John Elias Baldacci
Governor

Maine Department of Health and Human Services

Maine Center for Disease Control and Prevention
286 Water Street, 3rd Floor
11 State House Station
Augusta, ME 04333-0011

Brenda M. Harvey,
Commissioner

Dora Anne Mills, MD, MPH
Public Health Director
Maine CDC Director

June 5, 2006

Bio-Microbics, Inc.
Attn.: Allison Blodig, Regulatory Affairs Manager
8450 Cole Parkway
Shawnee, KS 66227

Subject: Product Registration, Bio-Microbics FAST System, 75 Per Cent Reduction

Dear Ms. Blodig:

The Division of Health Engineering has completed a review of a registration application for your company's product. This information was submitted pursuant to Section 1802 of the Maine State Plumbing Code, Subsurface Wastewater Disposal Rules (Rules), for code registration, for use in Maine.

Product Description

The Bio-Microbics FAST Systems consists of external air blowers, a bubbler, and a proprietary growth medium (e.g, "RetroFAST" insert for RetroFAST models and "MicroFAST" for other models). The RetroFAST models are designed for installation in conventional septic tanks. MicroFAST, HighStrength FAST, and NitriFAST are complete units. The Bio-Microbics FAST System is designed for use with conventional onsite sewage disposal areas and drip irrigation disposal areas. The various models have the treatment capacities shown in the following table.

Model	Capacity (gpd)
RetroFAST 0.25	250
RetroFAST 0.375	375
MicroFAST 0.5	500
MicroFAST 0.9	900
MicroFAST 1.5	1500
MicroFAST 3.0	3000
MicroFAST 4.5	4500
MicroFAST 9.0	9000
HighStrength FAST 1.0	1000
HighStrength FAST 1.5	1500
HighStrength FAST 3.0	3000
HighStrength FAST 4.5	4500
HighStrength FAST 9.0	9000
NitriFAST 0.5	500
NitriFAST 0.75	750
NitriFAST 0.9	900
NitriFAST 1.5	1500
NitriFAST 3.0	3000
NitriFAST 4.5	4500
NitriFAST 9.0	9000

The principal difference between the various models is their treatment capacities. A copy of NSF Standard 40 approval for the FAST Single Home System, dated August 28, 1996, was also included in your original application.

You have requested approval for use of these devices in Maine, and that the Division allow a 75% reduction in disposal area size for use of these devices

Claim

According to the information you provided, the Bio-Microbics FAST System provides significant reductions in BOD_5, TSS, and nitrogen compounds.

Determination

On the basis of the materials submitted, the Division has determined that the Bio-Microbics FAST System is acceptable for use in the State of Maine, provided that it is installed, operated, and maintained in conformance with the manufacturer's directions, with the following conditions:

1. The disposal areas for onsite sewage disposal systems using the Bio-Microbics FAST System shall be sized in accordance with Table 603.1 of the Subsurface Wastewater Disposal Rules, except as allowed pursuant to Condition #2, below.

2. Stone trenches are allowed a 75 per cent reduction in size, based upon the standard sizing requirements of the Rules, when used with the Bio-Microbics FAST System.

3. In the event that the product fails to perform as claimed by the applicant, use of the product in Maine, including all installations approved pursuant to Section 1801.7 of the Rules, shall cease. Use of the product shall not resume until the applicant and the Division have reached a mutually acceptable agreement for resolving the failure to perform as claimed.

4. This letter supersedes the letter dated August 30, 2002.

Because installation and owner maintenance has a significant effect on the working order of onsite sewage disposal systems, including their components, the Division makes no representation or guarantee as to the efficiency and/or operation of The Bio-Microbics FAST System. Further, registration of this product for use in the State of Maine does not represent Division preference or recommendation for this product over similar products.

If you have any questions please feel free to contact me at (207) 287-5695.

Sincerely,

James A. Jacobsen, Environmental Specialist IV
Wastewater and Plumbing Control Program
Division of Health Engineering
e-mail: james.jacobsen@state.me.us

/jaj

xc: Product File

Wendy- please log in as "product review" for F.A.S.T. System, there should be something in the database for previous product approvals. Thanks! Jim

P.S. AKA. Biomicrobics

Jacobsen, James

From: Martin, Russell
Sent: Tuesday, May 09, 2006 2:51 PM
To: Jacobsen, James
Subject: FW: Approval letter
Attachments: RUSSELL G. MARTIN (russell.martin@maine.gov).vcf

Jim,

Couldn't we consider this email a request for approval of the FAST system with a 75% reduction equivalent to what was given to SeptiTec and Clean Solutions, and simply sent them a similar approval letter?

Russell G. Martin, PE, F.NSPE
Director, Subsurface Wastewater Program
Division of Environmental Health
Department of Health and Human Services
(207) 287-4735
(207) 287-3165 FAX
russell.martin@maine.gov

E-Mail Confidentiality Notice

From: Allison Blodig [mailto:ablodig@biomicrobics.com]
Sent: Tuesday, May 09, 2006 12:26 PM
To: Martin, Russell
Cc: James Jacobsen
Subject: Approval letter

Hello Russ,

How are things in beautiful Maine? It has been cold and rainy here for about a week. The sun is out today thank goodness...it kind of lifts my spirits and turns me to thoughts of our approval in Maine. You and I talked several weeks ago and discussed our approval letter that was issued a few years back for a 75% reduction and the possibility of revamping it so it was more clear. I know that you and James were going to discuss this issue and decide how to do this. Our distributor has contacted me several times to find out the status and indicated that he was told we had to specifically apply for the approval with the use of a certain drainfield design and that we are currently not approved. I am confused as our letter indicates we are approved on a provisional basis. I am not familiar with this drainfield design and when the letter was originally issued there was nothing requesting this type

of information so I am at a stand-still right now. If this is the only way we can get the approval letter reworked then we need to move forward on it and I would assume that it would be a simple amendment. I could really use some direction though.

If you or James could give me a call to discuss, or just reply to this request via email I would greatly appreciate it.

Regards,

Allison Blodig

Allison Blodig, REHS
Regulatory Affairs Manager
Bio-Microbics, Inc.
(913)422-0707

STATE OF MAINE
DEPARTMENT OF HUMAN SERVICES
DIVISION OF HEALTH ENGINEERING
11 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0010

ANGUS S. KING, JR.
GOVERNOR

KEVIN W. CONCANNON
COMMISSIONER

August 30, 2002

Bio-Microbics, Inc.
Attn: Allison Blodig, REHS
8450 Cole Parkway
Shawnee, KS 66227

Subject: Product Registration, Bio-Microbics FAST Systems

Dear Ms. Blodig:

Thank you for your letter dated August 15, 2002 regarding your company's product. This information was submitted pursuant to Section 1802 of the Maine State Plumbing Code, Subsurface Wastewater Disposal Rules (Rules), for code registration, for use in Maine.

Product Description

The Bio-Microbics FAST Systems consists of external air blowers, a bubbler, and a proprietary growth medium (e.g, "RetroFAST" insert for RetroFAST models and "MicroFAST" for other models). The RetroFAST models are designed for installation in conventional septic tanks. MicroFAST, HighStrength FAST, and NitriFAST are complete units. The Bio-Microbics FAST System is designed for use with conventional onsite sewage disposal areas and drip irrigation disposal areas. The various models have the treatment capacities shown in the following table.

Model	Capacity (gpd)
RetroFAST 0.25	250
RetroFAST 0.375	375
MicroFAST 0.5	500
MicroFAST 0.9	900
MicroFAST 1.5	1500
MicroFAST 3.0	3000
MicroFAST 4.5	4500
MicroFAST 9.0	9000
HighStrength FAST 1.0	1000
HighStrength FAST 1.5	1500
HighStrength FAST 3.0	3000
HighStrength FAST 4.5	4500
HighStrength FAST 9.0	9000
NitriFAST 0.5	500
NitriFAST 0.75	750
NitriFAST 0.9	900
NitriFAST 1.5	1500
NitriFAST 3.0	3000
NitriFAST 4.5	4500
NitriFAST 9.0	9000

The principal difference between the various models is their treatment capacities. A copy of NSF Standard 40 approval for the FAST Single Home System, dated August 28, 1996, was also included in your application.

You have requested approval for use of these devices in Maine, and that the Division allow a 75% reduction in disposal area size for use of these devices; no specific rationale for such reduction was provided.

Under provisions of Table 603.1 of the Rules, the lowest adjustment factor allowed for improved effluent quality is 0.5, for a combined effluent BOD_5 and TSS of 30 mg/l or less.

Claim

According to most of the information you provided, the Bio-Microbics FAST Systems produce effluent with a combined BOD_5 and TSS less than 30 mg/l. Frequently, the test results demonstrated individual BOD_5 and TSS levels less than 10 mg/l. The ETV test results you submitted had average combined BOD_5 and TSS of 37.62 mg/l.

No compelling rationale was presented to support the request for a 75% reduction in disposal area size.

Determination

On the basis of the foregoing, the Division has determined that the Bio-Microbics FAST System is acceptable for use in the State of Maine on a Provisional Approval basis, provided that they are installed, operated, and maintained in conformance with the manufacturer's directions.

Disposal area size reductions shall be in accordance with Table 603.1 of the Rules.

Provisional approval installations may include sites that require a variance or waiver to the Rules, with the provision that such variances or waivers are also subject to the standard variance requirements of the Rules, i.e., a passing point score for soils related variances, etc. On no less than a monthly basis for a period of not less than one year, the applicant shall test the influent and effluent of each installed new or experimental technology system for the following parameters: five day Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), Nitrate Nitrogen (N03), and coliform bacteria. The results of these tests shall be submitted to the Division on no less than a semi-annual basis.

In the event that the product fails to perform as claimed by the applicant, use of the new or experimental technology in Maine, including all installations approved pursuant to Section 1801.7 of the Rules, shall cease. Use of the new or experimental technology shall not resume until the applicant and the Division have reached a mutually acceptable agreement for resolving the failure to perform as claimed.

Because installation and owner maintenance has a significant effect on the working order of onsite sewage disposal systems, including their components, the Division makes no representation or guarantee as to the efficiency and/or operation of Bio-Microbics FAST Systems. Further, registration of this product for use in the State of Maine does not represent Division preference or recommendation for this product over similar products.

If you have any questions please feel free to contact me at (207) 287-5695.

Sincerely,

James A. Jacobsen, Environmental Specialist IV
Wastewater and Plumbing Control Program
Division of Health Engineering
e-mail: james.jacobsen@state.me.us

/jaj

Enc: Chapter 6, CMR 241
Chapter 18, CMR 241

xc: Product File

Jacobsen, James

From: Jacobsen, James
Sent: Thursday, June 26, 2003 11:51 AM
To: 'Allison Blodig'
Subject: RE: Oops

Alison,

The letter ended up on my desk anyway. I've added you to the database, and the next time we print a report, it'll show up appropriately. In the meantime, we'll be sending out update sheets with our semi-annual newsletters.

Jim

-----Original Message-----
From: Allison Blodig [mailto:ablodig@biomicrobics.com]
Sent: Thursday, June 26, 2003 11:29 AM
To: james.jacobsen@state.me.us
Subject: Oops

Looks like if I did send the letter it went to Russell Martin for some reason. I am just going to resend the letter today to you.

Regards,

Allison Blodig
Regulatory Affairs Coordinator
Bio-Microbics, Inc.
(913)422-0707

BIO-MICROBICS® INCORPORATED

8450 Cole Parkway ▪ Shawnee, KS 66227 ▪ Phone: 913-422-0707 ▪ Fax: 913-422-0808
e-mail: onsite@biomicrobics.com ▪ www.biomicrobics.com ▪ 800-753-FAST(3278)

June 5, 2003

JUN 1 0 2003

Mr. Russell Martin
11 State House Station,
Augusta, ME 04333-0011

Dear Mr. Martin:

On August 20, 2002 Bio-Microbics, Inc. was granted a provisional approval for a 75% drainfield size reduction the FAST® wastewater treatments systems. In that approval request we discussed the RetroFAST 0.25 and 0.375 models to be used primarily with failing septic systems treating domestic sanitary waste. Since we were granted approval on these systems we are asking that the RetroFAST be listed under the Advanced Treatment Retrofit category of your product listing with a General Approval along with the White Knight and the Pirana. I have included the official results from the ETV testing program which has been completed.

If you have any questions or need further information, please contact me at (800)753-3278 (FAST), or Jim Russell with J&R Engineering at (207)947-2248.

Sincerely,

Allison Blodig

Allison Blodig, REHS
Regulatory Affairs Coordinator
Bio-Microbics, Inc.
(913)422-0707

Enclosures

cc: Maine regulatory files

NSF International
Ann Arbor, MI • Sacramento, CA • Washington, D.C. • Brussels, Belgium

Data Summary for BioMicrobics, Inc. RetroFAST 0.375 Under the EPA ETV Water Quality Protection Center

The following is a preliminary summary of the test results obtained for the BioMicrobics, Inc. RetroFAST 0.375 system for nutrient reduction under the ETV Water Quality Protection Center. These results have been QA reviewed, but will not be considered final until all EPA reviews have been completed. The testing was completed at the Mamquam Wastewater Technology Test Facility (British Columbia) during the period of September 2001 through October 2002. The data summarized below does not include data for November 2001 because of errors in testing. A full report for this testing will be completed soon and posted on the EPA (www.epa.gov/etv) and NSF (www.nsf.org/etv) web sites.

Table 1. BOD_5/$CBOD_5$ and TSS Data Summary

	BOD_5 Influent (mg/L)	$CBOD_5$ Effluent (mg/L)	Removal Percent	TSS Influent (mg/L)	TSS Effluent (mg/L)	TSS Removal Percent
No. Samples	61	61		61	61	
Average	150	12	92	190	28	84
Median	140	12	92	170	23	88
Max	210	28	98	440	170	98
Min	60	2.0	79	110	3	14
Std. Dev.	29	5.9	7.4	59	25	15

Table 2. Nitrogen Data Summary

	TKN (mg/L)		Ammonia (mg/L)		Total Nitrogen (mg/L)		Nitrate (mg/L)	Nitrite (mg/L)
	Influent	Effluent	Influent	Effluent	Influent	Effluent	Effluent	Effluent
No. Samples	61	61	61	61	61	61	59	58
Average	39	11	28	6.0	39	19	7.9	<0.002
Median	37	6.6	28	3.7	37	18	9.0	<0.002
Maximum	64	44	42	30	64	44	18	0.006
Minimum	28	1.7	19	0.2	28	6.4	0.1	<0.002
Std. Dev.	8.9	10	4.0	6.9	8.9	7.6	5.0	0.002

NSF Contact: Thomas Stevens
(734) 769-5347
stevenst@nsf.org

Bio-Microbios FAST Effluent BOD5 & TSS

JAJ 8/30/02

Florida OWNRS systems test Phase 1

Avg. BOD5 & TSS = 10.25 mg/l 11/96-8/97

Florida OWNRS systems test Phase 2

Avg. BOD5 & TSS = 7.81 mg/l 8/98-12/99

Paradise Elementary School

Avg. CBOD5 & TSS = 8.80 mg/l 1/01-5/01

Coonamesset Inn (MA)

Avg. BOD5 & TSS = 36.95 mg/l 8/96-4/99
(influent levels estimated, not measured)

99 Restaurant (MA)

Avg. BOD5 & TSS = 181.68 mg/l 2/97-10/98
(only 4 samples; influent levels >4000 mg/l each)

ETV SWP Residential Testing

Avg. BOD5 & TSS = 37.62 mg/l

Reductions are in excess of 90% of influent levels in all data sets, except as noted for Coonamesset Inn.

