure distribution manifolds feeding conventional gravity drain lines is another alternative being used in North Carolina to improve the distribution of effluent in large subsurface fields. This method is applied where soil conditions are favorable for conventional trenches and where the length of drain pipe required and degree of field slope would make it difficult to achieve uniform distribution between laterals in a low-pressure pipe network. Design criteria for such systems have not been previously available.

This paper sets forth some critical design parameters for pressure manifolds and laterals in large conventional and low-pressure pipe ground absorption sewage systems. The justification for these design parameters is presented elsewhere (Berkowitz, 1985)

PRESSURE MANIFOLDS
FOR CONVENTIONAL DRAIN FIELDS

The traditional approach to dividing effluent between conventional trenches is with a gravity distribution box. While relatively simple in concept and design, distribution boxes have proven to be generally ineffective in uniformly distributing effluent, especially when the number of trenches to be dosed is large (Mitchell, 1983).

Pressure manifolds can be designed to more effectively split flow between separate conventional trenches while still under pressure from the dosing tank. Schematics are presented below of pressure manifolds designed for level (Fig. 1) and sloping (Fig. 2) sites.

Pressure manifolds must be installed level, although some deviations may not seriously impair flow uniformity. Protective accessible boxes are recommended to be constructed around pressure manifolds installed above the drain field on sloping sites. Note that precautions against freezing may be necessary in cold

The author is: Steven J. Berkowitz, Environmental Engineer, Sanitation Branch, N. C. Division of Health Services, Raleigh, NC 27602-2091.

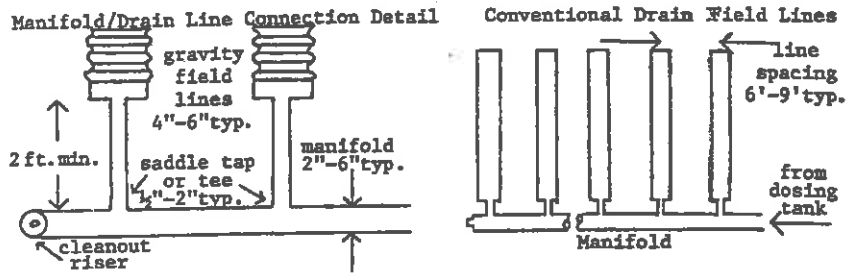


Fig. 1 Pressure Manifold For Level Site (1 ft. = .305 m)

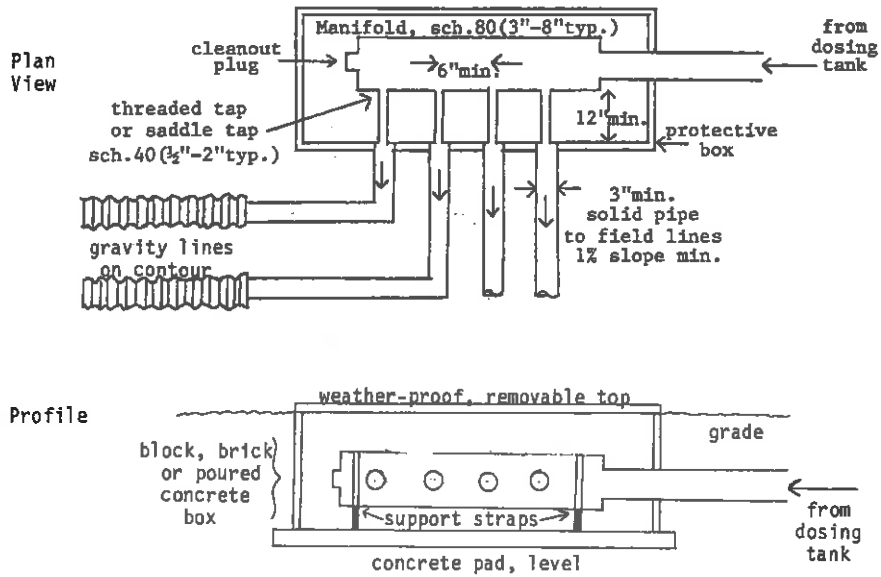


Fig. 2 Pressure Manifold For Sloping Sites

regions if the system is subject to extended periods of disuse unless provisions are made to drain out the manifolds, since they will normally remain about half-full between dosing cycles.

Design criteria for pressure distribution manifolds and laterals are presented in Table 1. Shown are the maximum number to taps by differently sized laterals which can be made out of manifolds of varying sizes, while maintaining no more than a five-percent difference between flow rates into each lateral. An important further assumption is that 1 to 4 feet of pressure head are available at the lateral outlets. Design criteria are presented both for manifolds with lateral taps in one side and for manifolds with lateral taps in adjacent sides.

Recommended design steps utilizing these criteria are as follows:

1. Select Drain Field Configuration: Determine the required field size, number of laterals to be dosed for each pressure manifold, and desired lateral and tap spacing.
2. Choose Lateral Tap Size: For pump dosed systems, pick the largest pressure tap that can be adequately pressurized by a reasonable sized pump. Use the orifice equation¹ to compute required flow per tap, assuming at least 2 feet of pressure head to each lateral opening. Taps less than one-half-inch nominal size is not recommended. For siphon-dosed systems, select a tap size large enough to handle the maximum siphon discharge rate with the head available between the siphon outlet and the pressure manifold, while still maintaining a sufficient pressure head at the minimum siphon discharge rate.
3. Select Manifold Size: Given the desired lateral tap size and spacing, select from Table 1 the minimum size of manifold from which at least the desired number of taps can be made while staying within the five-percent flow variation limit. Selecting the next larger sized manifold will yield an even greater degree of flow distribution uniformity.

¹Orifice equation:

$$Q = 13 (d^2) (h^*)$$

where Q = flow from orifice, gallons per minute
d = diameter of orifice, inches
h = pressure head, feet

Table 1: Pressure Distribution Manifolds for Conventional Septic Systems; Manifold and Lateral Tap Size Criteria

Tap Separation Distance (feet)	Manifold Size (Inches)	Lateral Taps out of One Side of Manifold Lateral Tap Size (inches)						Lateral Taps out of Both Sides of Manifold Lateral Tap Size (inches)							
		1/2	3/4	1	1 1/4	1 1/2	2	1/2	3/4	1	1 1/4	1 1/2	2		
0.5 ^a	2	4	2				2					2			
	3	9	5	3	2		4					2			
	4	16	9	5	3	2	7					4			
	6	40+	21	12	7	5	18					10			
	8		38	22	12	9	5	17				10			
3.0 ^c	2	8	2				2								
	3	14	12	3	2		6					2			
	4	21	18	6	3	2	16					5			
	6	38	30	26	8	5	20+					19			
												7			
6.0 ^c	2	5	4				4								
	3	9	7	6	2		7					3			
	4	14	11	9	4	2	10					9			
	6	27	20	17	14	7	19					15			
												13			
9.0 ^c	2	4	3	3			3								
	3	7	6	5	2		6					5			
	4	12	9	7	6	3	8					7			
												10			
												12			
Assumptions:		1 to 4 feet (.3 to 1.2 meters) head at lateral outlets; 5% maximum flow differential maintained between laterals; Hazen-Williams "C" factor of 140; taps are of Schedule 40 PVC and manifolds are of Schedule 80 PVC, with the following actual inside diameters:													
		-----nominal pipe size (inches)-----													
		1/2	3/4	1	1 1/4	1 1/2	2	3	4	6	8				
Taps		-----actual inside diameter: inches (millimeters)-----													
Manifolds		.622(19)	.824(25)	1.049(42)	1.38(42)	1.61(49)	2.067(63)								
Use for pressure manifold distribution box designed for sloping lots, located above highest field line.															
Use for pressure manifold on flat lots, located adjacent to end of each field line.															

PRESSURE MANIFOLDS
FOR LOW-PRESSURE PIPE DRAIN FIELDS

Low-pressure systems involve distributing effluent throughout the nitrification field within a pressurized manifold and small diameter lateral network. Effluent enters the nitrification trenches from orifices drilled into the distribution laterals (Fig. 3).

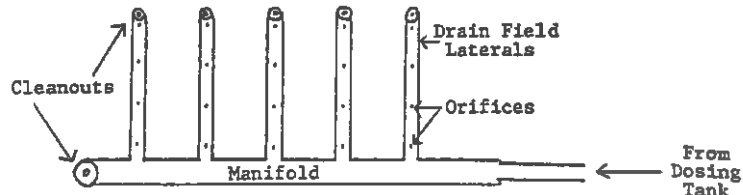


Fig. 3 Low-Pressure Pipe Drain Field

Pressure is generally maintained between 2 and 5 feet in the laterals to facilitate uniform distribution while minimizing scour outside of the orifices.

Critical design parameters for laterals are pipe diameter, lateral length, orifice size, and orifice spacing. In most low-pressure pipe applications in North Carolina, orifices range from 1/8-inch to 1/4-inch, with 5/32-inch orifices now recommended as the minimum size to use. Curves were developed which relate maximum lateral length to pipe diameter, orifice size, and spacing, based on yielding no more than a ten-percent difference between flow rates from each orifice (Fig. 4).

Critical design decisions for low-pressure system manifolds involve selecting the manifold diameter needed relative to the diameter of the laterals served and determining the maximum number of laterals which can be fed off a common supply manifold. Manifold design criteria are presented for the condition that the nitrification field is level and the manifold and laterals are on the same level (e.g.; laterals tee directly off from the manifold). Lateral spacing is assumed to be 5 feet, the most frequently used spacing for low-pressure pipe systems in North Carolina. Results are presented in Fig. 5 showing the maximum number of laterals of different sizes which can be supplied by a common manifold at varying mean lateral flow rates, while maintaining no more than 15-percent difference between flow rates into each lateral.

Results shown in Fig. 5 indicate that relatively few laterals can be served by small manifolds. It is uncertain, however, whether these criteria can be considered directly transferable to the more popular design whereby laterals are above the manifold, connected by short risers which tee off of the manifold and are elbowed or teed into each lateral. Under these conditions, more laterals than shown in Fig. 5 may in fact be fed by a common manifold while still maintaining relatively uniform flow distribution. Further research in this area is needed.

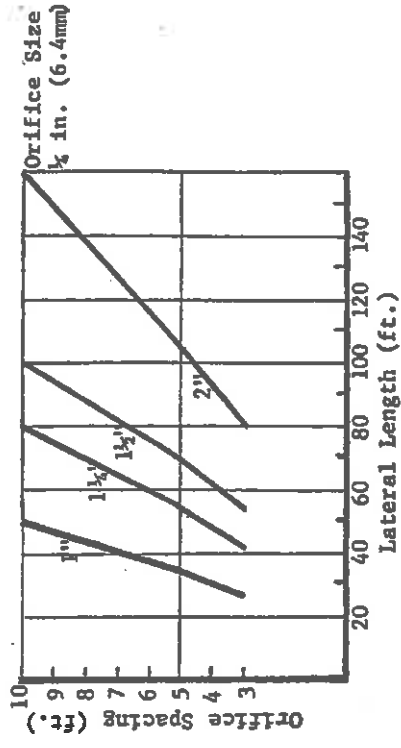
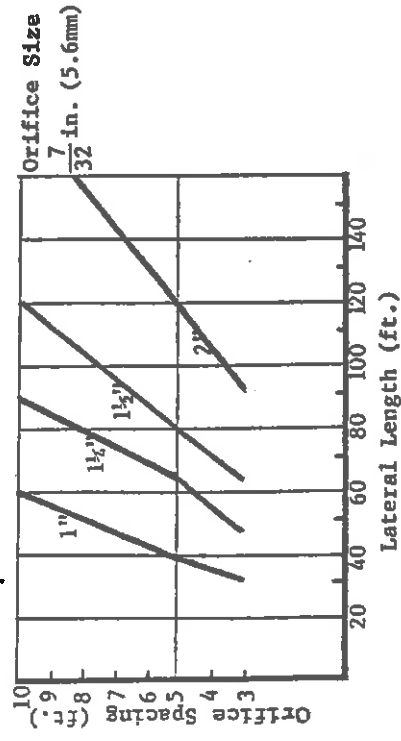
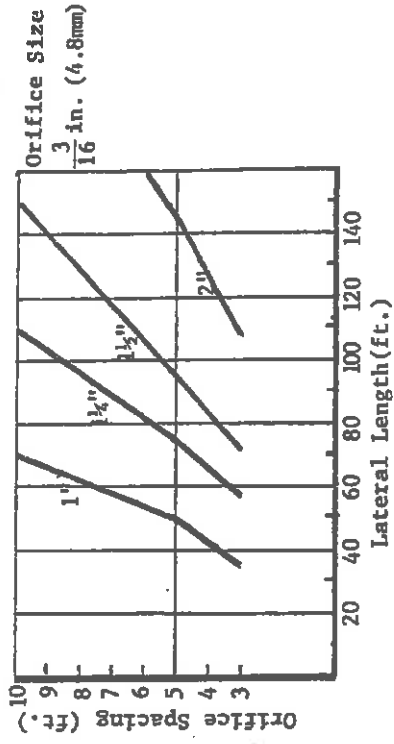
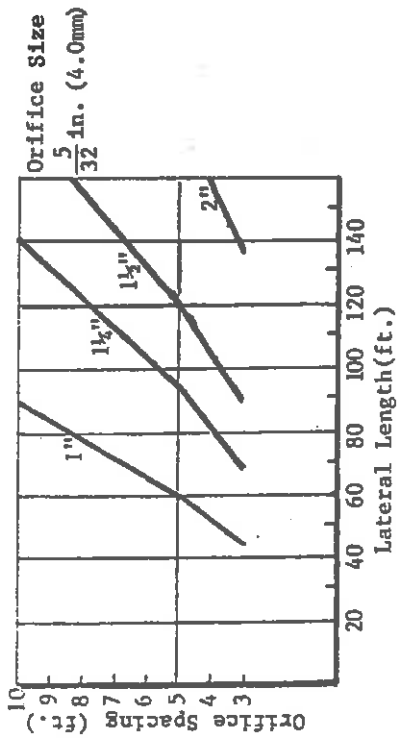