BIO-MICROBICS® INCORPORATED

8450 Cole Parkway • Shawnee, KS 66227 • Phone: 913-422-0707 • Fax: 913-422-0808
e-mail: onsite@biomicrobics.com • www.biomicrobics.com • 800-753-FAST(3278)

August 15, 2002

Mr. Russell Martin
11 State House Station,
Augusta, ME 04333-0011

Dear Mr. Martin:

We are writing to request a review of the following Bio-Microbics FAST® products for a seventy-five percent reduction in disposal field size in Maine:

Residential Waste	**High Nitrogen Waste**	**High Strenth/Commercial Waste**
MicroFAST 0.5	NitriFAST 0.5	HighStrengthFAST 1.0
MicroFAST 0.75	NitriFAST 0.75	HighStrengthFAST 1.5
MicroFAST 0.9	NitriFAST 0.9	HighStrengthFAST 3.0
MicroFAST 1.5	NitriFAST 1.5	HighStrengthFAST 4.5
MicroFAST 3.0	NitriFAST 3.0	HighStrengthFAST 9.0
MicroFAST 4.5	NitriFAST 4.5	
MicroFAST 9.0	NitriFAST 9.0	

We also request that you consider our RetroFAST® 0.25, and 0.375 models for use primarily with failing septic systems treating domestic sanitary waste.

We have included a catalogue which contains information on treatment capacities, drawings and specifications for all of our models and parts, data from several installations, NSF data, and preliminary ETV data on the RetroFAST® units.

If you have any questions or need further information, please contact me at (800)753-3278 (FAST), or Jim Russell with J&R Engineering at (207)947-2248.

Sincerely,

Allison Blodig, REHS
Regulatory Affairs Coordinator
Bio-Microbics, Inc.
(913)422-0707

Enclosures

cc: Maine regulatory files

BIO-MICROBICS INCORPORATED

8450 Cole Parkway ▪ Shawnee, KS 66227 ▪ Phone: 913-422-0707 ▪ Fax: 913-422-0808

e-mail: onsite@biomicrobics.com ▪ www.biomicrobics.com

Fast® Wastewater Treatment Systems

Application for Disposal Field Reduction in Maine

BIO-MICROBICS® INCORPORATED

8450 Cole Parkway • Shawnee, KS 66227 • Phone: 913-422-0707 • Fax: 913-422-0808
e-mail: onsite@biomicrobics.com • www.biomicrobics.com • 800-753-FAST(3278)

FAST® Models and Treatment Capacities*

Retrofit Applications	Maximum Treatment Capacity		Blower Capacity	Minimum Total Tank Volume
	Volume per Module	Persons per Module**		
RetroFAST® 0.25	250 GPD (946 LPD)	1 - 4 persons	1/8-1/4 Hp 6-17 cfm	500 GAL (1893 L)
RetroFAST® 0.375	375 GPD (1419 LPD)	1 - 6 persons	1/4 Hp 17-24 cfm	750 GAL (2838 L)

Residential Application Modules	Maximum Treatment Capacity		Blower Capacity	Minimum Total Tank Volume
	Volume per Module	Persons per Module**		
MicroFAST® 0.5	500 GPD (1893 LPD)	1 - 8 persons	1/3 Hp 22-25 cfm	800 GAL (3028 L)
MicroFAST® 0.9	900 GPD (3407 LPD)	1 - 14 persons	1/3 Hp 22-25 cfm	1250 GAL (4732 L)
MicroFAST® 1.5	1500 GPD (5678 LPD)	6 - 21 persons	1/2-3/4 Hp 34-40 cfm	1875 GAL (7098 L)
MicroFAST® 3.0	3000 GPD (11356 LPD)	10 - 42 persons	1.15-1.5 Hp 72-80 cfm	3750 GAL (14195 L)
MicroFAST® 4.5	4500 GPD (17034 LPD)	18 - 63 persons	2-2.5 Hp ~125-135 cfm	5625 GAL (21293 L)
MicroFAST® 9.0	9000 GPD (34068 LPD)	30 - 126 persons	4-5 Hp ~172-226 cfm	11250 GAL (42586 L)

HighStrength / Commercial Application	Maximum Hydraulic Capacity	Blower Capacity	Minimum Total Tank Volume
HighStrengthFAST® 1.0	1000 GPD (3785 LPD)	1/2 Hp 32-36 cfm	1250 GAL (4732 L)
HighStrengthFAST® 1.5	1500 GPD (5678 LPD)	1-1.15 Hp 50-60 cfm	1875 GAL (7098 L)
HighStrengthFAST® 3.0	3000 GPD (11356 LPD)	2-2.5 Hp 80-100 cfm	3750 GAL (14195 L)
HighStrengthFAST® 4.5	4500 GPD (17034 LPD)	3-4 Hp ~165-185 cfm	5625 GAL (21293 L)
HighStrengthFAST® 9.0	9000 GPD (34068 LPD)	7.5 Hp ~275-310 cfm	11250 GAL (42586 L)

Prepared by Bio-Microbics, Inc.
08/05/01

*IMPORTANT: The BOD loading of each individual application, along with the above flow parameters, are the major determining factors in the design for each FAST wastewater treatment application.
**PLEASE note that only residential applications or those applications requiring treatment for only sanitary wastewater may be designed from the number of persons per module.

BIO-MICROBICS® INCORPORATED

8450 Cole Parkway • Shawnee, KS 66227 • Phone: 913-422-0707 • Fax: 913-422-0808
e-mail: onsite@biomicrobics.com • www.biomicrobics.com • 800-753-FAST(3278)

Other FAST® Models and Treatment Capacities

NitriFAST®	Maximum Treatment Capacity	Blower Capacity	Minimum Total Tank Volume
NitriFAST® 0.5	500 GPD (3785 LPD)	1/3 Hp 22-25 cfm	1250 GAL (4732 L)
NitriFAST® 1.0	1000 GPD (3785 LPD)	1/3 Hp 22-25 cfm	1250 GAL (4732 L)
NitriFAST® 1.5	1500 GPD (5678 LPD)	1/2-3/4 Hp 34-40 cfm	1875 GAL (7098 L)
NitriFAST® 3.0	3000 GPD (11356 LPD)	1.15-1.5 Hp 72-80 cfm	3750 GAL (14195 L)
NitriFAST® 4.5	4500 GPD (17034 LPD)	2-2.5 Hp 125-135 cfm	5625 GAL (21293 L)
NitriFAST® 9.0	9000 GPD (34068 LPD)	4-5 Hp 172-226 cfm	11250 GAL (42586 L)

LagoonFAST®	Maximum Treatment Capacity	Blower Capacity
LagoonFAST® 1.5	1500 GPD (5678 LPD)	1-1.5 Hp 50-60 cfm
LagoonFAST® 3.0	3000 GPD (11356 LPD)	2-2.5 Hp 80-100 cfm
LagoonFAST® 4.5	4500 GPD (17034 LPD)	3-4 Hp ~165-185 cfm
LagoonFAST® 9.0	9000 GPD (34068 LPD)	7.5 Hp ~275-310 cfm

Prepared by Bio-Microbics, Inc.
08/05/01

*IMPORTANT: The BOD loading of each individual application, along with the above flow parameters, are the major determining factors in the design for each FAST wastewater treatment application.
**PLEASE note that only residential applications or those applications requiring treatment for only sanitary wastewater may be designed from the number of persons per module.

BIO-MICROBICS® INCORPORATED

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e-mail: onsite@biomicrobics.com • www.biomicrobics.com • 800-753-FAST(3278)

Air Blowers

FAST Model	Hydraulic Capacity (GPD)	Required Blower Power	Blower Options			
			Single Phase 110/115V	Single Phase 208/220/230V	Three Phase 208/220/230V	Three Phase 460V
RetroFAST 0.25	250	1/8 Hp 6-17 cfm	2.0amp 0.232kw/hr	1.0amp 0.232kw.hr	Consult Factory	Consult Factory
RetroFAST 0.375	375	1/4 Hp 17-24 cfm	2.3amp 0.266kw/hr	1.15amp 0.266kw/hr	Consult Factory	Consult Factory
MicroFAST 0.5	500	1/3 Hp 22-25 cfm	2.8amp 0.322kw/hr	1.4amp 0.322kw/hr	Consult Factory	Consult Factory
MicroFAST 0.9	900	1/3 Hp 22-25 cfm	2.8amp 0.322kw/hr	1.4amp 0.322kw/hr	Consult Factory	Consult Factory
MicroFAST 1.5	1500	1/2-3/4 Hp 34-40 cfm	4.6-5.0amp 0.52-0.57kw/hr	2.3-2.5amp 0.52-0.57kw/hr	Consult Factory	Consult Factory
MicroFAST 3.0	3000	1.15-1.5 Hp 72-80 cfm	Consult Factory	8.9-9.5amp 2.05-2.19kw/hr	4.4-4.8amp 1.75-1.90kw/hr	Consult Factory
MicroFAST 4.5	4500	2-2.5 Hp 125-135 cfm	Consult Factory	Consult Factory	7.6-6.6 FLA 81-94 LRA 1.69kw/hr	3.3 FLA 27 LRA 1.69kw/hr
MicroFAST 9.0	9000	4-5 Hp 172-226 cfm	Consult Factory	Consult Factory	13.2-12 FLA 47-54 LRA 1.69kw/hr	6 FLA 47 LRA 1.69kw/hr
*High Strength FAST 1.0	1000	1/2 Hp 32-36 cfm	4.6amp 0.529kw/hr	2.3amp 0.529kw/hr	Consult Factory	Consult Factory
*High Strength FAST 1.5	1500	1-1.15 Hp 50-60 cfm	Consult Factory	7.5-8.9amp 2.65-2.97kw/hr	4.0-4.4amp 1.59-1.75kw/hr	Consult Factory
*High Strength FAST 3.0	3000	2-2.5 Hp 80-100 cfm	Consult Factory	11.5-12.9amp 2.65-2.97kw/hr	6.2-6.9amp 2.47-2.75kw/hr	Consult Factory
*High Strength FAST 4.5	4500	3-4 Hp 165-185 cfm	Consult Factory	Consult Factory	10.6-10.2 FLA 101.3-112 LRA 2.61kw/hr	5.1 FLA 56 LRA 2.61kw/hr
*High Strength FAST 9.0	9000	7.5 Hp 275-310 cfm	Consult Factory	Consult Factory	20.8-18.8 FLA 125-113 LRA 4.80kw/hr	9.4 FLA 57 LRA 4.80kw/hr

*** ALL SYSTEM DESIGNS SHOULD BE BASED ON FLOW PARAMETERS AND BOD LOADING.**
**** OTHER POWER SUPPLIES MAY BE USED.**

ITS Intertek Testing Services

Job No. 473-5897

Issued: March 30, 1999

Report No. 473-5897-1/99

INSPECTION, TEST AND EVALUATION
OF A
BLOWER SYSTEM FOR WASTE WATER TREATMENT

RENDERED TO

BIO-MICROBICS INCORPORATED

GENERAL: This report gives the results of the inspection, tests and evaluation of a blower system for compliance with applicable requirements of the standard for Electric Fans (UL507) and the standard Fans and Ventilators (CSA C22.2 No.113). This investigation was authorized by PO#1339, dated 01/18/99. A production-line sample, in good condition was provided by the client on 02/09/99 and tested at ITS's Coquitlam facility.

Electric Fans
UL.507

Fans and Ventilators
CSA C22.2 No,113

Applicant:	Bio-Microbics Inc.
Company	Bio-Microbics Inc 8271 Melrose Drive Lenexa, KS 66214
Contact:	Mr. Bob Rebori
Manufacturer:	Same as applicant
Contact:	Same as applicant

Intertek Testing Services NA Ltd.
211 Schoolhouse Street, Coquitlam, BC V3K 4X9 Canada
Telephone 604-520-3321 Fax 604-524-9186 Home Page www.worldlab.com

Report No.:
Client Name

REVISION PAGE

Issued:03/30/99
Total Pages in this Report: 39

The following changes have been made to this Report:

DATE	APPROVAL	PAGE	ITEM	DESCRIPTION
N/A				

TEST PERFORMANCE

A representative sample of the product was tested in accordance with the standard for

The following tests were performed:

Description	Standard(s) / Clause
Rating	CSA C22.2 No.113 / 6.3
Temperature	CSA C22.2 No.113 / 6.4
Dielectric Strength	CSA C22.2 No.113 / 6.5
Temperature (Abnormal)	CSA C22.2 No.113 / 6.11
Continuity of Grounding Circuits	UL507 / 31
Starting Current	UL507 / 32
Input	UL507 / 33
Temperature	UL507 / 34
Dielectric Voltage Withstand	UL507 / 35

Results of the tests indicate the specimens conform to applicable test criteria.

BIO-MICROBICS® INCORPORATED

8450 Cole Parkway • Shawnee, KS 66227 • Phone: 913-422-0707 • Fax: 913-422-0808
e-mail: onsite@biomicrobics.com • www.biomicrobics.com • 800-753-FAST(3278)

Description of Accessories and Other Parts

Panel Timers*

Panel timers enhance FAST® performance in some situations and decrease electrical costs. The panel timers are simple to program and are incorporated into the circuit board design.

Expanded Panels*

Expanded panels have the ability to control one pump up to 1/2 Hp with three floats. The expanded panels are simple to program and are incorporated into the circuit board design.

TRACK®

TRACK is an acronym for Talking Remote Alarm Calling Kit. TRACK is an electronic device that uses an existing phone line to monitor operations of appliances and notify a remote location in event of an alarm. The system is available in four versions, TRACK I, TRACK IV, TRACK I PLUS and TRACK IV PLUS. TRACK I can receive one alarm input onsite, and the TRACK IV can receive up to four alarm inputs onsite. TRACK I PLUS features the ability to program one alarm input from a remote location, and TRACK IV PLUS features the ability to program up to four alarm inputs from a remote location. TRACK PLUS requires a dedicated phone line for the remote programming. Once an alarm site is activated, the TRACK system will dial up to four different telephone numbers until a successful connection is made. A short message is then delivered to inform the receiver where the alarm was activated. The TRACK IV will notify the receiver exactly which alarm point (one, two, three, or four) was activated. TRACK will also call out at a programmed frequency and notify a service person that the system is running correctly, offering assurances that all system components, including TRACK, are functioning as intended. The frequency of this call can be adjusted so that TRACK dials out once every one to 365 days.

Grease Interceptors

Grease interceptors are designed to promote regular maintenance through simple, accessible cleaning methods. The multiple baffle system is equipped with an effluent flow control valve and constructed with corrosion resistant material. Bio-Microbics, Inc. grease interceptors are IAPMO (International Association of Plumbing and Mechanical Officials,) UPC (Universal Plumbing Code,) and PDI (Plumbing and Drainage Institute) certified, and have grease elimination capabilities well beyond IAPMO requirements.

***PANELS ARE INTENDED FOR USE WITH FAST® SYSTEMS**

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MAINTENANCE INSPECTION AGREEMENT

For Bio-Microbics, Inc. Authorized Technician

It is hereby agreed this ____day of_____ ,_____(year) by and between _____(owner) and _____ of _____(service provider) that in consideration of the payments provided for herein, _____ will provide the services of a factory-trained representative to perform a Preventative Maintenance Inspection of the equipment described herein on the frequency shown below.

Each inspection of the equipment shall be followed by a written report to the Purchaser. The inspection report will describe the operational status of the system. It will also include recommendations for any preventative maintenance deemed necessary by the inspector as well as a list of any replacement parts needed.

This agreement does not assume any responsibilities or obligations which are normally the responsibilities of Purchaser's maintenance department (if applicable) as related to parts or labor and does not extend to cover any costs that may be associated with any recommendations made under this agreement. _____ can only supply parts or labor after receipt of Purchaser's purchase order. Billings for inspection trips shall be made on a _____ basis.

In no event shall Bio-Microbics, Inc. or _____ be responsible for special or consequential damages, including but not limited to, loss of time, injury to person or property or any other consequential damages or incidental or economic loss due to equipment failure or for any other reason whatsoever.

This agreement shall remain in force for a period of ____ year(s), beginning _____, _____(year) and ending _____, _____(year).

Equipment Covered Under This Agreement

Nomenclature	Serial Number	Location	Min No. of Annual Trips	Annual Rate

Purchaser:

Sign: _____

Print: _____

Date: _____

Address: _____

Address: _____

Phone: _____

Fax: _____

E-mail: _____

Service Provider:

Sign: _____

Print: _____

Date: _____

Address: _____

Address: _____

Phone: _____

Fax: _____

E-mail: _____

BIO-MICROBICS® INCORPORATED

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FIELD INSPECTION & SERVICE REPORT

For Bio-Microbics Single Home FAST® System

INSTALLATION	AUTHORIZED SERVICE PROVIDER
Installation Address	Name
Owner Name	Street
Mail Address	Mail Address
City State Zip	City State Zip
Phone Fax e-mail	Phone Fax e-mail

INSTALLATION INFORMATION

Model No.	Serial No.	Date of Installation	Date of last pumpout

EQUIPMENT	YES	NO	MAINTENANCE PERFORMED AND COMMENTS
Electrical Panel(s)			
Visual Alarm Operating			
Audio Alarm Operating (if present)			
Blower(s)			
Air Inlet Filter Clean			
Blower Hood Vents Clear			
Excessive Noise			
Excessive Vibration			
Treatment Unit(s)			
Unusual Odor			
Pumpout Required:			
Primary Settling Zone			
Aerobic Treatment Zone			
EFFLUENT(options)	**LIMIT**	**RESULT**	
Estimated Daily Flow			
pH (Standard Units)	6-9 S.U.		
Color	Clear		
Temperature			
Odor	Slightly Musty odor (not septic)		

OWNER SIGNATURE	TECHNICIAN SIGNATURE	SERVICE DATE

Product Registration & Start-Up Report

BIO-MICROBICS® INCORPORATED

8450 Cole Parkway
Shawnee, KS 66227
Ph: 800-753-FAST (3278)
Fax: (913) 422-0808
www.biomicrobics.com

PLEASE CIRCLE

MODEL: MicroFAST® HighStrengthFAST® RetroFAST® NitriFAST® LagoonFAST®

MODEL SIZE: 0.25 0.375 0.5 0.75 0.9 1.0 1.5 3.0 4.5 9.0

SERIAL NUMBER _____ **DATE OF INSTALLATION** _____

OWNER	
NAME	
ADDRESS	
CITY/STATE/ZIP	
PHONE/FAX	
INSTALLATION SITE (if different than OWNER)	
NAME	
ADDRESS	
CITY/STATE/ZIP	
PHONE/FAX	
BIO-MICROBICS DISTRIBUTOR	
NAME	
ADDRESS	
CITY/STATE/ZIP	
PHONE/FAX	
INSTALLER	
NAME	
ADDRESS	
CITY/STATE/ZIP	
PHONE/FAX	
CONSULTING ENGINEER (if applicable)	
NAME	
ADDRESS	
CITY/STATE/ZIP	
PHONE/FAX	

A Complete this section ONLY if the FAST® was installed in tank at the jobsite.

Tank Manufacturer _____ Tank Model No. _____
Working Liquid Volume in Trash Collector Chamber _____
Working Liquid Volume in FAST Treatment Chamber _____
FAST system installed using which method _____ Lid Suspension
_____ Leg Support
FAST system installed into tank by whom: _____

B Tankage

	Yes	No
Concrete Tank		
Fiberglass Tank		
Anti-Flotation Installed		
H_20 Loading Capabilities		
Fill Over FAST Lid		
Tank Level		
Watertight Joints & Piping		

Service & Access Ports

	Yes	No
Trash Tank Clean Out Present		
FAST Chamber Clean Out Present		
Trash Tank Vent		
Inspection Port Access to Grade		

C Alarm Panel/Piping

Visual Alarm Operating		
Audio Alarm Operating		
Sensor Switch Installed		

Length of Air Supply Line _____
Diameter of Air Supply Line _____

D Air Blower

Filter Element Inside		
Blower Hood Installed		
Blower Hood Secure		
Blower Area Ventilated		

Inlet and Outlet Pipe Installed Correctly		
Blower Operates Correctly		
Blower Area Subject to Flooding		
Blower Area Subject to Snow Load		
Blower Hood Vents Clear		

Wired for High or Low Voltage _____
Voltage _____
Single Phase or Three Phase _____
50 hz or 60 hz _____

E Treatment Unit

Air Lift Operates Correctly		
Module Insert Stable		
4" Outlet Pipe Placed		

Remote or Inspection Port Vent		
Module Sealed & Bolted to Tank		
Air Line Connection Glued to Airlift		

Length of Vent Line _____
Size of Vent Line Pipe _____

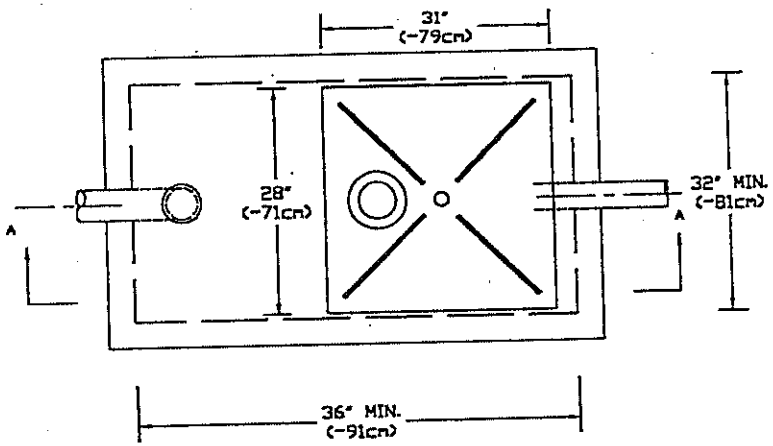
F Other

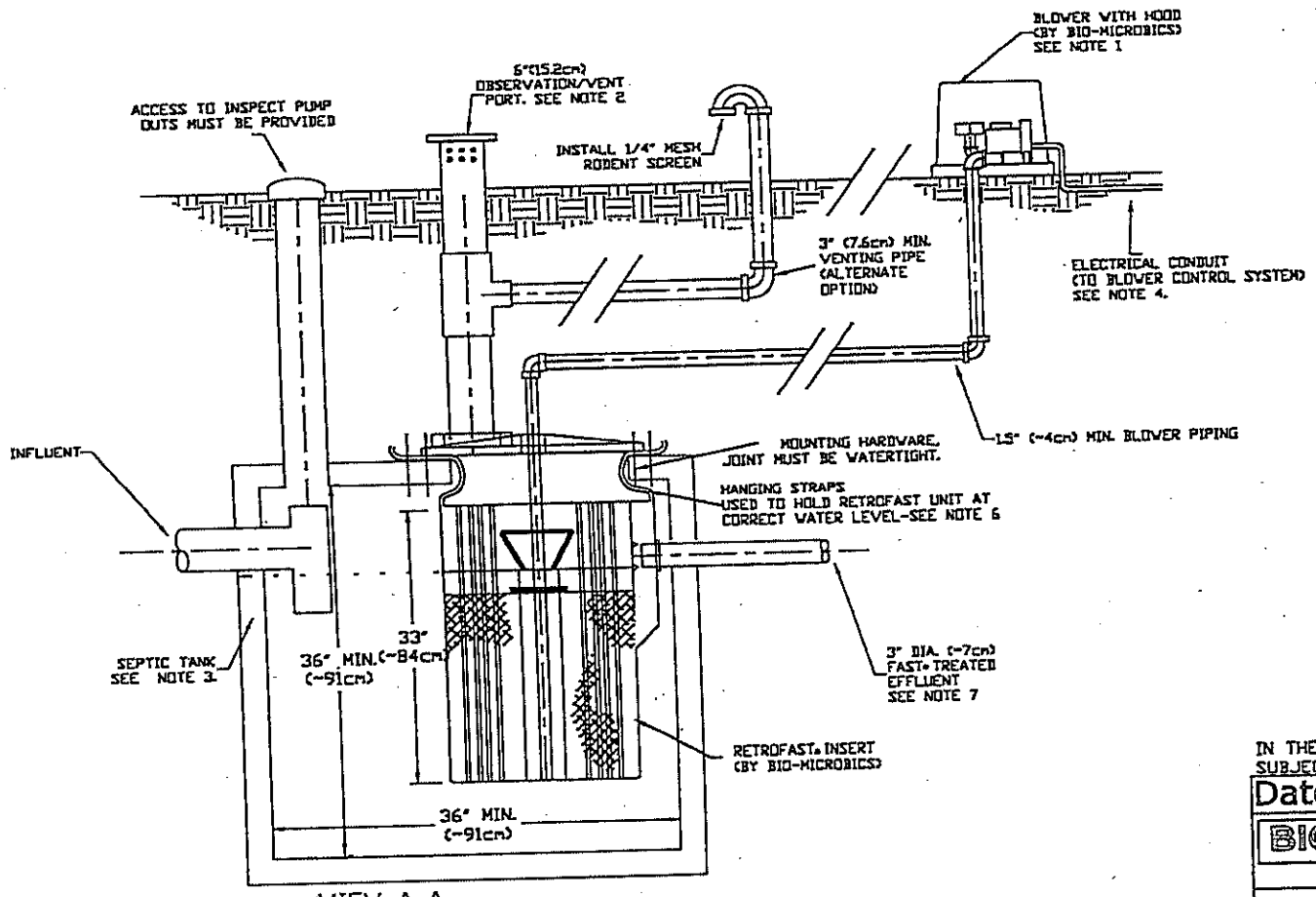
Manuals Onsite for Owner		
Warranty to Owner		

NSF Inspection Service Given to Owner		
After NSF Service Contract to Owner		

G Remarks & Describe/Sketch Treatment System Components and Configuration (attach additional sheets if necessary)

* Product Registration Report must be completed and returned to Bio-Microbics, Inc. to effect warranty. *





VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5m) OF FAST UNIT. FOR DISTANCES GREATER THAN 100 FEET -- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS.

2. CAP PIPE WITH 6" CLEANOUT.. DRILL 16 HOLES MIN. (3/8" DIA.) IN 6" PIPE JUST UNDER PVC PIPE CAP TO VENT UNIT.
   OR:
   RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH RODENT SCREEN. NOTE: ODORS MAY BE PRESENT.

3. ALL APPURTENANCES TO FAST (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5. COPYRIGHT (C) 2001, BIO-MICROBICS, INC.

6. FAST MODULE MUST BE SECURED BY BOLTING THROUGH THE STRAPS, THEN THE LID IS BOLTED TO THE TANK. NOTE: ANCHOR BOLTS NOT PROVIDED.

7. EFFLUENT HOLE WILL ACCEPT A 3" SCH 40 PVC PIPE WHICH CAN THEN BE INSERTED INTO THE EXISTING 4" DISCHARGE PIPE IN THE SEPTIC TANK.

Date 7-16-01

BIO-MICROBICS® INCORPORATED

RetroFAST®0.25

in by SMF

Specifications For RetroFAST 0.25 Wastewater Treatment System

1. GENERAL

The contractor shall furnish and install (1) RetroFAST 0.25 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, insert lids a, blower assembly, blower controls and alarms. The RetroFAST 0.25 unit shall be situated within a tank with minimum inner dimensions of 36 inches-L, 32 inches-W, and 36 inches-H, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS

The RetroFAST 0.25 treatment system shall be capable of treating the wastewater produced by typical family activities (bath, laundry, kitchen, etc.) ranging from (1) one to (4) four persons and up to 250 US Gallons per day (947 LPD).

3. MEDIA

The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER

The RetroFAST 0.25 unit shall come equipped with a regenerative type blower capable of delivering 5-17 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER

The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the RetroFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the RetroFAST shall be provided and installed by the contractor.

6. ELECTRICAL

The treatment system shall be designed to operate on standard current. The input power required for the blower is 115/230 Volts, Single Phase, 60/50 Hertz, 2.0/1.0 Full Load Amps (Locked Rotor Amps are 8.5/4.3). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS

The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS

Installation of the RetroFAST 0.25 shall be done in accordance with the written instructions provided by the manufacturer.