Fig. 4 Maximum Length of Different Sized Laterals For Low-Pressure Pipe Systems With Varying Orifice Sizes and Spacings (1 ft. = .305 m)

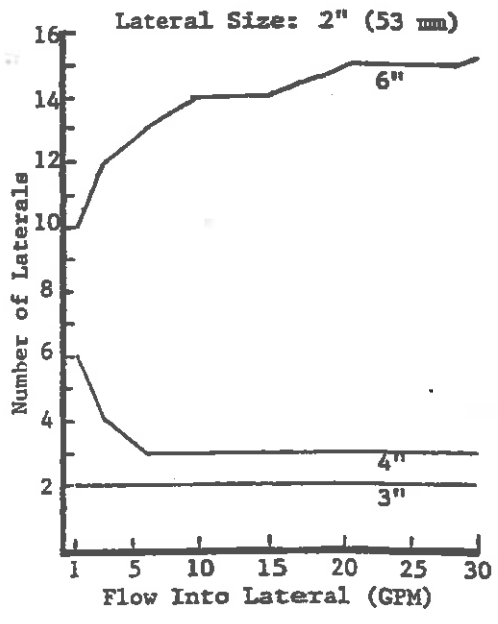
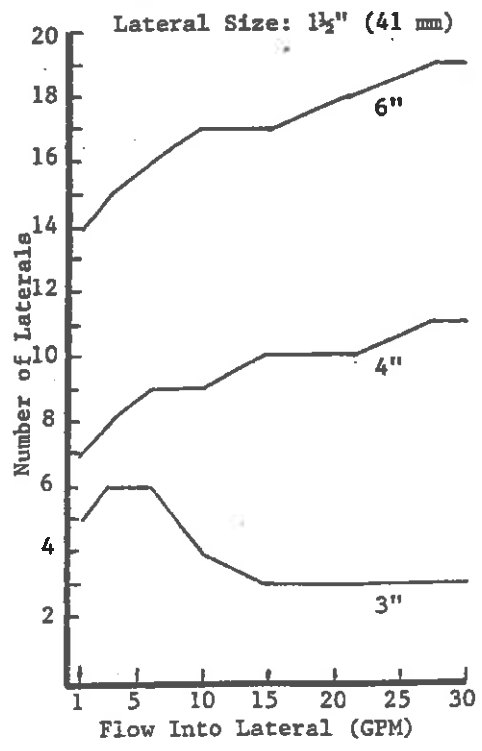
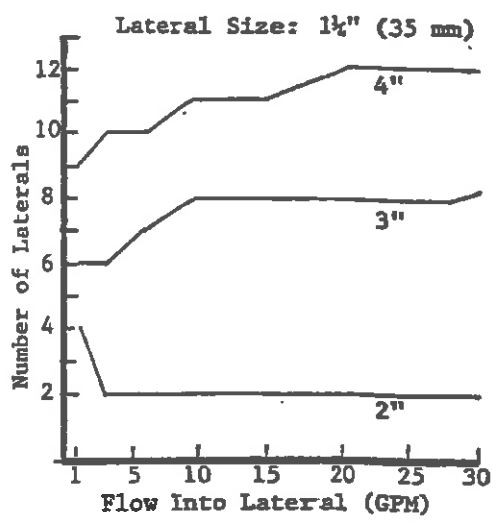
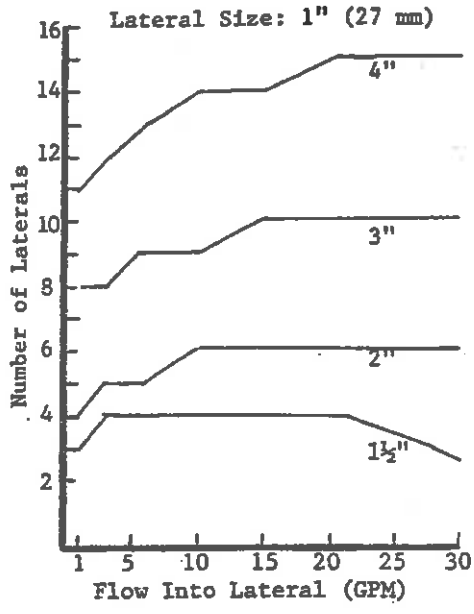


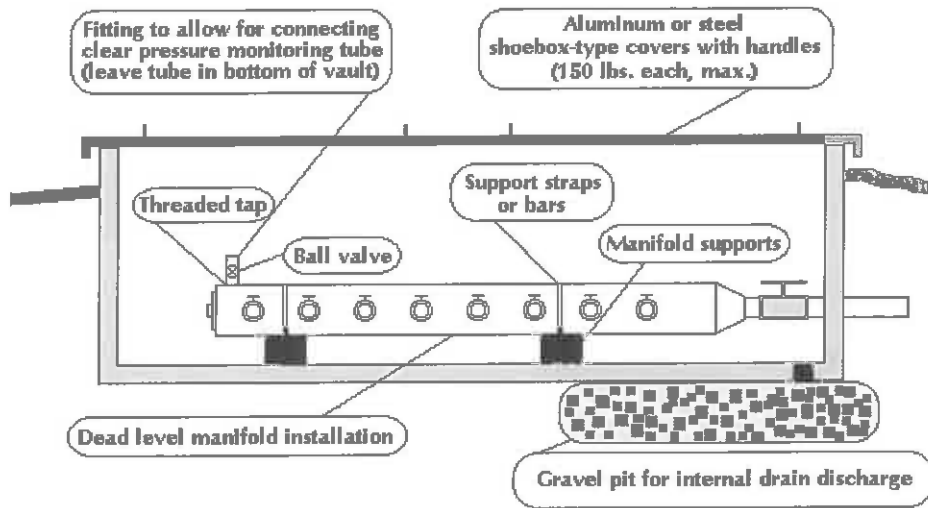
Fig. 5 Maximum Number of Different Sized Laterals For Low-Pressure Pipe Systems With Varying Sizes of Manifolds and Varying Rates of Flow Into Lateral (1 GPM = .0631 l/sec)

Recommended design steps using these criteria are as follows:

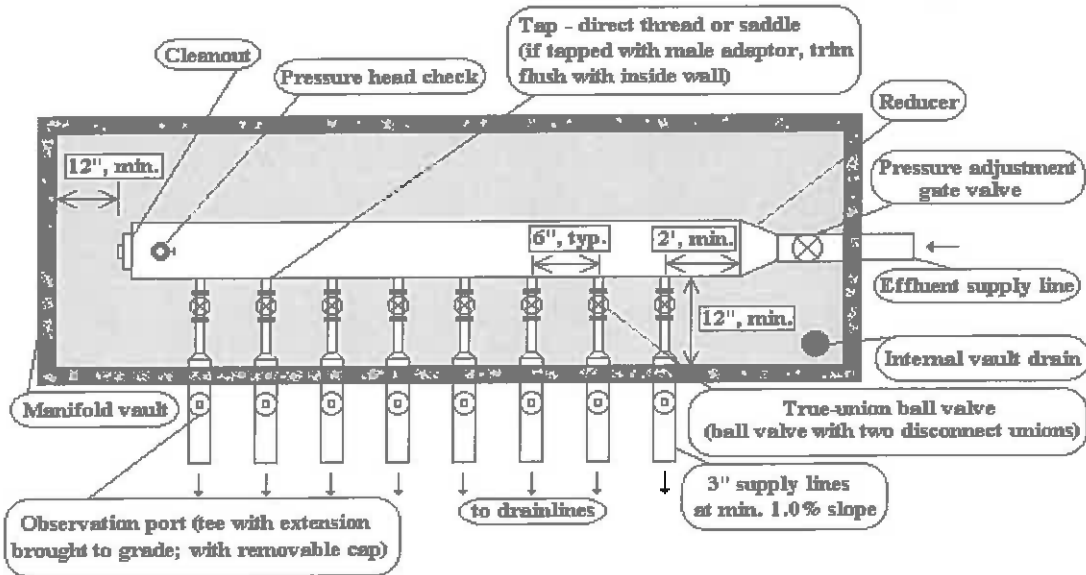
1. Select Drain Field Configuration: Determine the desired field size configuration, lengths of laterals, and location of supply manifolds.
2. Choose Orifice Size and Spacing: For pump dosed systems, select the largest orifice size and shortest orifice spacing resulting in a total number of orifices which can be adequately pressurized by a reasonably sized pump. Use the orifice equation to compute required flow per orifice, assuming at least 2 feet of pressure head at each orifice. Taps less than 5/32-inch and spacing greater than 10 feet are not recommended. For siphon-dosed systems, select an orifice size and spacing so that there are enough orifices of sufficient size to handle the maximum siphon discharge rate with the head available between the siphon outlet and the drain field, while still maintaining a sufficient pressure head at the minimum siphon discharge rate.
3. Choose Lateral Diameter: Given the desired lateral length and orifice size and spacing, select from Fig. 4 the minimum size of lateral from which at least the desired size and spacing of orifices can be used while staying within the 10-percent flow variation limit.
4. Select Manifold Size: Given the desired lateral size and lateral design flow rate, select from Fig. 5 the minimum size of manifold from which at least the desired number of laterals can be dosed while staying within the 15-percent flow variation limit.
5. Optimize Design: Repeat steps 1 through 4 above until a practical, workable manifold and lateral network design is obtained.

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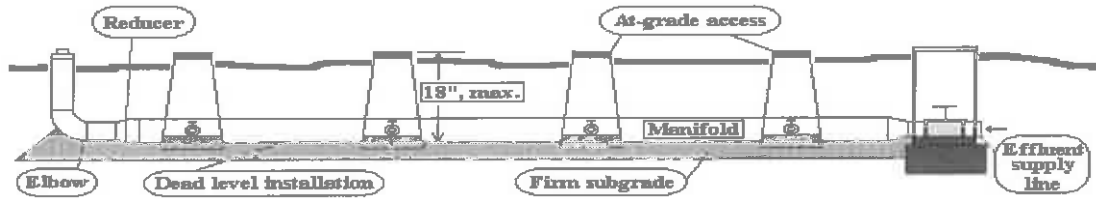
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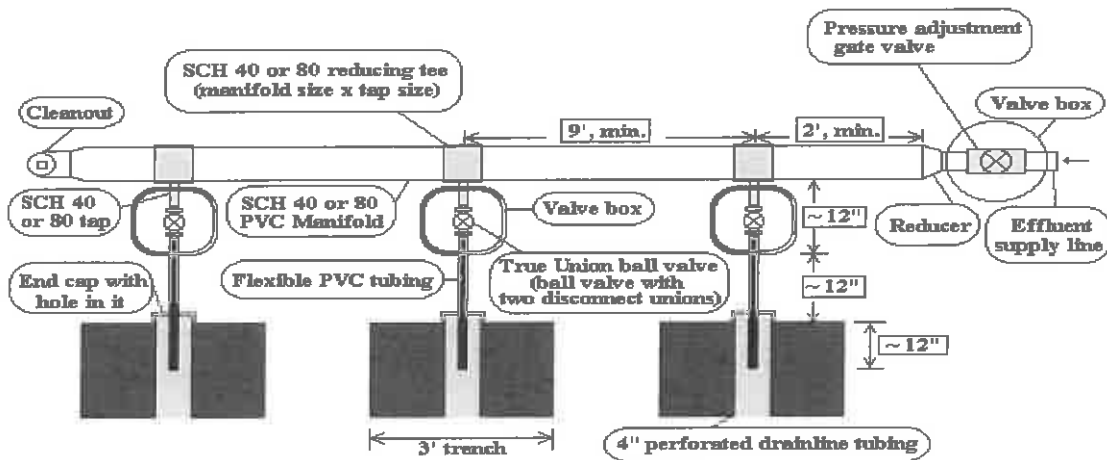
Profile View of Pressure Manifold for Sloping Site Installation (not to scale)



Plan View of Pressure Manifold for Sloping Site Installation (not to scale)



**Profile View of Pressure Manifold for Level Site Installation
(not to scale)**



**Plan View of Pressure Manifold for Level Site Installation
(not to scale)**



INFILTRATOR®
water technologies



The Quick4® Plus Standard Low Profile (LP) Chamber

Quick4 Plus™ Series

The Quick4 Plus Standard Low Profile (LP) offers maximum strength through its four center structural columns. This chamber can be installed in a 36-inch-wide trench. It is shorter in height than Infiltrator's other Standard model chambers, allowing for shallower installation. Like the original line of Quick4 chambers, it offers advanced contouring capability with its Contour Swivel Connection™, which permits turns up to 15°, right or left. The Quick4 Plus All-in-One 8 and Quick4 Plus Endcaps provide increased flexibility in system design and configurations.