9. WARRANTY

The manufacturer of the RetroFAST 0.25 treatment system shall warrant for three years from the date of shipment or two years from the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

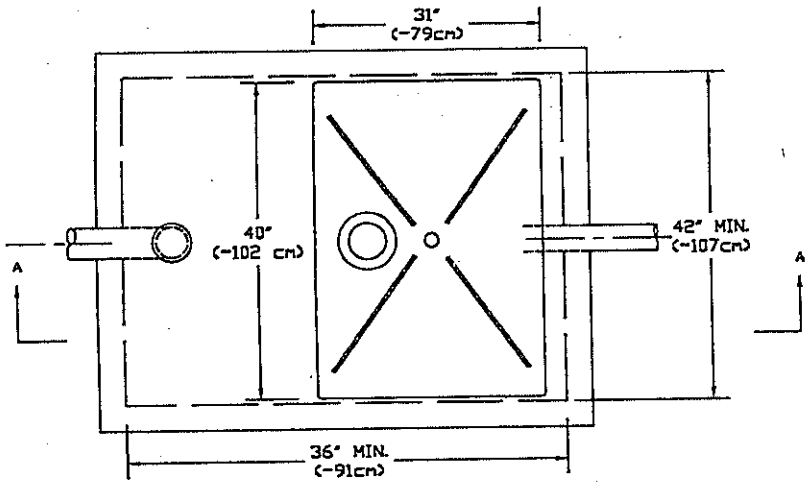
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

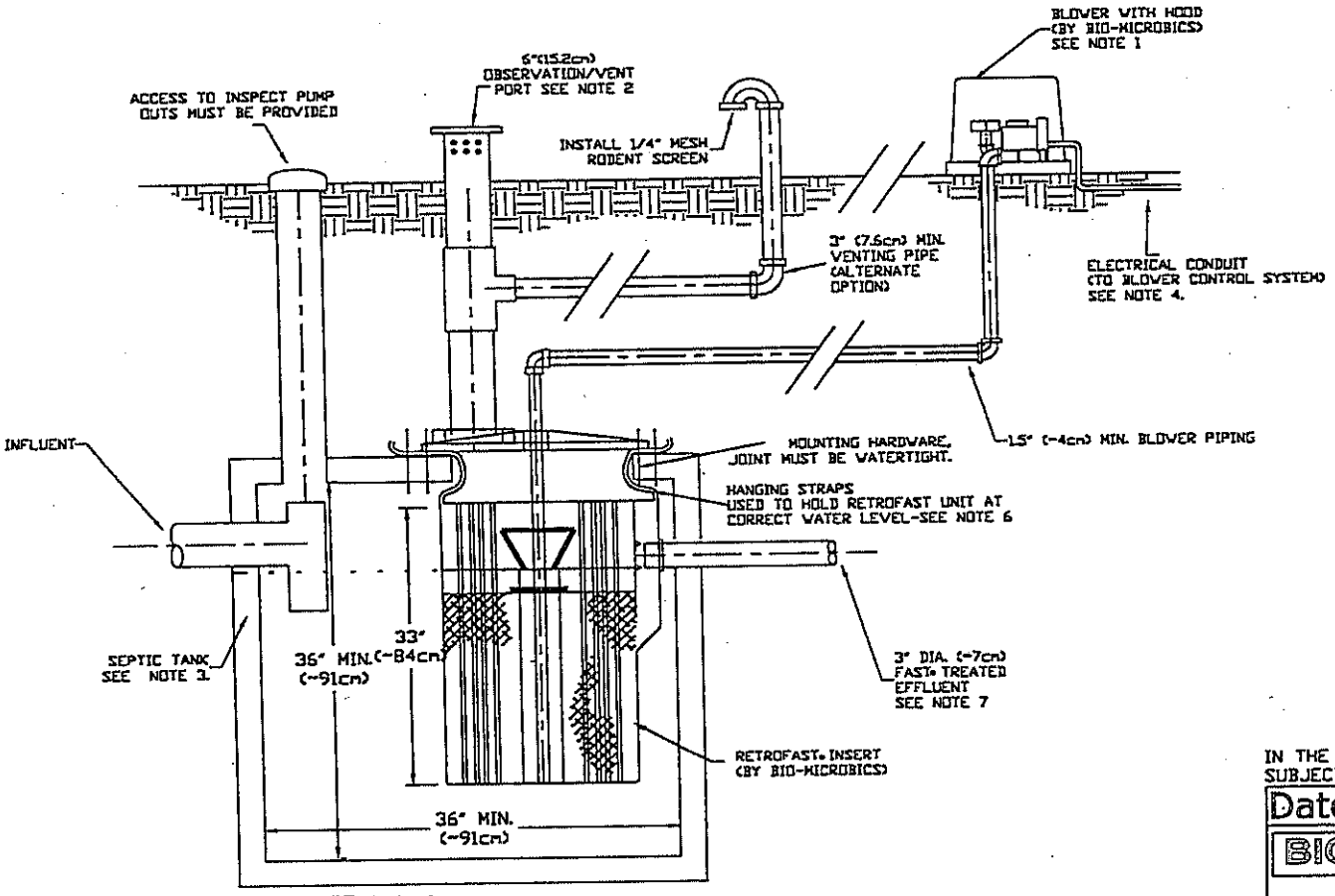
Date 7-16-01

BIO-MICROBICS INCORPORATED

RetroFAST 0.25 Specifications

Drawn by SMF





VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5m) OF FAST UNIT. FOR DISTANCES GREATER THAN 100 FEET -- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS.

2. CAP PIPE WITH 6" CLEANOUT. DRILL 16 HOLES MIN. (3/8" DIA.) IN 6" PIPE JUST UNDER PVC PIPE CAP TO VENT UNIT.
   OR:
   RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH RODENT SCREEN. NOTE: ODORS MAY BE PRESENT.

3. ALL APPURTENANCES TO FAST (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5. COPYRIGHT (C) 2001, BIO-MICROBICS, INC.

6. FAST MODULE MUST BE SECURED BY BOLTING THROUGH THE STRAPS, THEN THE LID IS BOLTED TO THE TANK. NOTE: ANCHOR BOLTS NOT PROVIDED.

7. EFFLUENT HOLE WILL ACCEPT A 3" SCH 40 PVC PIPE WHICH CAN THEN BE INSERTED INTO THE EXISTING 4" DISCHARGE PIPE IN THE SEPTIC TANK.

Date 7-16-01

BIO-MICROBICS® INCORPORATED

RetroFAST® 0.375

by SMF

Specifications For RetroFAST 0.375 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) RetroFAST 0.375 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System Insert, Insert lid, blower assembly, blower controls and alarms. The RetroFAST 0.375 unit shall be situated within a tank with minimum inner dimensions of 36 inches-L, 42 inches-W, and 36 inches-H, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The RetroFAST 0.375 treatment system shall be capable of treating the wastewater produced by typical family activities (bath, laundry, kitchen, etc.) ranging from (1) one to (5) five persons and up to 375 US Gallons per day (1420 LPD).

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The RetroFAST 0.375 unit shall come equipped with a regenerative type blower capable of delivering 9-24 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the RetroFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the RetroFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 115/230 Volts, Single Phase, 60/50 Hertz, 2.4/1.2 Full Load Amps (Locked Rotor Amps are 10.9/5.5). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the RetroFAST 0.375 shall be done in accordance with the written instructions provided by the manufacturer.

9. WARRANTY
The manufacturer of the RetroFAST 0.375 treatment system shall warrant for three years from the date of shipment or two years from the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

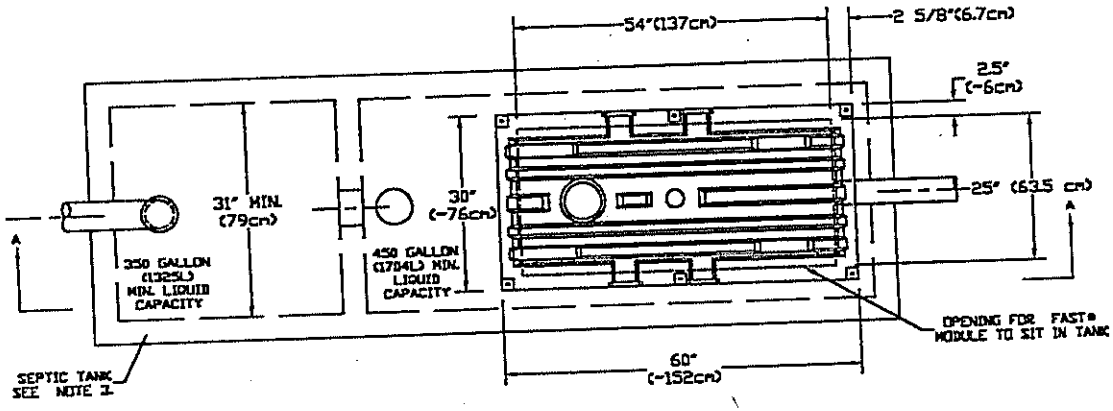
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

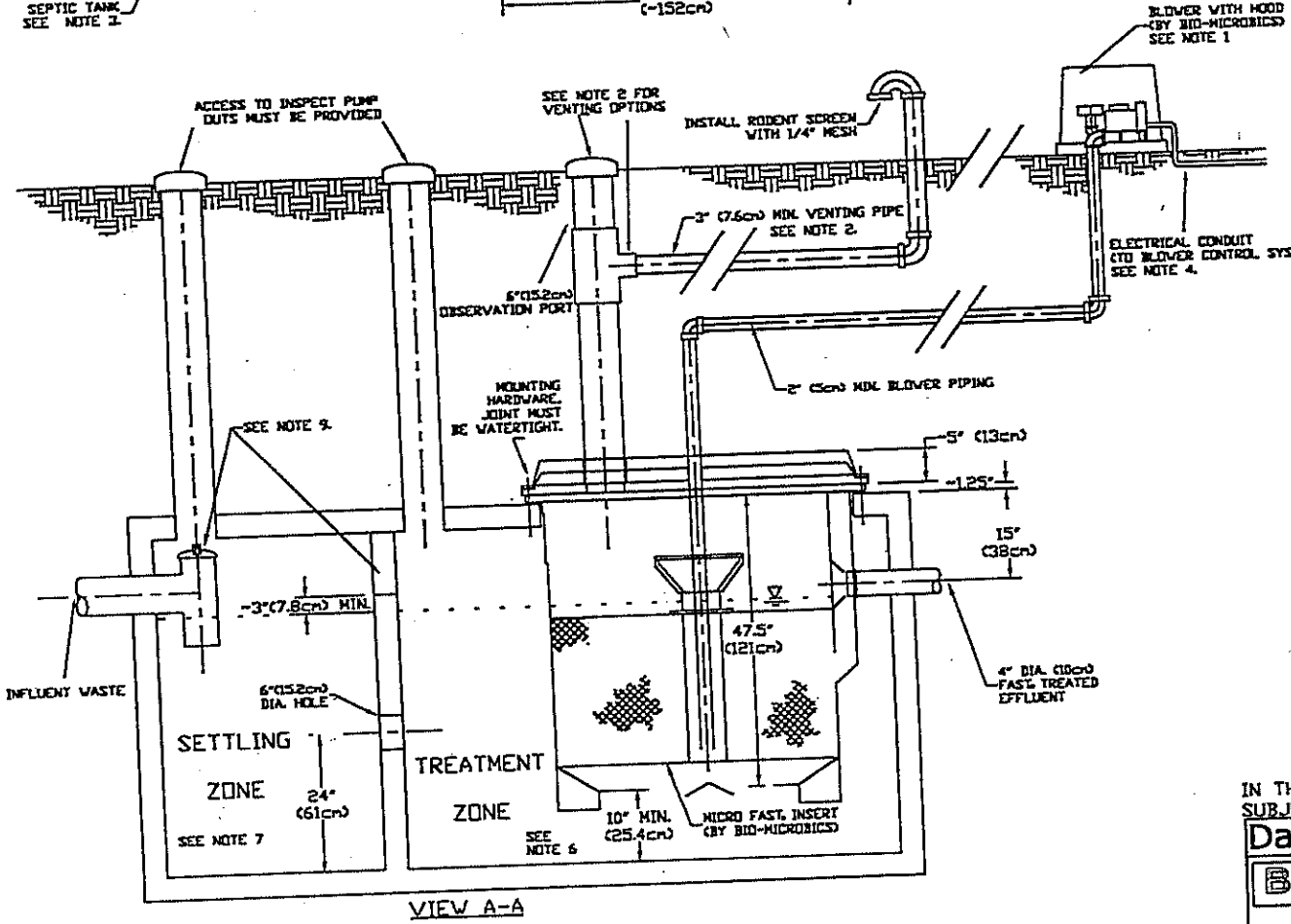
Date 8-15-01

BIO-MICROBICS INCORPORATED

RetroFAST 0.375 Specifications

Drawn by SMF





VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST UNIT AND USE A MAXIMUM OF 4 ELBOWS IN THE PIPING SYSTEM@100FT). FOR DISTANCES GREATER THAN 100 FEET-- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS.

2. RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH RODENT SCREEN.

OR:

CAP PIPES WITH 6" CLEANOUT. DRILL A MINIMUM OF 16 HOLES (3/8"DIA.) IN 6" PIPE JUST UNDER PVC PIPE PIPE CAP. SEE ADDITIONAL VIEWS DRAWING.

NOTE: ODORS MAY BE PRESENT--SEE MANUAL.

3. ALL APPURTENANCES TO THE FAST (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5.

6. MUST INCREASE TANK SIZE BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF THE TANK. CONSULT FACTORY FOR APPROVAL.

7. THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.

8. FOUR LEG EXTENSIONS MAY BE USED TO STAND UNIT IN TANK ELIMINATING THE NEED FOR LID. SEE ADDITIONAL VIEWS AND REFER TO INSTALLATION MANUAL FOR MORE DETAILS.

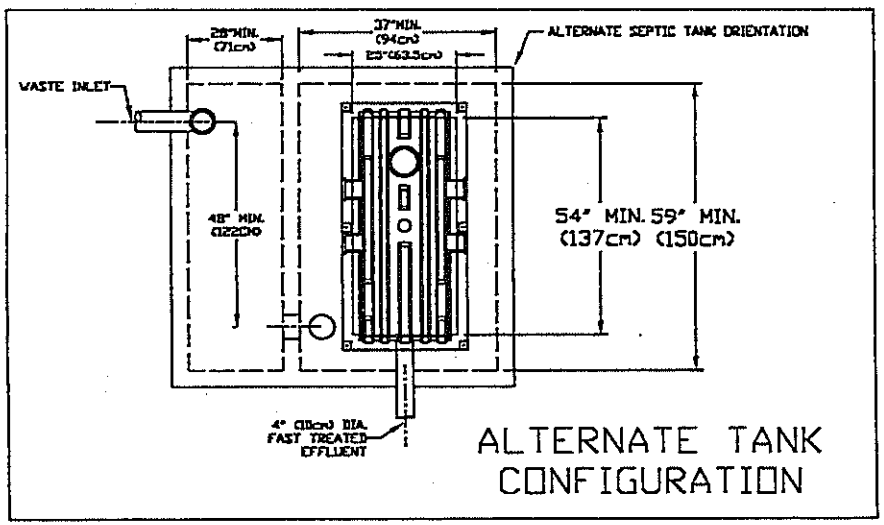
9. EITHER PLACE A PIPE CAP ON THE TOP OF THE INFLUENT PIPE TEE, OR EXTEND THE BAFFLE SEPARATING THE TWO ZONES ALL THE WAY TO THE TOP OF THE CONCRETE TANK. IF USING THE PIPE CAP, THE BAFFLE MUST EXTEND PAST THE WATER LEVEL 3" MIN. AS SHOWN ON THE DRAWING.