Maximum Strength

Quick4 Plus Standard LP Chamber Specifications

Size
34"W x 53"L x 8"H
(864 mm x 1346 mm x 203 mm)

Effective Length
48" (1219 mm)

Louwer Height
6.3" (160 mm)

Storage Capacity
32 gal (121 L)

Invert Height
3.3" (84 mm), 9.6" (244 mm)



Quick4 Plus Standard Low Profile (LP) Chamber Benefits:

- Low profile design makes this chamber ideal for shallow applications
- Reduces imported fill needed for cap and fill systems
- Four center structural columns offer superior strength
- Advanced contouring connections
- Latching mechanism allows for quick installation
- Four-foot chamber lengths are easy to handle and install
- Supports wheel loads of 16,000 lbs/axle with 12" of cover

Quick4 Plus All-in-One Periscope Benefits:

- Allows for raised invert installations
- 180° directional inletting
- 12" raised invert is ideal for serial applications



Quick4 Plus All-in-One 8 Endcap Benefits:

- May be used at the end of chamber row for an inlet/outlet or can be installed mid-trench
- Mid-trench connection feature allows center feed inletting of chamber rows
- Center-feed connection allows for easy installation of serial distribution systems
- Variable pipe connection options allow for side, end or top inletting
- Piping drill points are set for gravity or pressure pipe

Quick4 Plus Endcap Benefits:

- Simple, flat design
- Allows installation of a pipe from the end only
- Piping drill points are set for gravity or pressure pipe

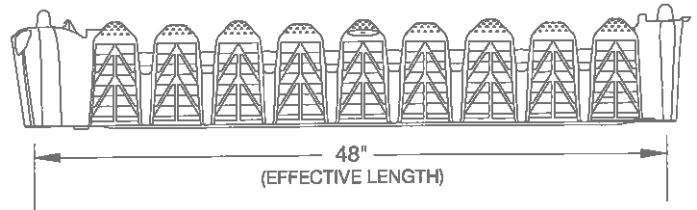
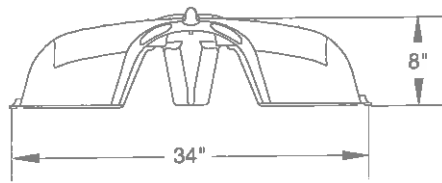


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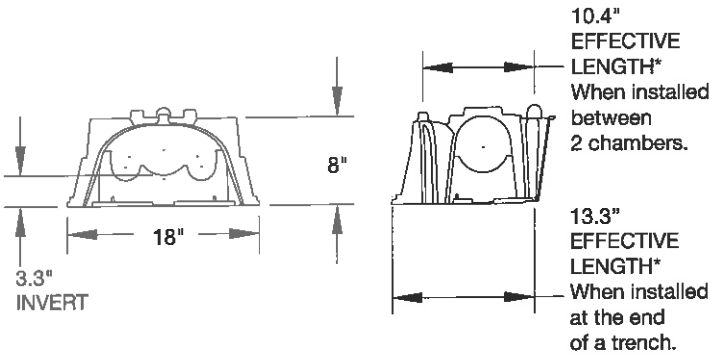


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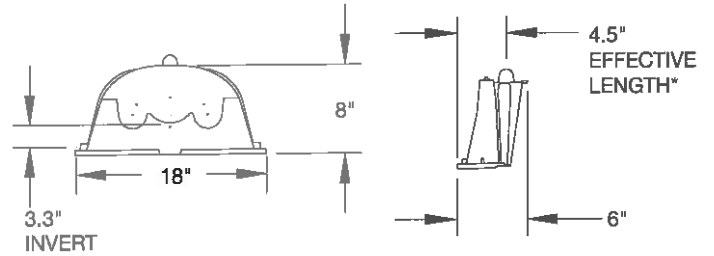
Quick4 Plus Standard Low Profile Chamber



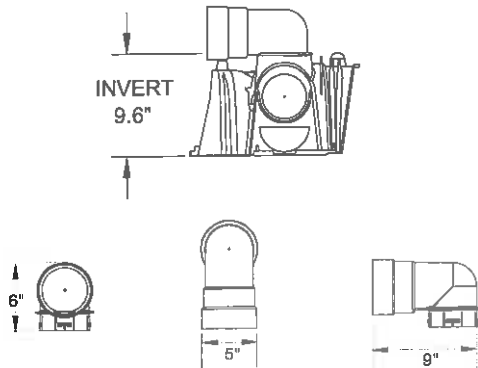
Quick4 Plus All-in-One 8 Endcap



Quick4 Plus Endcap



Quick4 Plus All-in-One Periscope



INFILTRATOR WATER TECHNOLOGIES, LLC ("INFILTRATOR")

Infiltrator Water Technologies, LLC STANDARD LIMITED Drainfield WARRANTY

(a) The structural integrity of each chamber, endcap, EZflow expanded polystyrene and/or other accessory manufactured by Infiltrator ("Units"), when installed and operated in a leachfield of an onsite septic system in accordance with Infiltrator's instructions, is warranted to the original purchaser ("Holder") against defective materials and workmanship for one year from the date that the septic permit is issued for the septic system containing the Units; provided, however, that if a septic permit is not required by applicable law, the warranty period will begin upon the date that installation of the septic system commences. To exercise its warranty rights, Holder must notify Infiltrator in writing at its Corporate Headquarters in Old Saybrook, Connecticut within fifteen (15) days of the alleged defect. Infiltrator will supply replacement Units for Units determined by Infiltrator to be covered by this Limited Warranty. Infiltrator's liability specifically excludes the cost of removal and/or installation of the Units.

(b) THE LIMITED WARRANTY AND REMEDIES IN SUBPARAGRAPH (a) ARE EXCLUSIVE. THERE ARE NO OTHER WARRANTIES WITH RESPECT TO THE UNITS, INCLUDING NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE

(c) This Limited Warranty shall be void if any part of the chamber system is manufactured by anyone other than Infiltrator. The Limited Warranty does not extend to incidental, consequential, special or indirect damages. Infiltrator shall not be liable for penalties or liquidated damages, including loss of production and profits, labor and materials, overhead costs, or other losses or expenses incurred by the Holder or any third party. Specifically excluded from Limited Warranty coverage are damage to the Units due to ordinary wear and tear, alteration, accident, misuse, abuse or neglect of the Units; the Units being subjected to vehicle traffic or other conditions which are not permitted by the installation instructions; failure to maintain the minimum ground covers set forth in the installation instructions; the placement of improper materials into the system containing the Units; failure of the Units or the septic system due to improper siting or improper sizing, excessive water usage, improper grease disposal, or improper operation; or any other event not caused by Infiltrator. This Limited Warranty shall be void if the Holder fails to comply with all of the terms set forth in this Limited Warranty. Further, in no event shall Infiltrator be responsible for any loss or damage to the Holder, the Units, or any third party resulting from installation or shipment, or from any product liability claims of Holder or any third party. For this Limited Warranty to apply, the Units must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Infiltrator's installation instructions.

(d) No representative of Infiltrator has the authority to change or extend this Limited Warranty. No warranty applies to any party other than the original Holder. The above represents the Standard Limited Warranty offered by Infiltrator. A limited number of states and counties have different warranty requirements. Any purchaser of Units should contact Infiltrator's Corporate Headquarters in Old Saybrook, Connecticut, prior to such purchase, to obtain a copy of the applicable warranty, and should carefully read that warranty prior to the purchase of Units.



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www.infiltratorwater.com

U.S. Patents: 4,759,661; 5,017,041; 5,156,488; 5,336,017; 5,401,118; 5,401,459; 5,511,903; 5,716,163; 5,588,778; 5,839,844 Canadian Patents: 1,329,858; 2,004,564 Other patents pending.
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Quick4® Plus Low Profile Chamber Installation Instructions



Note: When installing in sandy soil conditions, wheeled construction equipment is prohibited over the top of system. Tracked equipment can be used over top of system with a minimum of 6" of soil cover.

Before You Begin

This document addresses the installation of Quick4 Plus Standard Low Profile (LP) and Quick4 Plus Equalizer 36 Low Profile (LP) chambers. The Quick4 Plus Standard LP and the Quick4 Equalizer 36 LP chambers are designed for shallow placement applications. All chambers may only be installed according to state and/or local regulations. If unsure of the installation requirements for a particular site, contact the local health department. Like conventional systems, the soil and site conditions must be approved prior to installation. Conduct a thorough site evaluation to determine the proper sizing and siting of the system before installation.

Materials and Equipment Needed

- | | |
|---|---|
| <input type="checkbox"/> Quick4 Plus Standard Low Profile (LP) Chambers | <input type="checkbox"/> Utility Knife |
| <input type="checkbox"/> Quick4 Plus Equalizer 36 Low Profile (LP) Chambers | <input type="checkbox"/> 1 1/4-inch Drywall Screws* |
| <input type="checkbox"/> Quick4 Plus 8 Endcaps | <input type="checkbox"/> Drill |
| <input type="checkbox"/> Quick4 Plus All-in-One 8 Endcaps | <input type="checkbox"/> Hole Saw |
| <input type="checkbox"/> PVC Pipe and Couplings | <input type="checkbox"/> Screw Gun* |
| <input type="checkbox"/> Backhoe | <input type="checkbox"/> Small Valve-cover Box* |
| <input type="checkbox"/> Laser, Transit or Level | <input type="checkbox"/> 4-inch Cap for Inspection Port |
| <input type="checkbox"/> Tape Measure | |
| <input type="checkbox"/> Shovel and Rake | <i>* Optional</i> |

These guidelines for construction machinery must be followed during installation:

- Avoid direct contact with chambers when using construction equipment. Chambers require a 12-inch minimum of compacted cover to support a wheel load rating of 16,000 lbs/axle or equivalent to an AASHTO H-10 load rating.
- When installing in sandy soil conditions, wheeled construction equipment is prohibited over top of system. Tracked equipment can be used over top of system with a minimum of 6" of soil cover.**
- Avoid stones larger than 3 inches in diameter in backfill. Remove stones this size or larger that are in contact with chambers.

Excavating and Preparing the Site

Note: As is the case with conventional systems, do not install systems in wet conditions or in overly moist soils, as this causes machinery to smear the soil.

1. Stake out location of all trenches and lines. Set elevations of tank, pipe, and trench bottom.
2. Install sedimentation and erosion control measures. Temporary drainage swales/berms may be installed to protect site during rainfall.
3. Excavate and level trenches with proper width and center-to-center separation. Verify that trenches are level or have the prescribed slope.

Note: Over excavate in areas where you are planning to contour.

4. Rake bottom and sides if smearing has occurred while excavating. Remove any large stones and other debris. Do not use bucket teeth to rake trench bottom.

Note: Raking to eliminate smearing is not necessary in sandy soils. In fine textured soils (silts and clays), avoid walking in the trench to prevent compaction and loss of soil structure.