Date 7-06-01

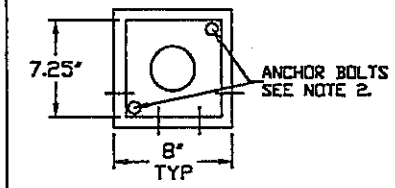
BIO-MICROBICS INCORPORATED

MicroFAST®
0.5

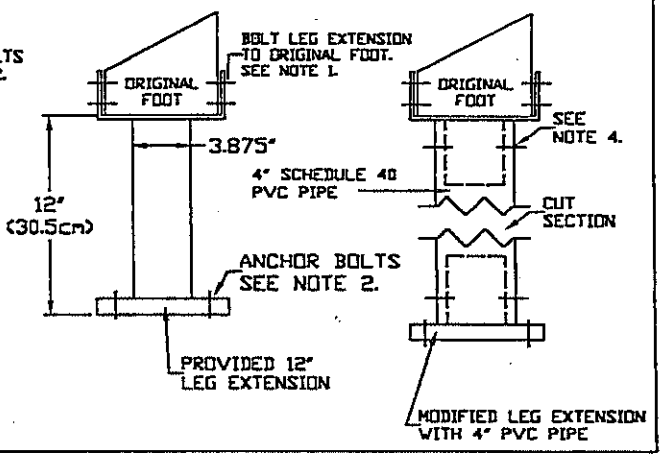
drawn by SMF



ALTERNATE TANK CONFIGURATION

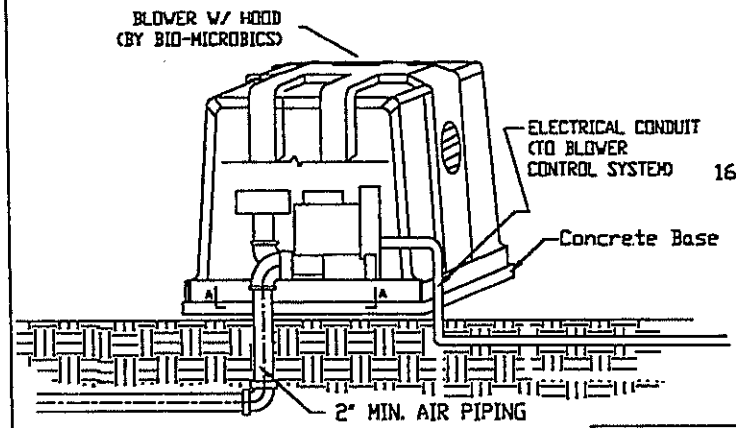


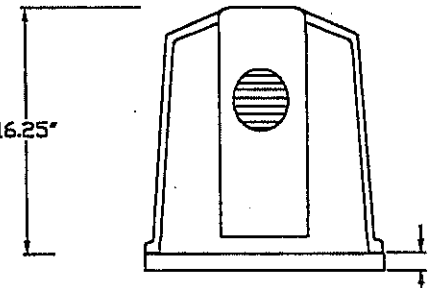
PLAN VIEW



LEG EXTENSION

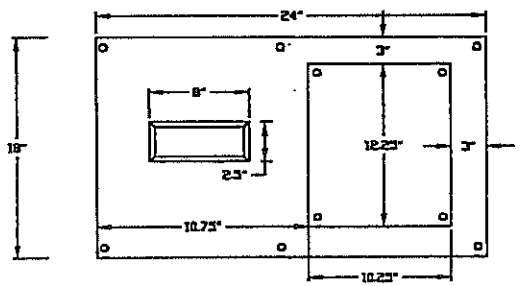
SEE NOTE 3.

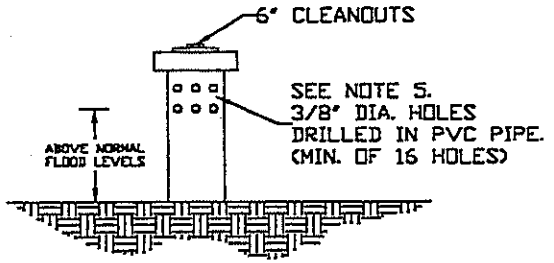




BLOWER HOUSING DIMENSIONS

Base Dimensions
Section A-A





VENTING OPTION

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH OF THE FOUR (4) CORNER LEG EXTENSIONS.
2. ANCHOR THE LEG EXTENSIONS (4 CORNER LEGS ONLY) TO THE BASE OF THE TANK. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 8-12 HOLES IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.

Date 7-25-01

BIO-MICROBICS INCORPORATED

MicroFAST® 0.5
Additional Views

Drawn by SMF

Specifications For MicroFAST 0.5 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) MicroFAST 0.5 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The MicroFAST 0.5 unit shall be situated within a 800 Gallon (3028 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The MicroFAST 0.5 treatment system shall be capable of treating the wastewater produced by typical family activities (bath, laundry, kitchen, etc.) ranging from (1) one to (8) eight persons and up to 500 US Gallons per day (1893 LPD).

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The MicroFAST 0.5 unit shall come equipped with a regenerative type blower capable of delivering 11-25 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the MicroFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the MicroFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 115/230 Volts, Single Phase, 60/50 Hertz, 3.8/1.9 Full Load Amps (Locked Rotor Amps are 18.6/9.3). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the MicroFAST 0.5 shall be done in accordance with the written instructions provided by the manufacturer. Operation manuals shall be furnished which will include a description of installation, operation, and system maintenance procedures. There shall be a separate manual for the installer, service provider, and owner, tailored to each.

9. WARRANTY
The manufacturer of the MicroFAST 0.5 treatment system shall warrant for three years from the date of shipment or two years form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

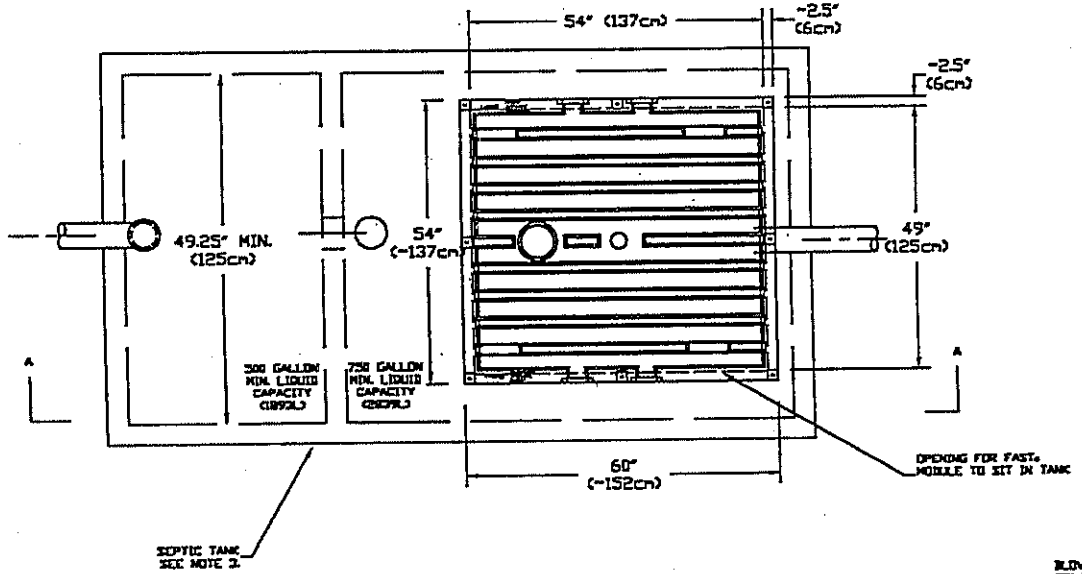
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

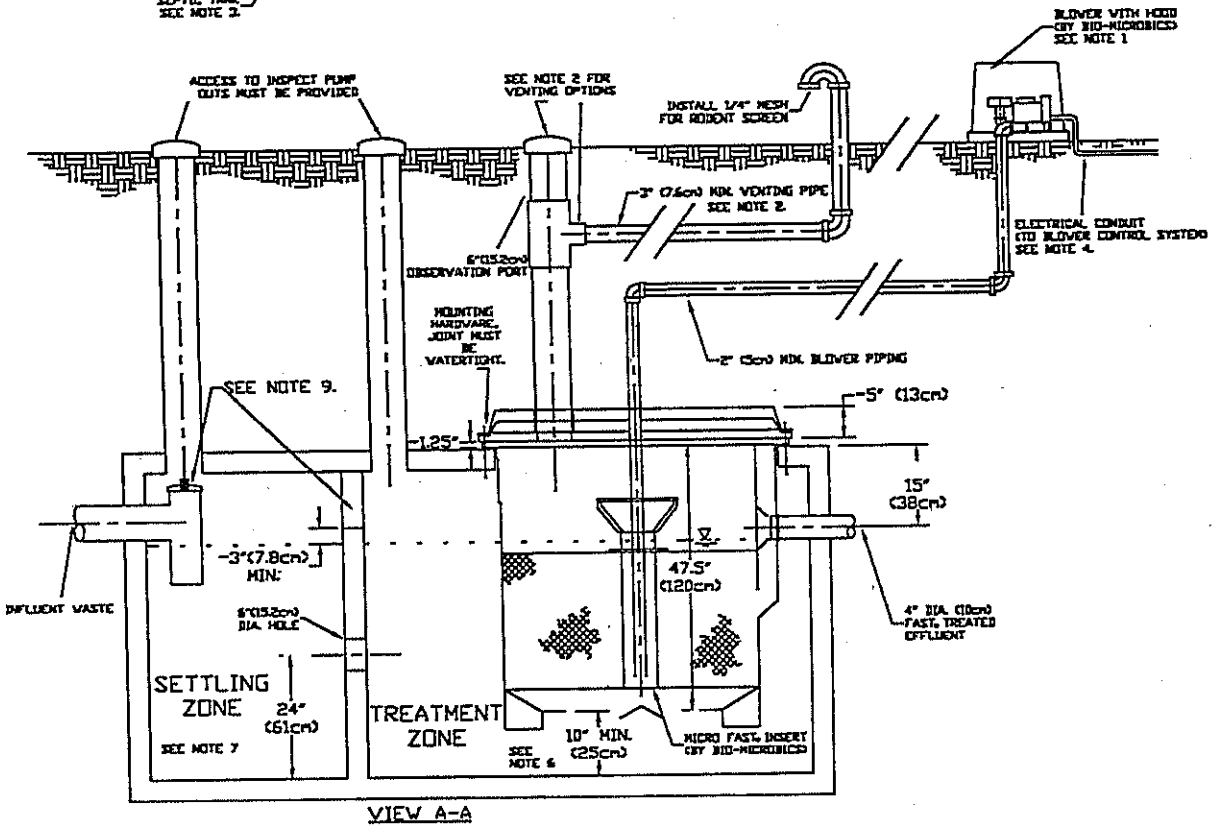
Date 7-24-01

BIO-MICROBICS INCORPORATED

MicroFAST 0.5 Specifications

by SMF





VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST UNIT. FOR DISTANCES GREATER THAN 100 FEET -- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS

2. RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH INSECT SCREEN.
   OR:
   CAP PIPES WITH 6" CLEANOUT. DRILL 8-12 HOLES IN 6" PIPE JUST UNDER PVC PIPE CAP. SEE ADDITIONAL VIEWS.
   NOTE: ODORS MAY BE PRESENT -- SEE MANUAL.

3. ALL APPURTENANCES TO FAST® (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5.

6. MUST INCREASE TANK SIZE BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF TANK. CONSULT FACTORY FOR APPROVAL.

7. THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.

8. FOUR LEG EXTENSIONS MAY BE USED TO STAND UNIT IN TANK ELIMINATING NEED FOR LID. SEE ADDITIONAL VIEWS AND REFER TO INSTALLATION MANUAL FOR MORE DETAILS.

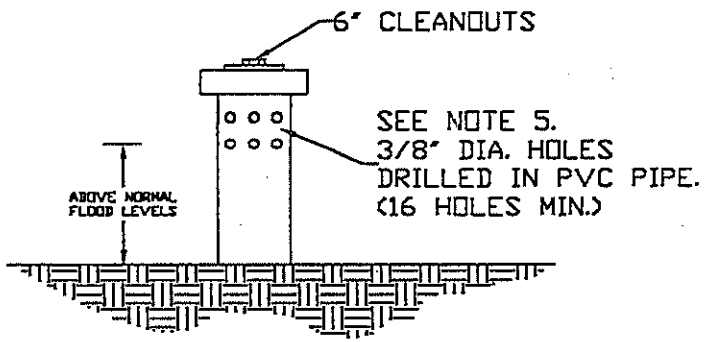
9. EITHER THE INFLUENT PIPE TEE SHALL BE FITTED WITH A PIPE CAP OR THE BAFFLE SEPERATING THE TWO ZONES SHALL BE EXTENDED ALL THE WAY TO THE TOP OF THE CONCRETE TANK. IF CHOOSING TO USE THE PIPE CAP, THEN THE BAFFLE SHALL BE AT LEAST 3" HIGHER THAN THE WATER LEVEL AS SHOWN ON THE DRAWING.

Date 7-28-01

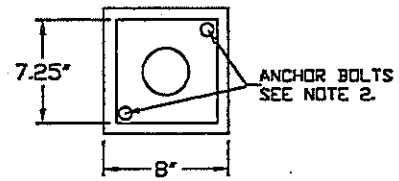
BIO-MICROBICS INCORPORATED

MicroFAST® 0.75

Drawn by SMF



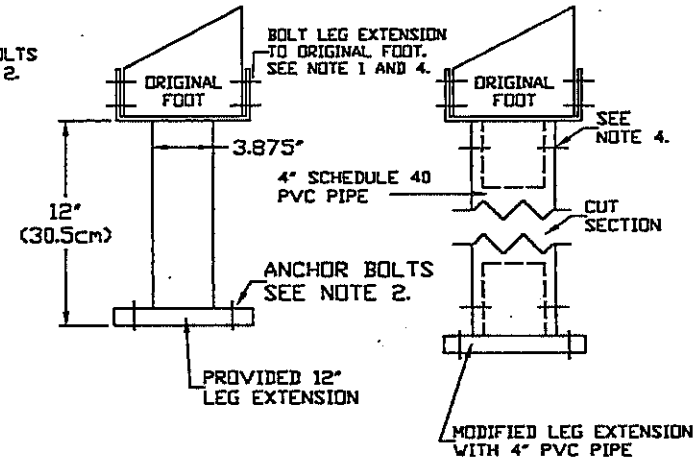
VENTING OPTION



PLAN VIEW

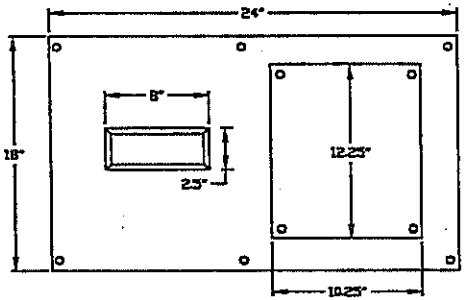
LEG EXTENSION

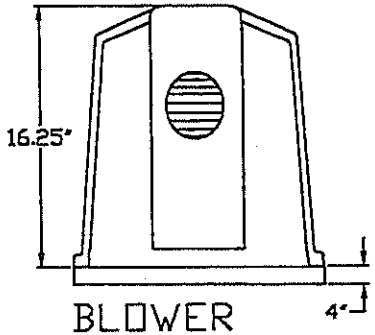
SEE NOTE 3.



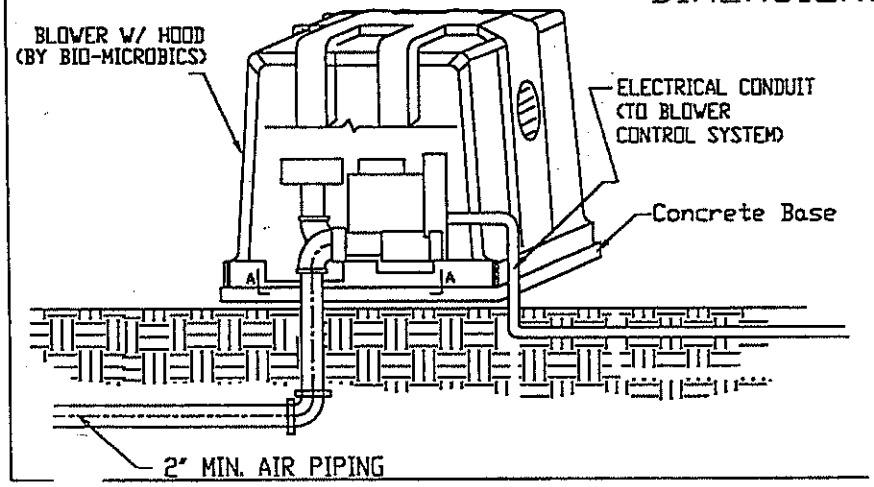
Base Dimensions

Section A-A





BLOWER DIMENSIONS



NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH OF THE FOUR (4) CORNER LEG EXTENSIONS.

2. ANCHOR THE LEG EXTENSIONS (4 CORNER LEGS ONLY) TO THE BASE OF THE TANK. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE.

3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.

4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.

5. ACCESS PORTS MAY BE USED AS VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.

Date 7-25-01

BIO-MICROBICS INCORPORATED

MicroFAST 0.75
Additional Views

wn by SMF

Specifications For MicroFAST 0.75 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) MicroFAST 0.75 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The MicroFAST 0.75 unit shall be situated within a 1,250 Gallon (4732 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The MicroFAST 0.75 treatment system shall be capable of treating the wastewater produced by typical family activities (bath, laundry, kitchen, etc.) ranging from (1) one to (11) eleven persons and up to 750 US Gallons per day (2842.5 LPD).

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The MicroFAST 0.75 unit shall come equipped with a regenerative type blower capable of delivering 17-25 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the MicroFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the MicroFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 115/230 Volts, Single Phase, 60/50 Hertz, 3.8/1.9 Full Load Amps (Locked Rotor Amps are 18.6/9.3). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the MicroFAST 0.75 shall be done in accordance with the written instructions provided by the manufacturer. Operation manuals shall be furnished which will include a description of installation, operation, and system maintenance procedures. There shall be a separate manual for the installer, service provider, and owner, tailored to each.

9. WARRANTY
The manufacturer of the MicroFAST 0.75 treatment system shall warrant for three years from the date of shipment or two years form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

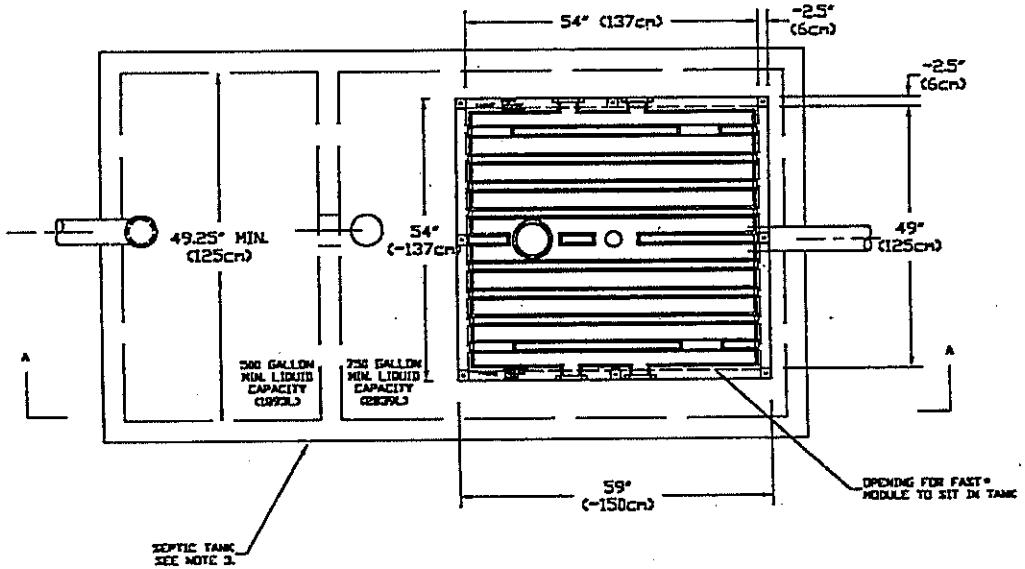
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

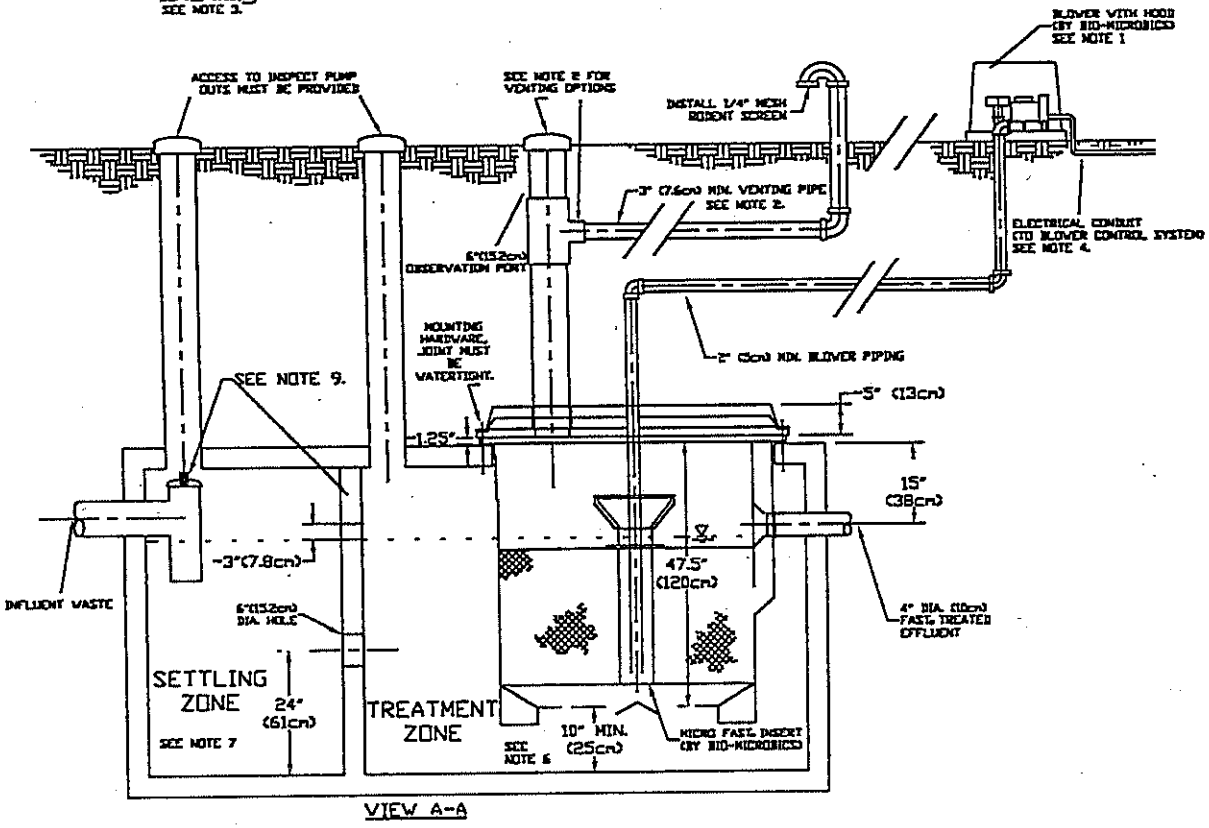
Date 7-25-01

BIO-MICROBICS INCORPORATED

MicroFAST 0.75 Specifications

Dr SMF





VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST UNIT. FOR DISTANCES GREATER THAN 100 FEET -- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS

2. RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH RODENT SCREEN.
   OR:
   CAP PIPES WITH 6" CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST UNDER PVC PIPE CAP. SEE ADDITIONAL VIEWS.

   NOTE: ODORS MAY BE PRESENT -- SEE MANUAL.

3. ALL APPURTENANCES TO FAST® (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5. COPYRIGHT (C) 2001, BIO-MICROBICS, INC.

6. MUST INCREASE TANK SIZE BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF TANK. CONSULT FACTORY FOR APPROVAL.

7. THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.

8. FOUR LEG EXTENSIONS MAY BE USED TO STAND UNIT IN TANK ELIMINATING NEED FOR LID. SEE ADDITIONAL VIEWS AND REFER TO INSTALLATION MANUAL FOR MORE DETAILS.

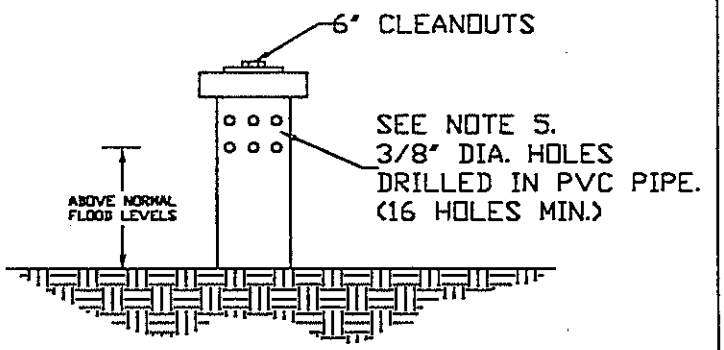
9. THE INFLUENT PIPE TEE SHALL BE FITTED WITH A PIPE CAP, OR THE BAFFLE THAT SEPARATES THE TWO ZONES NEEDS TO EXTEND ALL THE WAY TO THE TOP OF THE CONCRETE TANK. IF THE PIPE CAP OPTION IS CHOSEN, THE BAFFLE MUST EXTEND PAST THE WATER LEVEL AT LEAST THREE INCHES AS SHOWN IN THE DRAWING.

Date 7-23-01

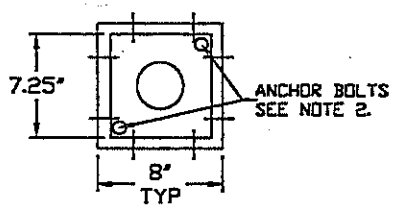
BIO-MICROBICS INCORPORATED

MicroFAST® 0.9

by SMF



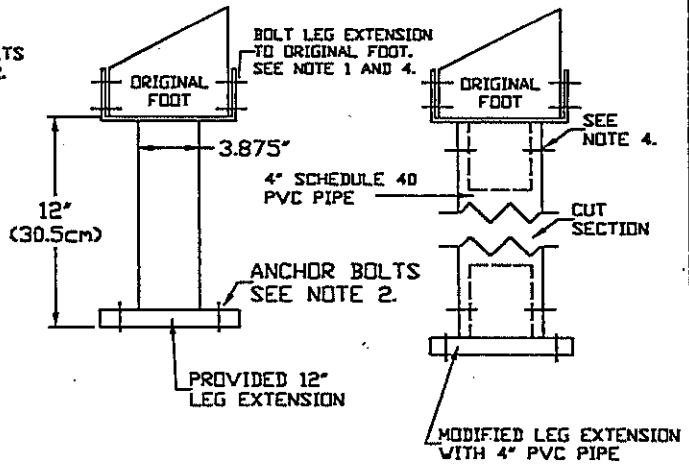
VENTING OPTION



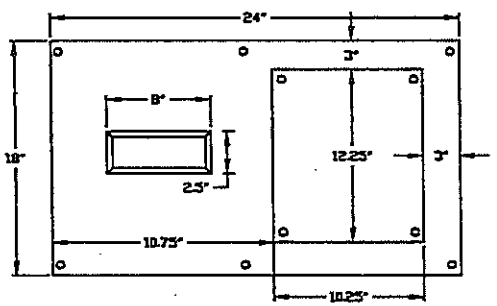
PLAN VIEW

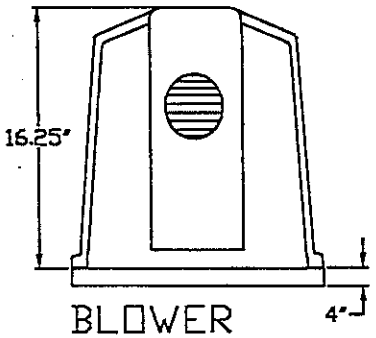
LEG EXTENSION

SEE NOTE 3.

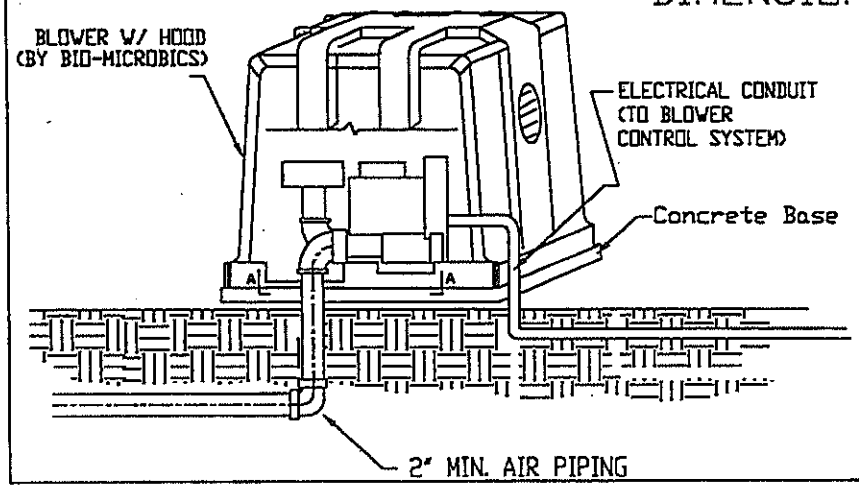


Base Dimensions
Section A-A





BLOWER
DIMENSIONS



NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH OF THE FOUR (4) CORNER LEG EXTENSIONS.
2. ANCHOR THE LEG EXTENSIONS (4 CORNER LEGS ONLY) TO THE BASE OF THE TANK. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL A MIN. OF 16 HOLES IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.

Date 7-25-01

BIO-MICROBICS INCORPORATED

MicroFAST® 0.9
Additional Views

Drawn by SMF

Specifications For MicroFAST 0.9 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) MicroFAST 0.9 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The MicroFAST 0.9 unit shall be situated within a 1,250 Gallon (4732 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The MicroFAST 0.9 treatment system shall be capable of treating the wastewater produced by typical family activities (bath, laundry, kitchen, etc.) ranging from (1) one to (14) fourteen persons and up to 900 US Gallons per day (3407 LPD).

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The MicroFAST 0.9 unit shall come equipped with a regenerative type blower capable of delivering 17-25 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the MicroFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the MicroFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 115/230 Volts, Single Phase, 60/50 Hertz, 3.8/1.9 Full Load Amps (Locked Rotor Amps are 18.6/9.3). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the MicroFAST 0.9 shall be done in accordance with the written instructions provided by the manufacturer. Operation manuals shall be furnished which will include a description of installation, operation, and system maintenance procedures. There shall be a separate manual for the installer, service provider, and owner, tailored to each.