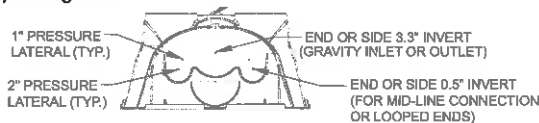
Preparing the End Cap

Note: Quick4 Plus 8 and Quick4 Plus All-in-One 8 Endcaps are available for use with the Quick4 Plus Standard LP and 36LP chambers on either end of the trench, depending upon the installer's preference and configuration requirements.

1. With a hole saw drill an opening appropriate for pipe diameter being used (normally 3 - 4 inches) on front or side of end cap using center point marking (see illustration) as a guide.



1 Drill end cap.



2. Snap off the molded splash plate located on the bottom front of the end cap.
3. Install splash plate into the appropriate slots below the inlet to prevent trench bottom erosion.

Installing the Quick4 Plus Periscope

Note: Available for use with Quick4 Plus 8 or Quick4 Plus All-in-One 8 Endcaps only. Invert options based on system design.

1. With a hole saw drill the pre-marked area on top of the Quick4 Plus 8 or Quick4 Plus All-in-One 8 Endcap.
2. Insert the Quick4 Plus Periscope into the top of the Quick4 Plus 8 or Quick4 Plus All-in-One 8 Endcap. Insert the Quick4 Plus Periscope until it snaps into place.



1 Drill Quick4 Plus Periscope.



2 Insert Quick4 Plus Periscope.

3. Insert a 4" Schedule 40 PVC pipe into the Quick4 Plus Periscope at the appropriate locations for the system design.

4. Rotate Quick4 Plus Periscope to desired angle.



3 Connect inlet pipe.

Installing the System

1. Check the header pipe to be sure it is level or has the prescribed slope.
2. Set the invert height as specified in the design from the bottom of the inlet.
3. Place the first chamber in the trench.

4. Place the back edge of the end cap over the inlet end of the first chamber. Be sure to line up the locking pins on the top of both the chamber and end cap.

Optional: Fasten the end cap to the chamber with a screw at the top of the end cap.



4 Place end cap inlet end.

5. Insert the inlet pipe 2.5 inches into the opening on the front of the end cap. Insert fully to the internal pipe stop.



5 Insert inlet pipe.

6. Lift and place the end of the next chamber onto the previous chamber by holding it at a 45-degree angle. Line up the chamber end between the connector hook and locking pin at the top of the first chamber. Lower the chamber to the ground to connect the chambers.

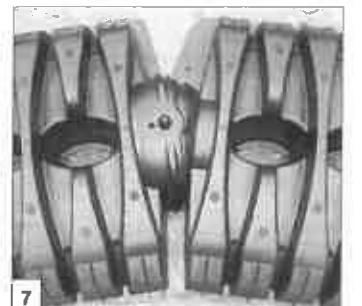
Note: The connector hook serves as a guide to ensure proper connection and does not add structural integrity to the chamber joint. Broken hooks will not affect the structure or void the warranty.

7. Swivel the chamber on the pin to achieve the proper direction for the trench layout.

Note: The chamber allows up to 10-degree swivel in either direction at each joint.

8. Continue connecting chambers until the trench is completed.

Note: As chambers are installed, verify they are level or have the prescribed slope.



7 Swivel chambers.

9. The last chamber in the trench requires an end cap. Lift the end cap at a 45-degree angle and align the connector hook on the top of the chamber with the raised slot on the top of the end cap. Lower the end cap to the ground and into place.

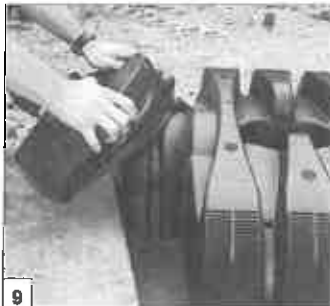
Note: Place a few shovels of soil around the end cap to secure it during backfill.

10. To ensure structural stability, fill the sidewall area by pulling soil from the sides of the trench with a shovel. Start at the joints where the chambers connect. Continue backfilling the entire sidewall area, making sure the fill covers the louvers.

11. Pack down fill by walking along the edges of trench and chambers.

Note: In wet or clay soils, do not walk in the sidewalls.

12. Proceed to the next trench and begin with Step 1.



Place end cap outlet end.

Installing Quick4 Plus All-in-One 8 Endcap as a Mid-line Connection

Note: See mid-line piping options on the back of this document.

1. With a hole saw drill an opening appropriate for the pipe diameter being used on the side (3.3" invert) or on top (9.0" invert) of the Quick4 Plus All-in-One 8 Endcap.

Note: Piping configurations are determined by the preference of the installer or designer.

2. With a hole saw, drill an opening on the end of the Quick4 Plus All-in-One 8 Endcap to create an invert at 0.5 inches. This will allow effluent to fill both sides of the chamber line.

2. Snap off the molded splash plate located on the bottom front of the end cap.

3. Install splash plate into the appropriate slots below the inlet to prevent trench bottom erosion.

4. Place the back edge of the end cap over the inlet end of the first chamber. Be sure to line up the locking pins on the top of both the chamber and end cap.

Optional: Fasten end cap to chamber with a screw at the top of endcap.

5. Insert the connection pipe 2.5 inches into the opening on endcap.

6. Repeat Steps 1 through 5 for additional trenches.



Drill endcap on side or top.



Drill endcap on end.



All-in-One 8 as mid-line connection.

Installing Optional Inspection Ports

Inspection ports may be installed on the chamber or the Quick4 Plus All-in-One 8 Endcap. The Quick4 Plus 8 Endcap does not allow inspection port construction.

Quick4 Plus All-in-One 8 Inspection Port

1. With a hole saw drill the pre-marked area in the top of the Quick4 Plus All-in-One 8 Endcap to create a 4 1/3 to 4 1/2-inch opening based on type of pipe.

2. Set a cut piece of pipe of the appropriate length into the corresponding end cap's inspection port sleeve.

Note: The sleeve will accommodate up to a 4-inch Schedule 40 pipe.

3. Use two screws to fasten the pipe to the sleeve around the inspection port.

4. Attach a threaded cap or cleanout assembly onto the protruding pipe at the appropriate height.

5. A small valve cover box may be used if the inspection port is below the desired grade.



All-in-One 8 inspection port.

Chamber Inspection Port

1. With a hole saw drill the pre-marked area in the top of the chamber to create a 2.5-inch opening.

2. Set a cut piece of pipe of the appropriate length into the corresponding chamber's inspection port hole.

Note: The sleeve will accommodate up to a 2.5-inch Schedule 40 pipe.

3. Use two screws to fasten the pipe to the chamber dome adjacent to the inspection port.

4. Attach a threaded cap or cleanout assembly onto the protruding pipe at the appropriate height.

5. A small valve cover box may be used if the inspection port is below the desired grade.



Chamber inspection port.

Covering the System

Before backfilling, the system must be inspected by a health officer or other official as required by state and local codes. Create an as-built drawing at this time for future records.

1. Backfill the system by pushing fill material over the chambers. Keep a minimum of 12 inches of compacted cover over the chambers before driving over the system with wheeled construction equipment.

Note: Do not drive over the system while backfilling in sandy soil.

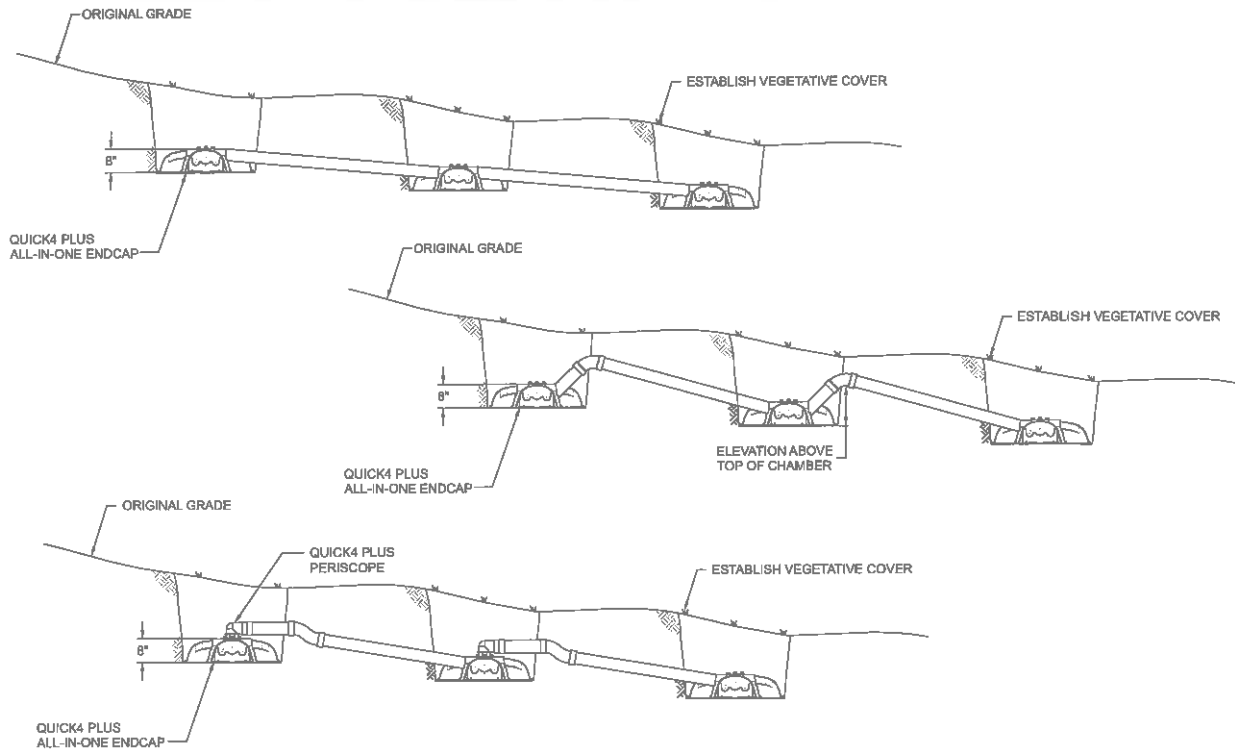
Note For shallow cover, sand fill, and sandy soil applications, tracked construction equipment must be used. You must mound 12 inches of soil over the system before driving over it with wheeled construction equipment, then grade it back a minimum 6 inches upon completion.

2. It is best to mound several inches of soil over the finished grade to allow for settling. A slight crown also ensures that runoff water is diverted away from the system trench.

3. After the system is covered, the site should be seeded or sodded to prevent erosion.

Note: If system is for new home construction, it is important to leave marking stakes along the boundary of the system. This will notify contractors of the system location so they will not cross it with equipment.

Serial Trench System Configuration Options



Infiltrator Water Technologies Limited Warranty

(a) The structural integrity of each chamber, end cap and other accessory manufactured by Infiltrator ("Units"), when installed and operated in a leachfield of an onsite septic system in accordance with Infiltrator's instructions, is warranted to the original purchaser ("Holder") against defective materials and workmanship for one year from the date that the septic permit is issued for the septic system containing the Units; provided, however, that if a septic permit is not required by applicable law, the warranty period will begin upon the date that installation of the septic system commences. To exercise its warranty rights, Holder must notify Infiltrator in writing at its Corporate Headquarters in Old Saybrook, Connecticut within fifteen (15) days of the alleged defect. Infiltrator will supply replacement Units for Units determined by Infiltrator to be covered by this Limited Warranty. Infiltrator's liability specifically excludes the cost of removal and/or installation of the Units.

(b) THE LIMITED WARRANTY AND REMEDIES IN SUBPARAGRAPH (a) ARE EXCLUSIVE. THERE ARE NO OTHER WARRANTIES WITH RESPECT TO THE UNITS, INCLUDING NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

(c) This Limited Warranty shall be void if any part of the chamber system is manufactured by anyone other than Infiltrator. The Limited Warranty does not extend to incidental, consequential, special or indirect damages. Infiltrator shall not be liable for penalties or liquidated damages, including loss of production and profits, labor and materials, overhead costs, or other losses or expenses incurred by the Holder or any third party. Specifically excluded from Limited Warranty coverage are damage to the Units due to ordinary wear and tear, alteration, accident, misuse, abuse or neglect of the Units; the Units being subjected to vehicle traffic or other conditions which are not permitted by the installation instructions; failure to maintain the minimum ground covers set forth in the installation instructions; the placement of improper materials into the system containing the Units; failure of the Units or the septic system due to improper siting or improper sizing, excessive water usage, improper grease disposal, or improper operation; or any other event not caused by Infiltrator. This Limited Warranty shall be void if the Holder fails to comply with all of the terms set forth in this Limited Warranty.