9. WARRANTY
The manufacturer of the MicroFAST 0.9 treatment system shall warrant for three years from the date of shipment or two years form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

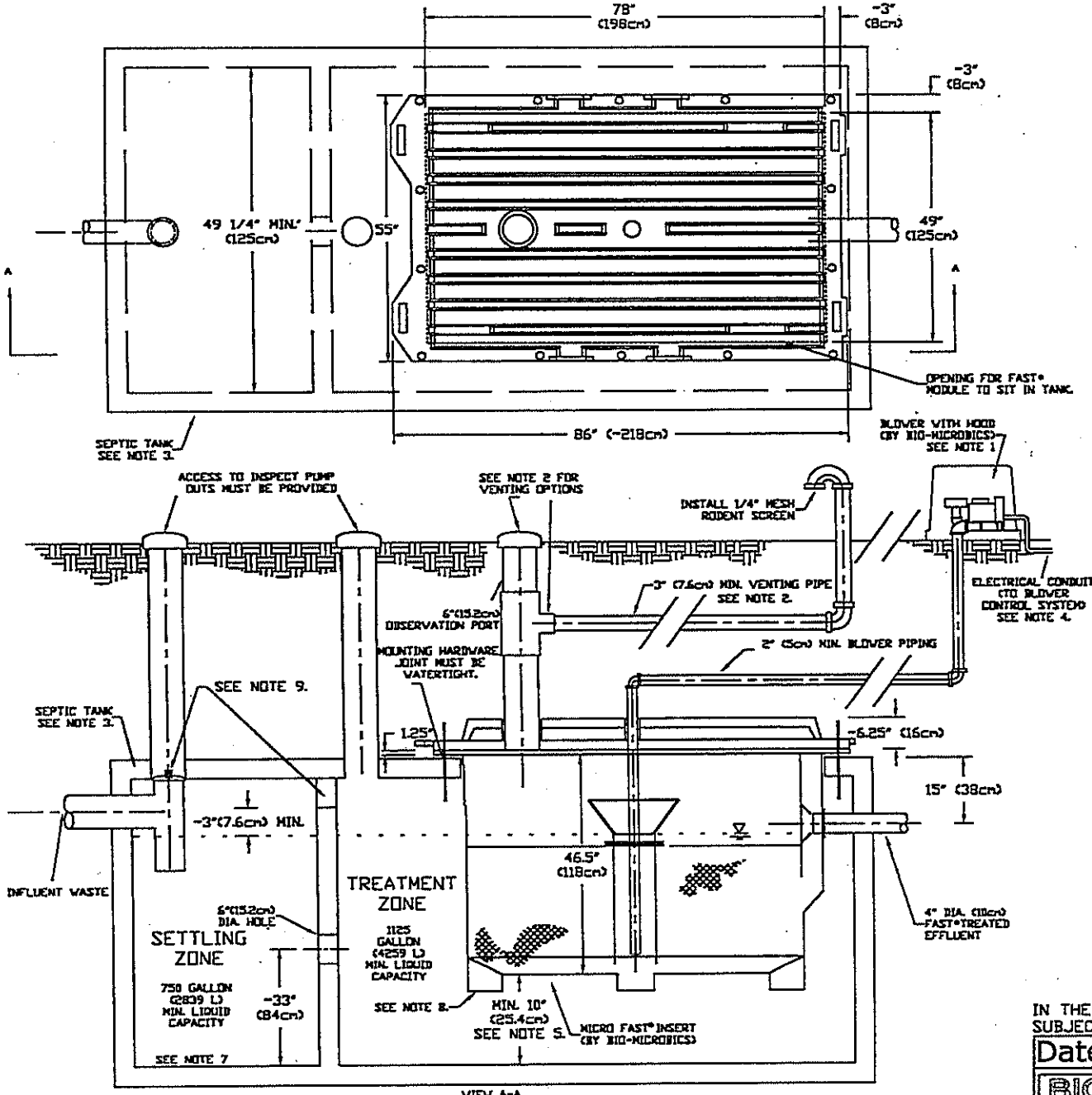
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

Date 7-09-01

BIO-MICROBICS INCORPORATED

MicroFAST 0.9 Specifications

by SMF



NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST UNIT. FOR DISTANCES GREATER THAN 100 FEET -- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS

2. RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH RODENT SCREEN.

   OR:

   CAP PIPES WITH 6" CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST UNDER PVC PIPE CAP. SEE ADDITIONAL VIEWS.

   NOTE: ODORS MAY BE PRESENT -- SEE MANUAL.

3. ALL APPURTENANCES TO FAST® (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5. COPYRIGHT (C) 2001, BIO-MICROBICS, INC.

6. MUST INCREASE TANK SIZE BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF TANK. CONSULT FACTORY FOR APPROVAL.

7. THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.

8. FOUR LEG EXTENSIONS MAY BE USED TO STAND UNIT IN TANK ELIMINATING NEED FOR LID. SEE ADDITIONAL VIEWS AND REFER TO INSTALLATION MANUAL FOR MORE DETAILS.

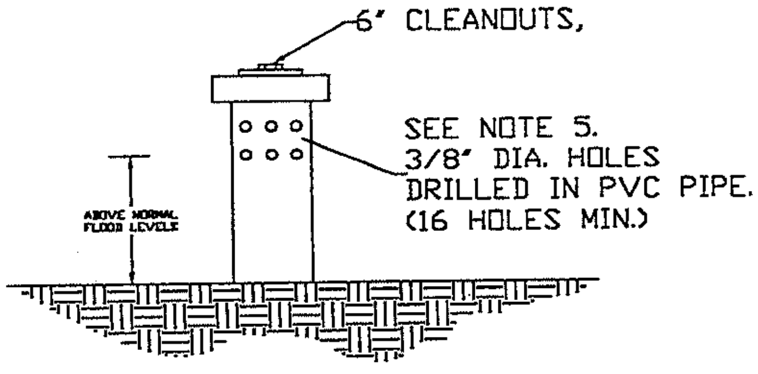
9. THERE IS AN OPTION OF EITHER PLACING A PIPE CAP ON THE TOP OF THE INFLUENT TEE OR EXTENDING THE BAFFLE SEPERATING THE TWO ZONES ALL THE WAY TO THE TOP OF THE CONCRETE TANK. IF USING THE PIPE CAP OPTION, THE BAFFLE MUST EXTEND AT LEAST 3" PAST THE WATER LEVEL IN THE TANK AS SHOWN IN THE DRAWING.

Date 7-23-01

BIO-MICROBICS INCORPORATED

MicroFAST® 1.5

by SMF



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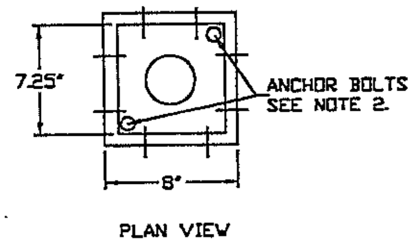
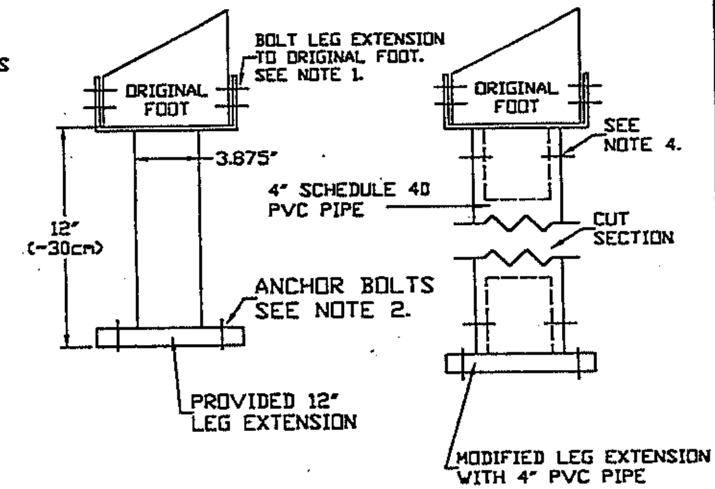
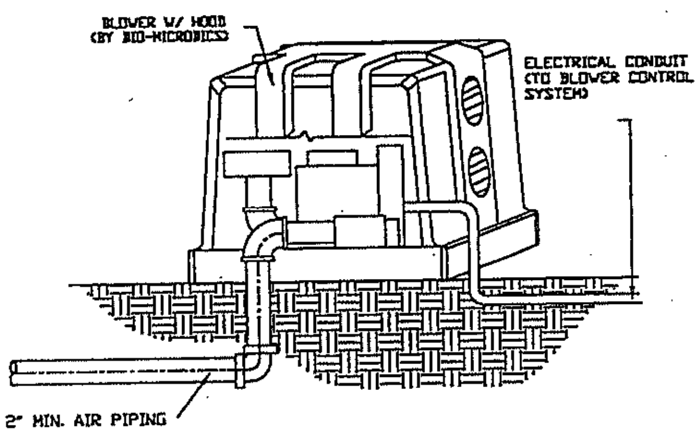




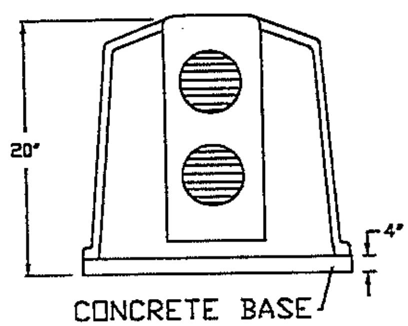
LEG EXTENSION

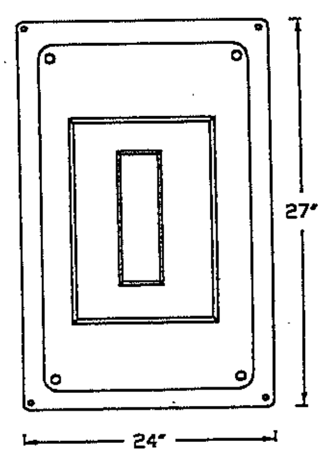
SEE NOTE 3.

BLOWER HOUSING DIMENSIONS



SIDE VIEW





PLAN VIEW OF BLOWER BASE

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH OF THE FOUR (4) CORNER LEG EXTENSIONS.
2. ANCHOR THE LEG EXTENSIONS (4 CORNER LEGS ONLY) TO THE BASE OF THE TANK. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.

IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 7-25-01	MicroFAST® 1.5 Additional Views
BIO-MICROBICS® INCORPORATED	
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	Drawn by SMF

Specifications For MicroFAST 1.5 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) MicroFAST 1.5 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System Insert, Insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The MicroFAST 1.5 unit shall be situated within a 1,875 Gallon (7098 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The MicroFAST 1.5 treatment system shall be capable of treating the wastewater produced by typical family activities (bath, laundry, kitchen, etc.) ranging from (6) six to (21) twenty-one persons and up to 1,500 US Gallons per day (5678 LPD).

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The MicroFAST 1.5 unit shall come equipped with a regenerative type blower capable of delivering 25-40 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the MicroFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the MicroFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 115/230 Volts, Single Phase, 60/50 Hertz, 5.6/2.8 Full Load Amps (Locked Rotor Amps are 23.2/11.6). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the MicroFAST 1.5 shall be done in accordance with the written instructions provided by the manufacturer. Operation manuals shall be furnished which will include a description of installation, operation, and system maintenance procedures. There shall be a separate manual for the installer, service provider, and owner, tailored to each.

9. FLOW & PIPE SIZING
Each FAST module is provided with a standard (4) four inch effluent pipe hole and gasket. The maximum free or unrestricted flow with a four inch effluent pipe is 90 U.S. Gallons per minute (341 LPM), or 45 U.S. GPM (170 LPM) with a 2.0 design safety factor. An optional (6) six inch hole and gasket can be utilized on the same centerline dimension or up to 2 inches (5 cm) higher. Maximum free or unrestricted flow with a 6 inch effluent pipe is 260 GPM (984 LPM) or 130 GPM (492 LPM) with a 2.0 design safety factor.

10. WARRANTY
The manufacturer of the MicroFAST 1.5 treatment system shall warrant for three years from the date of shipment or two years form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

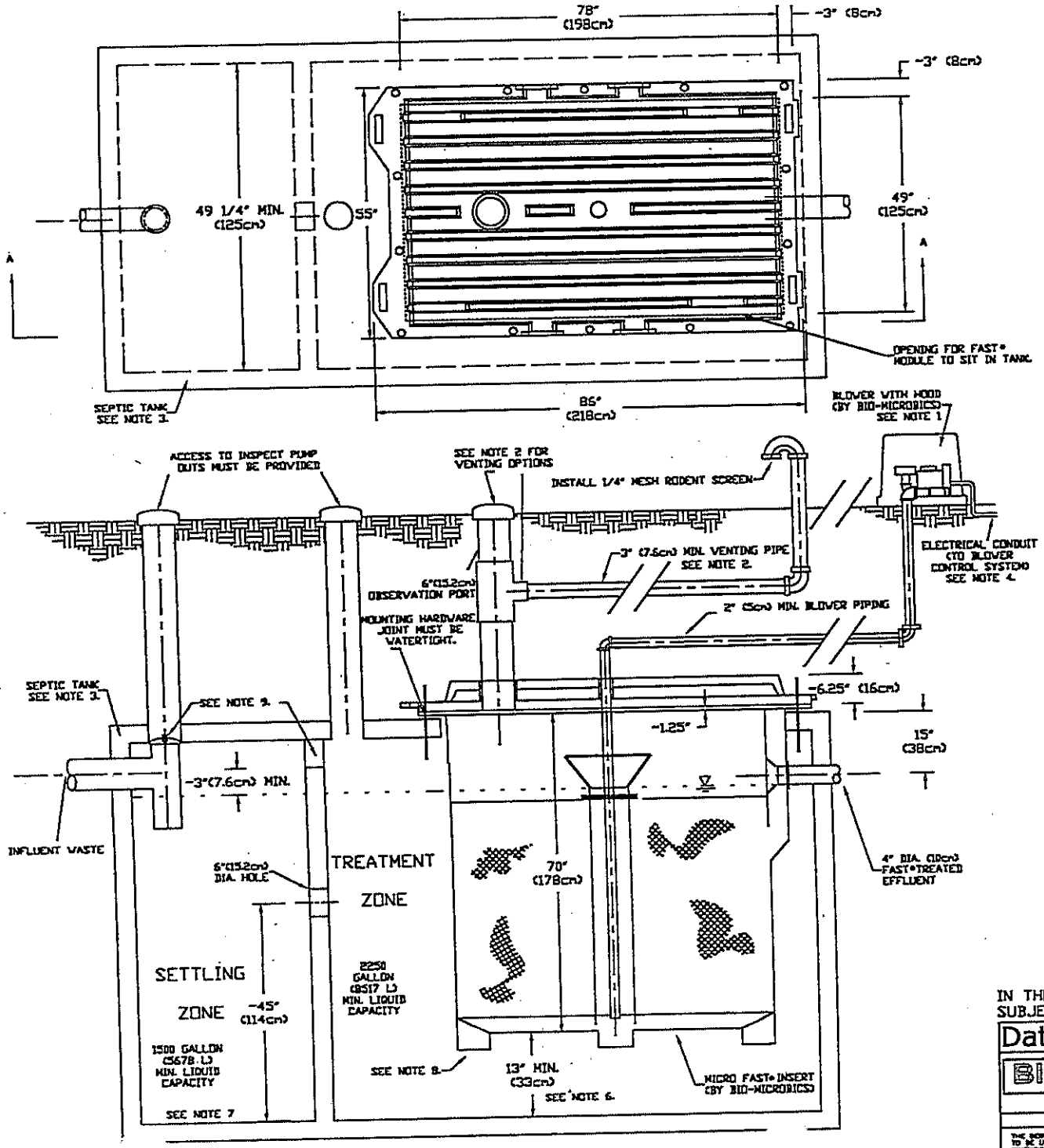
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

Date 7-13-01

BIO-MICROBICS INCORPORATED

MicroFAST 1.5 Specifications

by SMF



VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST UNIT. FOR DISTANCES GREATER THAN 100 FEET -- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS

2. RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH RODENT SCREEN.

   OR:

   CAP PIPES WITH 6" CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST UNDER PVC PIPE CAP. SEE ADDITIONAL VIEWS.