Further, in no event shall Infiltrator be responsible for any loss or damage to the Holder, the Units, or any third party resulting from installation or shipment, or from any product liability claims of Holder or any third party. For this Limited Warranty to apply, the Units must be installed in accordance with all site conditions required by State and local codes; all other applicable laws; and Infiltrator's installation instructions.

(d) No representative of Infiltrator has the authority to change or extend this Limited Warranty. No warranty applies to any party other than the original Holder.

The above represents the standard Limited Warranty offered by Infiltrator. A limited number of States and counties have different warranty requirements. Any purchaser of Units should contact Infiltrator's Corporate Headquarters in Old Saybrook, Connecticut, prior to such purchase, to obtain a copy of the applicable warranty, and should carefully read that warranty prior to the purchase of Units.



INFILTRATOR®
water technologies

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Old Saybrook, CT 06475
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1-800-221-4436
www.infiltratorwater.com

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Product information presented here reflects conditions at time of publication. Consult factory regarding discrepancies or inconsistencies.



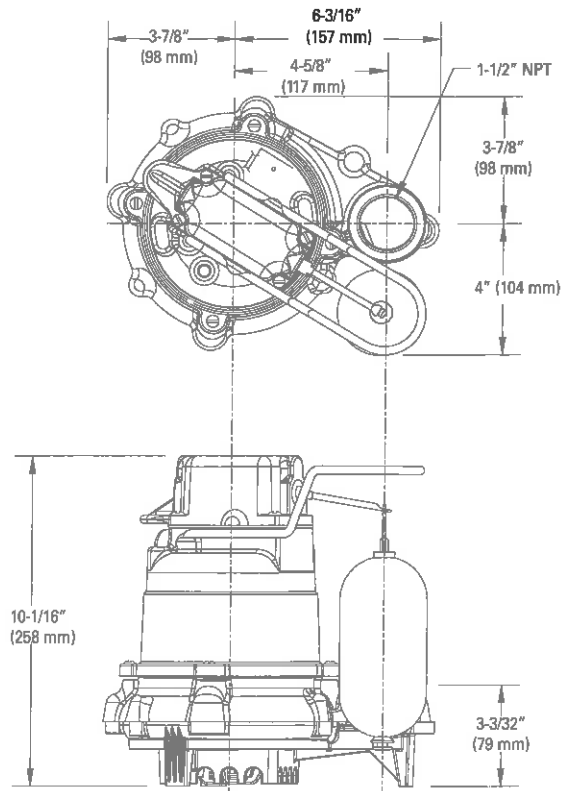
SECTION: 2.15.020
FM2778
1120
Supersedes
0515

TECHNICAL DATA SHEET MIGHTY-MATE SERIES

Cast Iron Models 53, 57 and Bronze Models 55, 59
Submersible Effluent / Dewatering Pumps

PRODUCT SPECIFICATIONS

MOTOR	Horse Power	3/10
	Voltage	115 or 230
	Phase	1 Ph
	Hertz	60 Hz
	RPM	1550
	Type	Shaded pole
	Insulation	Class B
	Amps	4.8 - 9.7
PUMP	Operation	Automatic or nonautomatic
	Auto On/Off Points	7-1/4" (18.4 cm) / 3" (7.6 cm)
	Discharge Size	1-1/2" NPT
	Solids Handling	1/2" (12 mm) spherical solids
	Cord Length	9' (3 m) automatic, 15' (5 m) nonautomatic
	Cord Type	UL listed, 3-wire, grounded plug
	Max. Head	19.25' (5.9 m)
	Max. Flow Rate	43 GPM (163 LPM)
	Max. Operating Temp.	130° F (54° C)
	Cooling	Oil filled
	Motor Protection	Auto reset thermal overload
MATERIALS	Cap	Cast iron or bronze
	Motor Housing	Cast iron or bronze
	Pump Housing	Cast iron or bronze
	Base	Cast iron, bronze or engineered thermoplastic
	Upper Bearing	Sleeve bearing
	Lower Bearing	Sleeve bearing
	Mechanical Seals	Carbon and ceramic
	Impeller Type	Non-clogging vortex
	Impeller	Plastic, cast iron or bronze
	Hardware	Stainless steel
	Motor Shaft	AISI 1215 cold rolled steel
	Gasket	Neoprene



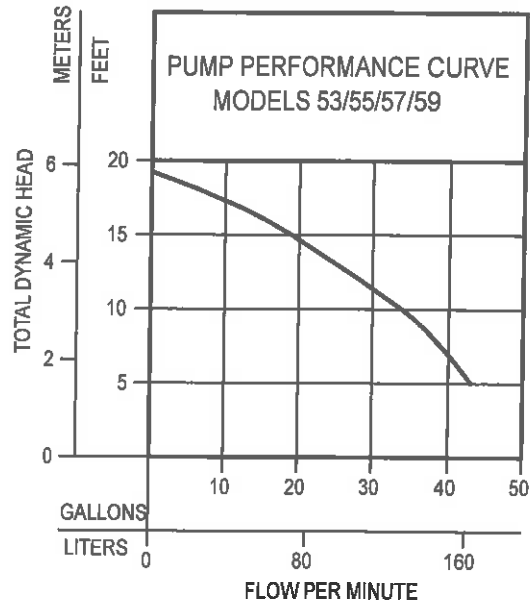
SK858

NOTE: See model comparison chart for specific details.



TOTAL DYNAMIC HEAD FLOW PER MINUTE

MODEL		53/55/57/59	
Feet	Meters	Gal.	Liters
5	1.5	43	163
10	3.0	34	129
15	4.6	19	72
Shut-off Head:		19.25 ft.(5.9m)	



009897

Model	MODEL COMPARISON										
	Seal	Mode	Volts	Ph	Amps	HP	Hz	Lbs	Kg	Simplex	Duplex
M53/M55	Single	Auto	115	1	9.7	3/10	60	23	10	1	---
N53/N55	Single	Non	115	1	9.7	3/10	60	23	10	2	3 & 4
* BN53	Single	Auto	115	1	9.7	3/10	60	25	11	*	---
* BE53/BE57	Single	Auto	230	1	4.8	3/10	60	24 / 30	11 / 13	*	---
D53	Single	Auto	230	1	4.8	3/10	60	23	10	1	---
E53/E55	Single	Non	230	1	4.8	3/10	60	22	10	2	3 & 4
M57/M59	Single	Auto	115	1	9.7	3/10	60	29 / 33	13 / 15	1	---
N57/N59	Single	Non	115	1	9.7	3/10	60	28 / 29	12 / 13	2	3 & 4
* BN57	Single	Auto	115	1	9.7	3/10	60	30	13	*	---
D57/D59	Single	Auto	230	1	4.8	3/10	60	30 / 33	13 / 15	1	---
E57/E59	Single	Non	230	1	4.8	3/10	60	28 / 29	12 / 13	2	3 & 4
E59	Single	Non	230	1	4.8	3/10	60	29	13	2	3 & 4

* Single piggyback switch included.

SPECIAL MODEL FEATURES

Additional cord lengths are available in 15' (5 m), 25' (8 m) and 35' (11 m). 50' (15 m) cord lengths available for 230 V units only.

BE and BN models include a piggyback variable level pump switch.

Model 53: cast iron switch case, motor and pump housing, a plastic impeller and base. Model 57: all cast iron construction with a cast iron impeller. Model 55: bronze switch case, motor and pump housing, a plastic impeller and base. Model 59: bronze construction with a bronze impeller.

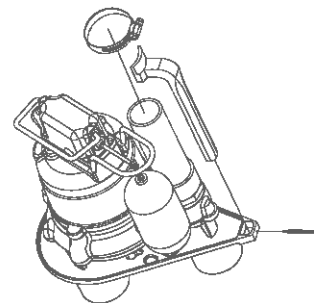
Optional pump stand (P/N 10-2421).

SELECTION GUIDE

1. Integral float-operated mechanical switch, no external control required.
2. Single piggyback variable level float switch or double piggyback variable level float switch. Refer to FM0477.
3. See FM0712 for correct model of Electrical Alternator.
4. Variable level control switch 10-0743 used as a control activator with electrical alternator (3) or (4) float system.

OPTIONAL PUMP STAND P/N 10-2421

- Reduces potential clogging by debris
 - Replaces rocks or bricks under the pump
 - Made of durable, noncorrosive ABS
 - Raises pump 2" (5 cm) off bottom of basin
 - Provides the ability to raise intake by adding sections of 1½" or 2" (DN40 or DN50) PVC piping
 - Attaches securely to pump
 - Accommodates sump, dewatering and effluent applications
- NOTE: Make sure float is free from obstruction.



All installation of controls, protection devices and wiring should be done by a qualified licensed electrician. All electrical and safety codes should be followed including the most recent National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).

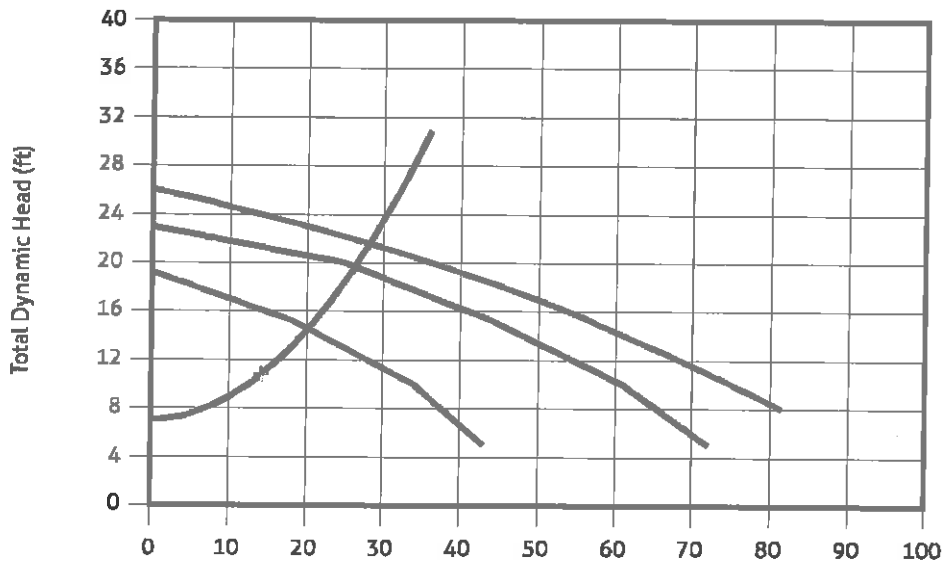
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502-778-2731 | 800-928-7867 | 3649 Cane Run Road | Louisville, KY 40211-1961 | zoellerpumps.com

Known Flow and TDH

Effluent

Sizing ID: PW6-ZZ6-TRM



System Curve		Fittings
GPM	TDH (ft)	None Selected
0.00	7.10	
6.00	7.76	
12.00	9.74	
18.00	13.05	
24.00	17.67	
30.00	23.61	
36.00	30.88	

Flow (GPM)*: 14.20
TDH (ft)*: 10.80

*Per user data

Curve Models	Eq. Flow	Eq. Head
53	20.21	14.60
57	20.21	14.60
98	26.20	19.70
137	28.11	21.61

Pump Specs	
Electrical	115 volt, 1 phase, 60 Hertz
Physical	
Discharge Size	1.50" NPT
Solids Handling (in.)	0.5
Static Head (ft)	7.1000
TDH (ft)	10.8

By registering on this site, user acknowledges that Zoeller Company is not responsible for inaccurate pump sizing or misapplication due to incorrect information entered by the user. For sizing assistance, please contact Zoeller's Product Support Department at [1-800-928-7867](tel:1-800-928-7867) (or [1-502-778-2731](tel:1-502-778-2731)), extension 6, or email zcotechical@zoeller.com

EZ Series® - Single Phase Simplex

Single phase, simplex demand dose or timed dose float controlled system for pump control and system monitoring.

The EZ Series® simplex control panel is designed to control one 120, 208, 240 VAC single phase pump in water and sewage installations.

The EZ Series® simplex control panel features a display on the inside of the front cover for programming and system monitoring.

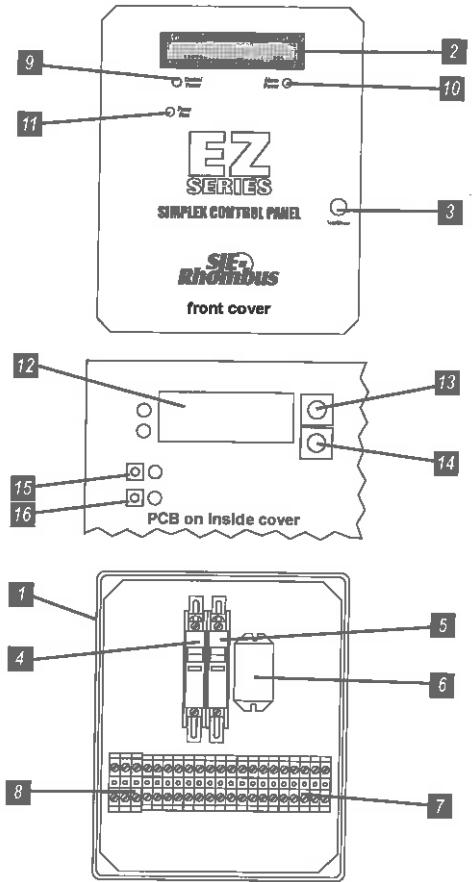
The panel configuration can be easily converted in the field to either a timed dose or demand dose.

The optional post models include an access door. The post can be mounted in the ground directly, over a 4X4, or conduit. The panel is also available with optional duo alarm to meet the needs of various applications.

PANEL COMPONENTS

1. **Enclosure base** measures 10 X 8 X 6 inches (25.4 X 20.32 X 15.24 cm). NEMA 4X (ultraviolet stabilized thermoplastic with removable mounting feet for outdoor or indoor use). Includes locking latch as standard. **Note:** Options, voltage, and amp range selected may change enclosure size and component layout.
2. **Red Alarm Beacon** provides visual check of alarm condition.
3. **Exterior Alarm Test/Silence Switch** allows horn and light to be tested and horn to be silenced in an alarm condition. Alarm automatically resets once alarm condition is cleared.
4. **Circuit Breaker** provides pump power disconnect and branch circuit protection.
5. **Circuit Breaker** provides control/alarm power disconnect.
6. **Power Relay** controls pump by switching electrical lines.
7. **Float Connection Terminal Block**
8. **Incoming Control/Alarm Power & Pump Power Terminal Block**
9. **Control Power Indicator** indicator light illuminates if control power is present in panel.
10. **Alarm Power Indicator** indicator light illuminates if alarm power is present in panel.
11. **Pump Run Indicator** will illuminate when pump is called to run.
12. **LED Display** shows system information including: pump elapsed time (hh:mm), events (cycles).
13. **Menu/Enter Button** used for viewing panel settings.
14. **Set/Change Button** used for programming panel settings.
15. **Pump 1 Push To Run Momentary Switch** - Pump activates when pressed
16. **Alarm Horn** provides audio warning of alarm condition (83 to 85 decibel rating). (Located inside panel on cover, not shown)

NOTE: Schematic/Wiring Diagram and Pump Specification Label are located inside the panel.



Model Shown EZS21W914X6A8AC10E15A (Inside view)

Reg. Cdn Pat. & TM Off

FEATURES

- Entire control system (panel and switches) is UL Listed to meet and/or exceed industry safety standards
- Dual safety certification for the United States and Canada
- Standard package includes:
 - Demand Dose** - three control switches
 - Timed Dose** - two control switches
- Available with EZconnex® float system
- Complete with step-by-step installation instructions
- Five-year limited warranty



SJE RHOMBUS.

PO Box 1708, Detroit Lakes, MN 56502

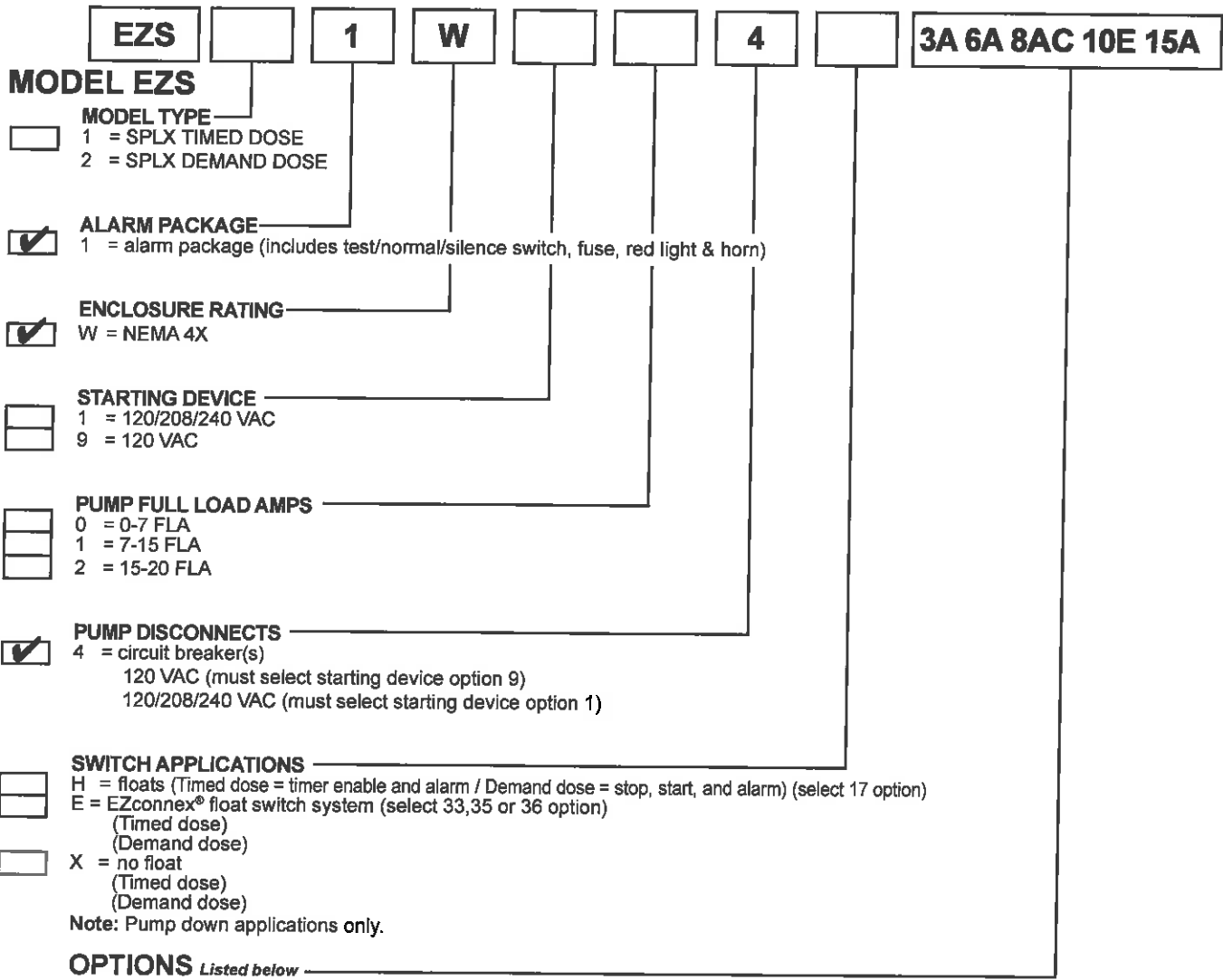
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1-218-847-4617 Fax

email: customer.service@sjerhombus.com

www.sjerhombus.com B.1

**SEE BACKSIDE FOR COMPLETE LISTING OF AVAILABLE OPTIONS.
SEE PRICE BOOK FOR LIST PRICE.**



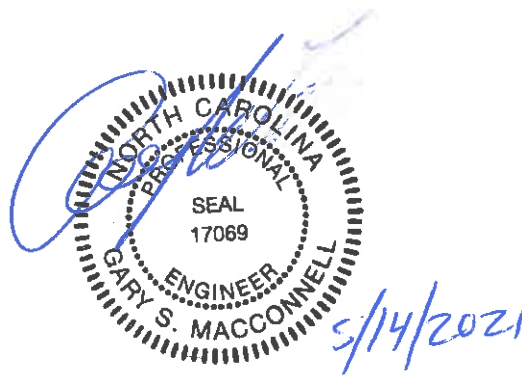
- CODE DESCRIPTION**
- 1J Duo alarm inputs
 - 3A Alarm Flasher *(included as standard)*
 - 4A Redundant off *(timed dose float panel only)*
(select 4D if floats are required)
 - 4D Redundant off float
(must select 4A option) (must select 17 option)
 - 6A Auxiliary alarm contact, form A *(included as standard)*
 - 8AC Display board includes: ETM counter, events (cycles)
counter, alarm counter *(included as standard)*
 - 10E Lockable latch - NEMA 4X *(included as standard)*
 - 10P Mounting post *(factory installed with 2.5" cord seal)*
 - 15A Control / Alarm circuit breaker *(included as standard)*
 - 16A 10' cord in lieu of 20' *(per float)*
 - 16B 15' cord in lieu of 20' *(per float)*
 - 16C 30' cord in lieu of 20' *(per float)*
 - 16D 40' cord in lieu of 20' *(per float)*
 - 17C Sensor Float® / internally weighted ▲ *(per float)*
 - 17D Sensor Float® / externally weighted ▲ *(per float)*
 - 17G MilliAmpMaster™ / pipe clamp ● *(per float)*
 - 17H MilliAmpMaster™ / externally weighted ● *(per float)*
 - 17J Sensor Float® / pipe clamp ▲ *(per float)*

- CODE DESCRIPTION**
- 18A Timer override float (timed dose float panel only)
 - 22G 2 1/2" hub installed with 6 hole cord seal
 - 33D EZconnex® 3-Port, 25', w/10' floats (3) /pipe clamp *
 - 33E EZconnex® 3-Port, 50', w/10' floats (3) /pipe clamp *
 - 33G EZconnex® 3-Port, 25', w/20' floats (3) /pipe clamp *
 - 33H EZconnex® 3-Port, 50', w/20' floats (3) /pipe clamp *
 - 35D EZconnex® 4-Port, 25', w/10' floats (4) /pipe clamp *
(timed dose only)
 - 35E EZconnex® 4-Port, 50', w/10' floats (4) /pipe clamp *
(timed dose only)
 - 35G EZconnex® 4-Port, 25', w/20' floats (4) /pipe clamp *
(timed dose only)
 - 35H EZconnex® 4-Port, 50', w/20' floats (4) /pipe clamp *
(timed dose only)
 - 36D EZconnex® 3-Port, 25', w/10' floats (2) /pipe clamp,
sealing plug *
 - 36E EZconnex® 3-Port, 50', w/10' floats (2) /pipe clamp,
sealing plug *
 - 36G EZconnex® 3-Port, 25', w/20' floats (2) /pipe clamp,
sealing plug *
 - 36H EZconnex® 3-Port, 50', w/20' floats (2) /pipe clamp,
sealing plug *

● Mechanically-activated ▲ Mercury-activated * EZconnex® mechanically-activated, narrow angle float switches with quick release connections.

**Evan and Patricia Germond
1594 Josey Williams Rd
(Lot 3 Kemp Holdings)**

**Engineered Option Permit
Pressure Manifold**



Operation and Maintenance Procedures

**MacConnell & Associates, P.C.
501 Cascade Pointe Lane, Ste 103
Cary, North Carolina 27513**

**P.O. Box 129
Morrisville, North Carolina 27560**

**Phone: (919) 467-1239
Fax: (919) 319-6510**

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

**INNOVATIVE WASTEWATER
SYSTEM APPROVAL**

INNOVATIVE WASTEWATER SYSTEM NO: IWWS-2010-1-R6

Issued To: Infiltrator Water Technologies, LLC
PO Box 768
Old Saybrook, CT 06475
800-221-4436; Fax: 860-577-7001
www.infiltratorwater.com

Contact: Dave Lentz, PE

For: Infiltrator Quick4 Plus Standard Low Profile (LP) Chamber, Quick4 Plus Standard Low Profile (LP) All-in-One 8 Endcap, and BioDiffuser Arc 36 Low Profile (LP) Chamber

Approval Dates:	May 21, 2010	Approve Quick4 Plus Standard Low Profile
	April 5, 2011	Approve Arc 36 LP
	November, 2012	Change of Arc 36 LP Ownership to Infiltrator Systems Inc.
	September 5, 2014	Add Area Credit for Endcap
	October 31, 2014	Add Reduced Soil Depth for Coastal Plain Physiographic Region
	May 1, 2015	Merge IWWS-2011-1-R1 Arc 36 LP specifications into IWWS-2010-1-R2; retire IWWS-2011-1-R1
	August 7, 2015	Update trench levelness requirements and change company name to Infiltrator Water Technologies, LLC*
	July 16, 2018	Addition of Piedmont and Mountain physiographic regions to Innovative Approval; retire CDWS-2010-1-R2B
	February 8, 2019	Addition of Bed-in-fill system specifications**

*Prior approvals were issued to Infiltrator Systems, Inc. or predecessor companies

**Refer to Section VIII for Bed-in-fill siting, sizing, special site assessment, design, installation criteria, and permitting.

In accordance with G.S. 130A-343 and 15A NCAC 18A .1969, an application by Infiltrator Water Technologies, LLC or its predecessor of Old Saybrook, CT for a revised approval of their chamber (gravel-less) trench, bed, and Bed-in-fill system has been reviewed and found to meet the requirements of an innovative system when all of the following conditions are met:

I. General

A. Scope of this Innovative Approval

1. Use, design and installation requirements for the Infiltrator Water Technologies, LLC chamber trench, bed, and Bed-in-fill systems.
2. Infiltrator has demonstrated that the modified systems, the Infiltrator Quick4 Plus Standard LP and Arc 36 LP models when sized using the equivalency factor of 3.0 sf/lf as stated in this approval, with a minimum of six inches of cover, will perform in a manner equal or superior to the system as previously approved by Innovative Wastewater System Approval No. IWWS-93-2-R11 and its successors and CDWS 2010-1-R2B. The Quick4 Plus Standard LP and Arc 36 LP models with a minimum of six inches of cover are therefore hereby approved with innovative status subject to the conditions contained herein.

II. System Description

A. Minimum pretreatment by septic tank as required in 15A NCAC 18A .1952.

1. The Quick4 Plus Standard LP unit consists of polypropylene arch-shaped injection molded chamber.
2. The connected overall length of a Quick4 Plus Standard LP chamber is 4 feet.
3. Twenty-five Quick4 Plus Standard LP chambers are approximately equal to 100 feet.
4. The Arc 36 LP unit consists of high-density polypropylene or polyethylene arch-shaped injection molded chambers.
5. The connected overall length of an Arc 36 LP chamber is 5 feet.
6. Twenty Arc 36 LP chambers are approximately equal to 100 feet.

Table I – Infiltrator Chamber Dimensions

Model	Height (in)	Invert ¹ Height (in)
Quick4 Plus Standard LP	8.0	3.3 and 9.0
Arc 36 LP	8.0	3.8 and 8.0

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

D. Each chamber unit shall be permanently marked as applicable:

1. Quick4 Plus Standard LP; or
2. Arc 36 LP.

E. Each chamber unit mechanically interlocks with the downstream chamber forming a complete line consisting of an inlet plate or cap with a splash plate located below the inlet on the trench bottom and a solid end plate or cap to be located at the distal end of any chamber line.

- F. In addition to conventional use as an end cap, the Quick4 Plus All-in-One 8 Endcap and the Quick4 Plus Periscope pipe appurtenances can also be used as an accessory with the Quick4 Plus Standard LP chamber 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. The Quick4 Plus All-in-One 8 Endcap can be used in all applications where the Quick4 Plus Standard LP chamber may be utilized.

III. Siting Criteria (*Refer to Section VIII for Bed-in-fill siting criteria.*)

- A. **ALL COUNTIES:** The Quick4 Plus Standard LP and Arc 36 LP trench assemblies may be utilized on any site which meets all the following criteria:
1. **All Soil Groups**
 - a. A **minimum of 20 inches** of naturally occurring soil shall be present above a limiting condition (saprolite, rock, parent material, expansive clay mineralogy, unsuitable soil structure, or restrictive horizons),
 - b. A **minimum of 26 inches** of naturally occurring soil shall be present above a soil wetness condition when the vertical separation consists of Group I soils as described in (d) below,
 - c. A **minimum of 12 inches** of naturally occurring soil shall be present between the trench bottom and saprolite, rock, parent material, restrictive horizons, or any soil horizon unsuitable as to structure or clay mineralogy,
 - d. A **minimum of 12 inches** of naturally occurring Group II, III, or IV soil shall be present between the trench bottom and an unsuitable soil wetness condition. If more than six inches of the vertical separation distance to a soil wetness condition consists of Group I soils, a **minimum of 18 inches** of separation is required. If 18 inches of separation cannot be achieved in natural soil, low pressure pipe (LPP) dispersal shall be required, and,
 - e. All other factors provisionally suitable or suitable.
 2. Sites which meet the criteria for new or existing fill in accordance with 15A NCAC 18A .1957(b). The provisions of 15A NCAC 18A .1957(b) are applicable whenever any portion of the chamber in an Infiltrator system extends into fill material. This reference to "fill material" applies to the site fill and not the backfill placed between the trench and the chamber sidewall.
 3. The required vertical separation shall be measured from the bottom edge of the chamber.

IV. System Sizing (*Refer to Section VIII for Bed-in-fill sizing criteria.*)

- A. Reductions in total trench bottom area shall not be granted.
- B. The maximum long-term acceptance rate (LTAR) shall be as specified in Table II:

Table II– LTAR for Infiltrator Chambers

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

*For sites where the LTAR exceeds 1.0 gpd/sq ft, use an LTAR of 1.0 gpd/sq ft.

- C. For sites with a usable soil depth of 26 inches or less, the LTAR shall be based on the most hydraulically limiting, naturally occurring soil horizon within 26 inches of the ground surface or to a depth of one foot below the trench bottom, whichever is shallower.
- D. For sites with a usable soil depth of 27 to 35 inches, the LTAR shall be based on the most hydraulically limiting, naturally occurring soil horizon within 27 inches of the ground surface or to a depth of one foot below the trench bottom, whichever is deeper.
- E. For sites with a usable soil depth of 36 inches or greater, 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.
- F. To determine the total trench bottom area (ft²) required the design daily sewage flow is divided by the applicable LTAR from Table II.
- G. The minimum area (without reduction) for a bed system in natural soil shall be determined as required in 15A NCAC 18A .1955(d) except that the chambers shall be placed in rows next to each other. The requirements of 15A NCAC 18A .1955(d) shall be met for the installation of a bed system.
- H. 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.
- I. The sizing for the Quick4 Plus Standard LP end cap system shall be determined by the equivalency factors in Table III. Equivalency factors for the Arc 36 LP end cap system do not apply.

Table III – Equivalency Factors for Quick4 Plus Standard LP End Caps

Product	Excavated Trench Width (inches)	Approved Chamber Equivalency Factor Linear Foot Basis (sf/lf) ^{1,2}	Linear Feet of Chamber Credit per Pair when Placed at Ends of Chamber Line (lf) ^{2,3}	Linear Feet of Chamber Credit per Unit when Placed as a Mid Line Connection (lf) ^{2,4}
Quick4 Plus Standard LP All-in-One 8 Endcap	36	3.0	1	1

¹ Actual linear-foot equivalency rating of compatible chamber part.

² Only listed end cap model qualifies for bed bottom area credit.

³ Must install two (2) end cap parts to get approved linear feet of chamber credit.

⁴ Single end cap part installed within chamber line receives one (1) linear foot of chamber credit.

V. Special Site Evaluation (*Refer to Section VIII for Bed-in-fill special site evaluation criteria.*)

A special site evaluation may be required based on the proposed ground absorption system. Refer to 15A NCAC 18A .1970(p).

VI. Design Criteria (*Refer to Section VIII for Bed-in-fill design criteria.*)

Refer to Siting Criteria (Section III) and Installation (Section VII) for details.

VII. Installation (*Refer to Section VIII for Bed-in-fill installation criteria.*)

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

Table IV – Infiltrator Installation Requirements (depths measured from finished grade)

Model	Maximum Trench Width (in)	Maximum Trench Depth (in)	Minimum Trench Spacing (ft on center)	Minimum Soil Cover (in)
Quick4 Plus Standard LP	36	36	9	6
Arc 36 LP	36	36	9	6

- B. The inlet to the Infiltrator chamber is in the uppermost portion of the specially molded inlet panel (end cap). 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 and modifications that enable the presence and effectiveness of these provisions to be field-verified.
- C. The Quick4 Plus All-in-One 8 Endcap may be used as an accessory with the Quick4 Plus Standard LP chamber 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. The number of chambers in the chamber rows extending in opposite directions from the Quick4 Plus All-in-One 8 Endcap does not need to be equal.
- D. Backfill shall be placed between the trench and chamber sidewall to a minimum compacted (carefully walked in) height that is equal to the top of the chamber louvers. Chamber systems can be installed utilizing native soil backfill (Group I, II, III, or IV). Backfill shall be free of trash or debris. The area adjacent to louvers 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 procedure shall be followed.
- E. Infiltrator chambers may be installed with a minimum compacted cover of six inches when the following conditions are met:
1. The person installing or constructing the system is certified (documented) by Infiltrator Water Technologies, LLC or its authorized representative as specially trained and qualified to install Infiltrator chamber units with a minimum soil cover of 6 inches;
 2. The person installing the Quick4 Plus Standard LP or Arc 36 LP chamber system shall produce certification documentation upon request by the State or local health department.
 3. When installing the Quick4 Plus Standard LP or Arc 36 LP chambers the installer shall carefully follow the manufacturer’s installation guideline for shallow placement.
 4. In Group I soils, with only six inches of cover, tracked equipment shall be used during backfill as specified by the manufacturer’s installation procedures.

Vehicular traffic or construction equipment may traverse the chamber system only during system

installation. The load must be 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 cover over the chamber.

- G. Chamber trenches shall be constructed level in all directions with one-half-inch tolerance from side-to-side and maximum fall in a single trench bottom not exceeding one-fourth inch in 10 feet end-to-end for any continuous contoured segment. The trenches shall follow the contour of the ground surface elevation (uniform depth). Trenches shall be constructed with continuous interlocking chambers, without any dams, stepdowns or other water stops.
- H. Infiltrator chamber systems installed on a sloping site may use distribution devices or stepdowns as described in 15A NCAC 18A .1955(j) and (l) when necessary to change level line segments from upper to lower elevations. For the Quick4 Plus Standard LP chamber, the Quick4 Plus All-In-One 8 Endcap and Quick4 Plus Periscope pipe appurtenances may be used as a stepdown by making the cross-over out of one of its pre-marked 3.3- or 9.0-inch-high ports. From the end cap, effluent is conveyed through a solid pipe segment installed on a positive downhill grade down to the next lower trench in series. For the Quick4 Plus Standard LP chamber, the pre-marked port on the top of the Quick4 Plus All-In-One 8 Endcap may be used to receive effluent from an upper trench by a cross-over pipe. Infiltrator's MultiPort Invert Adapter or glued 4-inch diameter piping may also be used to change elevation between lines. Stepdown installation details shall be in accordance with the manufacturer's installation procedures.
- I. After installation of chambers in trench or bed configurations, a filter fabric barrier shall be installed to cover the chambers (except Quick4 and Arc models) if chambers are installed in uncompacted, fine or very fine uniform sand and at least one of the following conditions 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 shall be approved in writing by the manufacturer on a case-by-case basis.
- J. The type and placement of soil cover shall be approved by the local health department.
- K. Manufacturer's installation instructions for the applicable Infiltrator chamber system used in septic tank systems shall be followed except as required herein or 15A NCAC 18A .1900 et.seq.
- L. All Infiltrator chamber systems shall be installed by a contractor or installer appropriately certified in writing by the manufacturer or its authorized representative.
- M. The Quick4 Plus Standard LP chamber system shall be installed only with the Infiltrator Quick4 Plus All-in-One 8 Endcap or Quick4 Plus 8 Endcap options at the ends of each chamber row. The ends of each Arc 36 LP chamber row shall be installed only with end cap system designed for that particular chamber model.
- N. For LPP applications, sleeving the pressurized pipe within a larger-diameter pipe is not

required or recommended, nor is it prohibited.

VIII. Bed Systems Installed in Fill (Bed-in-fill System)

- A. For chamber systems installed in a bed configuration in fill, all Section VIII requirements apply.
1. The allowable chambers models are the Quick4 Plus Standard LP and Arc 36 LP.
 2. End caps shall be compatible with the chamber model to be used and sized using the Bed-in-fill equivalency factor in Table V.

Table V – Bed-in-fill Equivalency Factors for End Cap Systems

Product ¹	Engaged Length of Single End Cap at End of a Chamber Line (ft)	Approved Bed-in-fill System Equivalency Factor Linear Foot Basis ² (sf/lf)
Quick4 Plus Standard LP All-in-One 8 Endcap	1.0	3.0

¹ End cap model used must be compatible with chamber product and only model listed qualifies for an equivalency factor.

² Linear-foot equivalency factor of compatible chamber part.

- B. Bed-in-fill Siting criteria
1. A Bed-in-fill system may be installed on sites where at least the first 36 inches below the naturally occurring soil surface consist of sand or loamy sand (Soil Group I).
 2. A Bed-in-fill system shall only be used when the local health department determines that there is inadequate space to install a gravity flow trench-type system as required in 15A NCAC 18A .1957(b). The site shall have a uniform slope not exceeding 2 percent.
 3. No soil wetness condition shall exist within the first 12 inches below the naturally occurring soil surface. Artificial drainage shall not be used to meet this requirement.
 4. The horizontal setbacks of 15A NCAC 18A .1950 shall apply as measured from a point of 5 feet from the nearest edge of the bed sidewall.
 5. Refer to Table I for chamber dimensions.
 6. The required vertical separation shall be measured from the bed bottom.
- C. Bed-in-fill System sizing
1. The maximum daily sewage flow shall not exceed 480 gpd.
 2. The LTAR shall not exceed 1.0 gpd/sq ft. For sites where the LTAR exceeds 1.0 gpd/sq ft, use 1.0 gpd/sq ft.
 3. The minimum required bed bottom area (sq ft) required shall be determined based upon the design daily sewage flow divided by the applicable LTAR. The resulting area value shall be increased by 50% in accordance with 15A NCAC 18A .1955(d).
 4. The minimum required bed bottom area shall contain a combination of chambers and end caps (placed on 3-foot centers) and the distribution device and piping such that their combined outside perimeter area is equal to or greater than the minimum bed bottom area required under Section VIII(C)(3). Chambers and end caps shall cover the bed bottom as described in Section VIII(E). The maximum spacing between opposing end caps adjacent to the distribution device shall be 6 feet or in accordance with the manufacturer's installation instructions. End cap bed bottom sizing shall be determined per the bed equivalency factors in Table V.

Example:

Three bedroom residence with a design daily sewage flow of 360 gallons on a sand (Group I) soil having a LTAR equal to 0.90 gpd/sq ft

Total minimum required Bed-in-fill system bed bottom area is:
 $360 \text{ gpd} / 0.90 \text{ gpd/sq ft LTAR} \times 1.5 \text{ bed upsizing factor} = 600 \text{ sq ft}$

For a center-fed Quick4 Plus Standard LP chamber with Quick4 Plus All-in-One 8 Endcap bed system constructed using five chambers and two end caps for each of four laterals on each side of the bed, the area provided to satisfy the minimum required bed bottom area is calculated as follows:

Chamber area = 2 sides of bed x 4 laterals x 5 chambers x 3 sq ft/ft x 4 ft/chamber
= 480 sq ft
End cap area = 2 sides of bed x 4 laterals x 3 sq ft/lf of end cap x 1.0 ft long x 2
end caps = 48 sq ft
Distribution device area = 4 laterals x 3 ft wide/lateral x 6 ft long = 72 sq ft
Total chamber, end cap, and distribution device area provided = 600 sq ft

This example results in a bed with a footprint of 12 ft x 50 ft minus any buffer and toe slope, and requires 40 chambers, 16 end caps, and a distribution box with at least 4 outlets on each side. Six feet of separation is allowed in the center of the bed for the distribution box and piping.

5. No industrial process wastewater shall discharge to a Bed-in-fill system.
6. The available space requirements of 15A NCAC 18A .1945 shall be met, and an approved innovative system may be designated as the required replacement system.

D. Bed-in-fill Special Site Evaluation

A special site evaluation may be required based on the proposed ground absorption system. Refer to 15A NCAC 18A .1970(p).

E. Bed-in-fill Installation

1. Fill material shall be sand or loamy sand (Group I soil), containing not more than 10 percent debris, and shall be approved prior to placement by the local health department.
2. Prior to fill placement, the site shall be void of a vegetative cover, organic litter, and debris.
3. Fill shall be placed in 6-inch lifts, with each fill layer mixed with the underlying layer of natural soil or sandy fill material.
4. The sideslope of the fill shall not exceed a rise to run ratio of 1:3.
5. The system shall be constructed as an elongated berm with the long axis parallel to the ground elevation contours of the slope.
6. The bottom of the bed shall be excavated level ($\pm 1/4$ ") in all directions.
7. Chamber rows shall be placed 3 feet on-center.
8. The edge of the bed shall be located 1 1/2 feet from the centerline of the outermost chamber row.

9. For each chamber row, the outer end caps shall extend at least to the end of the required bed footprint.
10. Allowable effluent distribution includes gravity flow, pressure-dosed gravity or LPP.
11. For gravity and pressure-dosed gravity distribution, the following requirements apply:
 - a. The bed bottom shall have a minimum separation of 24 inches from any soil wetness condition.
 - b. The bed bottom shall have a minimum separation of 30 inches from any soil horizon unsuitable as to soil structure, clay mineralogy, organic soil, restrictive horizon, rock, or saprolite.
 - c. The distribution device shall be placed in the center of the bed and is eligible for sizing credit if underlain by Group I fill material or 12 inches or less of gravel.
 - d. The bed bottom area shall include the area bounded by the edges of the outmost chamber rows and end caps located at the distal ends of the chamber rows. The bed bottom area includes the area between chamber rows where the distribution device and piping are located.
 - e. Each line of chambers shall be connected to a distribution box or pressure manifold.
 - f. A maximum of 16 chamber lines are allowed, with no more than 8 on each side of the distribution device.
 - g. The bed width shall be constructed in a multiple of 3 feet up to a maximum of 24 feet.
 - h. Group I fill material shall be placed to the top of the chambers.
 - i. The final 6 inches of soil cover placed over the bed and side slopes shall be classified as a Group II or III soil.
12. For LPP distribution, the following requirements apply:
 - a. The bed bottom shall have a minimum separation of 18 inches from any soil wetness condition.
 - b. The bed width shall be constructed in a multiple of 3 feet up to a maximum of 24 feet.
 - c. Laterals shall be installed in each chamber line per the manufacturer's installation instructions using uniform spacing between laterals. Sleeving of the lateral in a larger-diameter pipe is not required or recommended, nor is it prohibited.
 - d. The bed bottom area shall include the area bounded by the edges of the outmost chamber rows and end caps located at the ends of the chamber rows.
 - e. Except as described herein, the provisions of 15A NCAC 18A .1957(a) shall apply.
 - f. Group I fill material shall be placed to the top of the chambers.
 - g. The final 4 inches of soil cover over the bed and side slopes shall be classified as Group II or III soil.
13. For approved Residential Wastewater Treatment Systems (RWTS) or approved innovative advanced pretreatment systems, the following requirements apply:
 - a. The RWTS shall be approved in accordance with the provisions of 15A NCAC 18A .1957(c).
 - b. The bed bottom shall have a minimum separation of 18 inches from any soil wetness condition.
 - c. The bed system may utilize a gravity distribution as described in Section VIII(E)(11).
 - d. If LPP distribution is utilized, the requirements of Section VIII(E)(12) shall apply except that the bed bottom shall have a minimum separation of 12 inches from

any soil wetness condition.

14. The latest version of the manufacturer's installation procedure shall be followed.
15. The person installing or constructing the system shall be certified (documented) by Infiltrator Water Technologies, LLC or its authorized representative as specially trained and qualified to install chamber units.
16. The person installing the chamber system shall produce certification documentation upon the request by the State or local health department.
17. The inlet to the Infiltrator chamber is in the uppermost portion of the end cap. 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 and modifications that enable the presence and effectiveness of these provisions to be field-verified.
18. After installation of chambers, 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 conditions are present.
 - a. Installations are left uncovered and subject to a major rain event.
 - b. Systems are subject to not being sodded (or stabilized) in a timely manner after final cover-up has occurred.
 - c. 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 shall be approved in writing by the manufacturer on a case-by-case basis.
19. Manufacturer's installation instructions for the applicable Infiltrator chamber system used in septic tank systems shall be followed except as required herein or 15A NCAC 18A .1900 et. seq.
20. All Infiltrator chamber systems shall be installed by a contractor or installer appropriately certified in writing by the manufacturer or its authorized representative.
21. The Quick4 Plus Standard LP chamber system shall be installed only with the Infiltrator Quick4 Plus All-in-One 8 Endcap or Quick4 Plus 8 Endcap options at the ends of each chamber row. The ends of each Arc 36 LP chamber row shall be installed only with end cap system designed for that particular chamber model.

E. Bed-in-fill Permitting

Any improvement permit and operation permit issued for a Bed-in-fill system shall include the specific condition required in 15A NCAC 18A .1957(b)(1)(L)(iv).

IX. Operation, Maintenance and Monitoring Requirements

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

X. Permitting

Prior to the installation of the approved Infiltrator chamber trench, bed, or Bed-in-fill system at a site, the owner or owner's agent shall fill out an application at the local health department for the proposed use of this system. The local health department shall issue an improvement permit and construction authorization or amend a previously issued construction authorization allowing the use of an Infiltrator chamber system

upon a finding that the provisions of the applicable Rules and conditions of this approval are 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.

XI. Repair of Systems

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

Approved by: _____ Date: _____

Utilization of Your Wastewater Disposal System

In order to obtain the maximum efficiency and life expectancy from your system, the following simple procedures must be adhered to:

1. **Practice water conservation.** This can include many practical considerations such as not leaving the water running while you brush your teeth, not overfilling the tub, limiting time in the shower, not replacing low flow fixtures with those of higher flows, over rinsing dishes (allow the dishwasher to do its job), immediate repair of any leaking fixtures, running washing machines and dishwashers only when full, etc.

NOTE: Washing machines generate significant volumes of wastewater. As a result, laundry activities should be spread over the week as opposed to accumulating all of laundry until the weekend.

2. **Do not utilize your wastewater disposal system as a trash can by dumping nondegradables down your drains or toilet.** These include cigarette butts, sanitary products, grease, plastics, disposable diapers, etc. Avoid use of garbage disposals. Do not retrofit garbage disposals unless the system is specifically permitted for their use. Also, do not dump harmful chemicals down the drain. These include petroleum products, paint, paint thinner, pesticides, antifreeze, etc.

Maintenance of Your Wastewater Disposal System

Every wastewater disposal system requires maintenance in order to function properly. The specific maintenance required is related to the type of system. The following are general considerations that apply to all systems.

1. **Protect your wastewater disposal system components including the tanks, access risers, disposal field and associated components.** Do not drive or park on any portion of the system. The area over the disposal field should be left undisturbed with the grass cover being maintained as you would your lawn. Location of trees and shrubs on or in close proximity to the disposal field is not recommended since roots may clog or damage your drain lines. Additionally, great care must be exercised when considering the addition of any structure(s) to the site. The location of any appurtenances cannot encroach on the installation or repair areas for your system. It is not recommended that irrigation systems be located in proximity to the disposal system since their construction can cause system damage and/or result in additional hydraulic load on the disposal field.
2. **Protect the system from excess surface and shallow groundwater.** The land surface on and around the wastewater disposal system should be landscaped to shed rainfall and runoff and prevent ponding. Be sure that foundation drains, runoff from roofs and drives, etc. are diverted away from the disposal system.
3. **Regularly have the septic tank / pump tank pumped and cleaned by a permitted septage hauler.** Although the necessary frequency of pumping varies with the household and system, most tanks need **pumping at a frequency of 3-5 years** and at any time solids occupy one-fourth to one-third of the septic tank liquid depth.

Note that all septic tanks being currently installed incorporate an effluent filter within the outlet compartment of the septic tank. This filter is to be cleaned anytime the septic tank is pumped. If plumbing becomes sluggish, this filter should be checked. If filter service is found to be necessary, the tank is to be pumped, the filter cleaned and the filter reinstalled.

4. **Be alert to warning signs that your system may not be functioning properly.**
These include sewage surfacing over the disposal system, sewage backups / slow draining in the house, lush growth over the disposal system, sewage odors, etc.
5. **Do not make or allow repairs to your system unless all necessary permits are obtained from Wake County Department of Environmental Services.**
6. **Commercial additives for septic tank systems** - It has generally not been demonstrated that these additives enhance the function of septic systems or reduce the need for tank pumping and other necessary maintenance.
7. **Special maintenance considerations** - As already alluded to, some of the more complex wastewater disposal systems require that you retain / maintain the services of a Certified Wastewater System Operator in order to comply with Laws and Rules and maintain a valid operation permit for your system. In Wake County this maintenance requirement should be recorded with Register of Deeds if applicable.

Where Do I Obtain Information and Assistance?

If you are purchasing a new home, you should request a copy of your wastewater system permit from the builder / seller along with information regarding any special maintenance requirements. You may also obtain information and assistance from the **Wake County Department of Environmental Services**, 336 Fayetteville Street Mall, Raleigh, NC, Telephone (919) 856-7400. The County also maintains an Internet web site at <http://www.wakegov.com/environment>. This site contains much useful information and a number of links.

BSM 12/14/05