   NOTE: ODORS MAY BE PRESENT -- SEE MANUAL.

3. ALL APPURTENANCES TO FAST® (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5.

6. MUST INCREASE TANK SIZE BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF TANK. CONSULT FACTORY FOR APPROVAL.

7. THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.

8. FOUR LEG EXTENSIONS MAY BE USED TO STAND UNIT IN TANK ELIMINATING NEED FOR LID. SEE ADDITIONAL VIEWS AND REFER TO INSTALLATION MANUAL FOR MORE DETAILS.

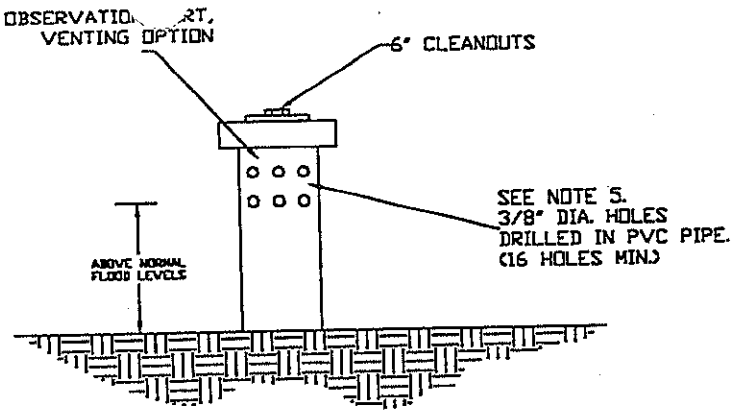
9. THERE IS AN OPTION OF EITHER PLACING A PIPE CAP ON THE TOP OF THE INFLUENT TEE OR EXTENDING THE BAFFLE SEPARATING THE TWO ZONES TO THE TOP OF THE CONCRETE TANK. IF THE PIPE CAP OPTION IS CHOSEN, THE BAFFLE MUST EXTEND AT LEAST 3" PAST THE WATER LEVEL AS SHOWN IN THE DRAWING.

Date 7-23-01

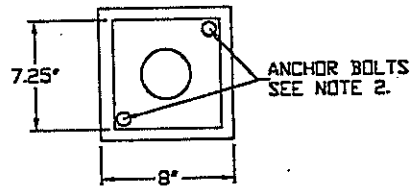
BIO-MICROBICS® INCORPORATED

MicroFAST®
3.0

by SMF



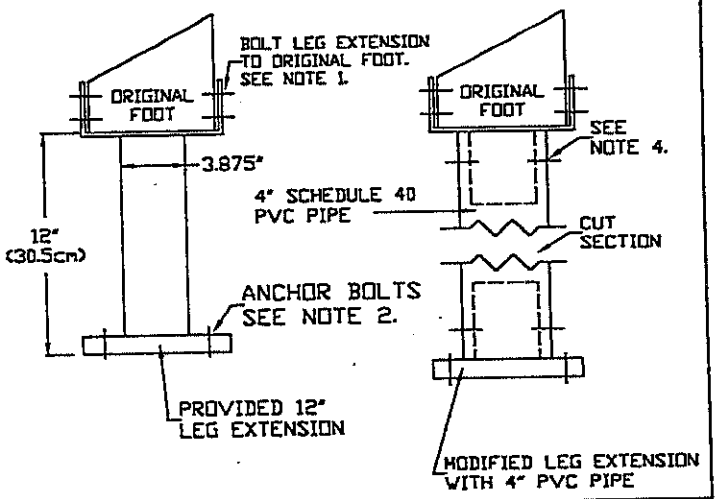
VENTING OPTION



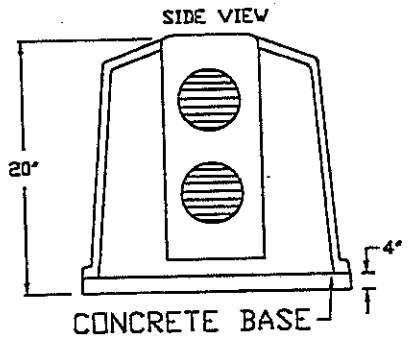
PLAN VIEW

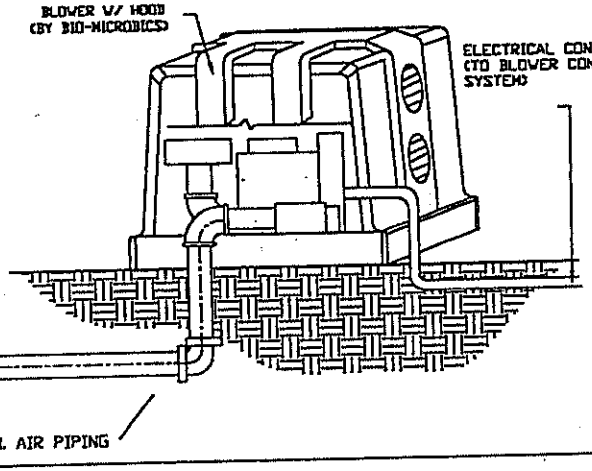
LEG EXTENSION

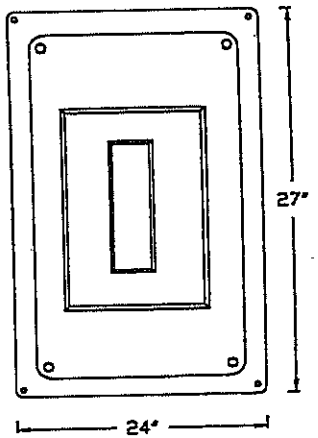
SEE NOTE 3.



BLOWER HOUSING DIMENSIONS







PLAN VIEW

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH OF THE FOUR (4) CORNER LEG EXTENSIONS.
2. ANCHOR THE LEG EXTENSIONS (4 CORNER LEGS ONLY) TO THE BASE OF THE TANK. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.

Date 7-18-01

BIO-MICROBICS INCORPORATED

MicroFAST 3.0 Additional Views

Drawn by SMF

Specifications For MicroFAST 3.0 Wastewater Treatment System

1. GENERAL

The contractor shall furnish and install (1) MicroFAST 3.0 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The MicroFAST 3.0 unit shall be situated within a 3,750 Gallon (14195 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS

The MicroFAST 3.0 treatment system shall be capable of treating the wastewater produced by typical family activities (bath, laundry, kitchen, etc.) ranging from (10) ten to (42) forty-two persons and up to 3,000 US Gallons per day (11355 LPD).

3. MEDIA

The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER

The MicroFAST 3.0 unit shall come equipped with a regenerative type blower capable of delivering 44-80 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER

The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the MicroFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the MicroFAST shall be provided and installed by the contractor.

6. ELECTRICAL

The treatment system shall be designed to operate on standard current. The input power required for the blower is 230 Volts, Single Phase, 60/50 Hertz, 10.4 Full Load Amps (Locked Rotor Amps are 49), or 208-230/460 Volts, Three Phase, 60/50 Hertz, 5/2.5 Full Load Amps (Locked Rotor Amps are 37/18.5). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS

The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS

Installation of the MicroFAST 3.0 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

9. FLOW & PIPE SIZING

Each FAST module is provided with a standard (4) four inch effluent pipe hole and gasket. The maximum free or unrestricted flow with a four inch effluent pipe is 90 U.S. Gallons per minute (341 LPM), or 45 U.S. GPM (170 LPM) with a 2.0 design safety factor. An optional (6) six inch hole and gasket can be utilized on the same centerline dimension or up to 2 inches (5 cm) higher. Maximum free or unrestricted flow with a 6 inch effluent pipe is 260 GPM (984 LPM) or 130 GPM (492 LPM) with a 2.0 design safety factor.

10. WARRANTY

The manufacturer of the MicroFAST 3.0 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

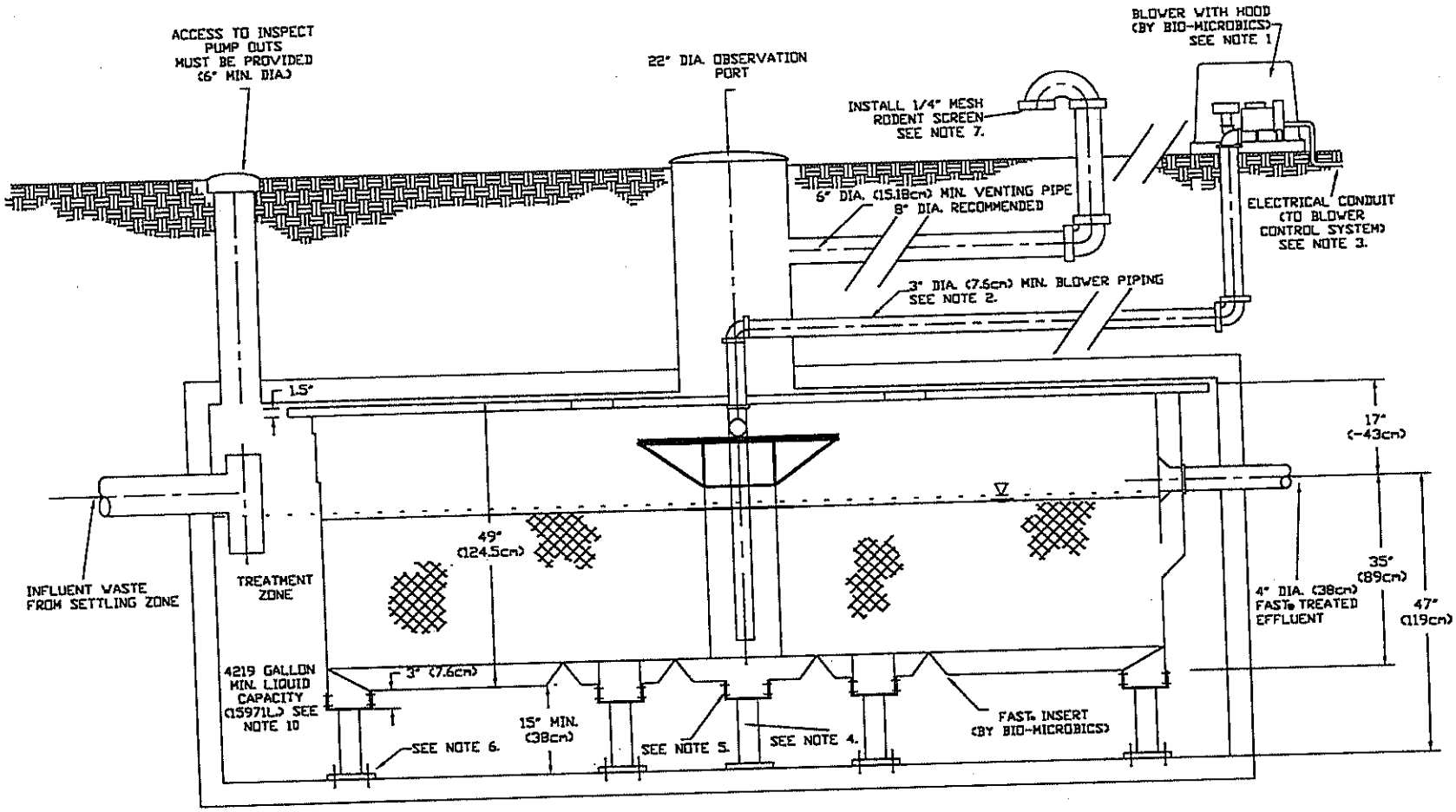
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

Date 7-11-01

BIO-MICROBICS INCORPORATED

MicroFAST 3.0 Specifications

by SMF



NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST® UNIT WITH LESS THAN 4 ELBOWS. FOR DISTANCES GREATER THAN 100 FEET--CONSULT FACTORY. BLOWER BASE MUST BE ABOVE NORMAL FLOOD LEVEL.

2. THE FACTORY RECOMMENDS CONNECTING AT LEAST ONE LENGTH OF GALVANIZED PIPE TO THE DISCHARGE SIDE OF THE BLOWER TO PREVENT HEAT FATIGUE CAUSED BY BLOWER FRICTION. DO NOT RUN GALVANIZED PIPE LENGTH INTO THE CONCRETE TANK.

3. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

4. TO ELONGATE THE FOOT PAST THE PROVIDED 12" (30.5cm) EXTENSION, CUT THE 3.9" DIA. (9.8cm) LEG EXTENSION INTO TWO SEPARATE PIECES. NEXT, CUT A 4" SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP CUT SECTION AND THE BOTTOM CUT SECTION OF THE LEG EXTENSION. ATTACH PIPE WITH STAINLESS STEEL SCREWS. EQUAL ELONGATION MUST BE DONE ON EACH LEG WHEN THE PROVIDED 12" IS FOUND INSUFFICIENT.

5. (11) ORIGINAL FEET ARE ON THE BASE OF THE FAST TREATMENT MODULE. EACH LEG EXTENSION IS TO BE ATTACHED TO THEIR CORRESPONDING FOOT WITH THE PROVIDED HARDWARE.

6. ANCHOR ALL LEG EXTENSIONS TO THE BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE FOOT EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED. SEE ADDITIONAL VIEWS DRAWING.

7. RUN VENT (6" DIA. MIN, 8" RECOMMENDED) TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH RODENT SCREEN.

OR:

CAP PIPES WITH 6" CLEANOUT. DRILL 16-20 HOLES IN 6" PIPE JUST BELOW THE PVC PIPE CAP.

NOTE: ODORS MAY BE PRESENT--SEE MANUAL.

8. PLEASE SEE ADDITIONAL VIEWS DRAWING.

9.

10. SETTLING TANK(S) EQUALLING 1/2 TO 1 X DAILY FLOW MUST BE USED PRIOR TO FAST.

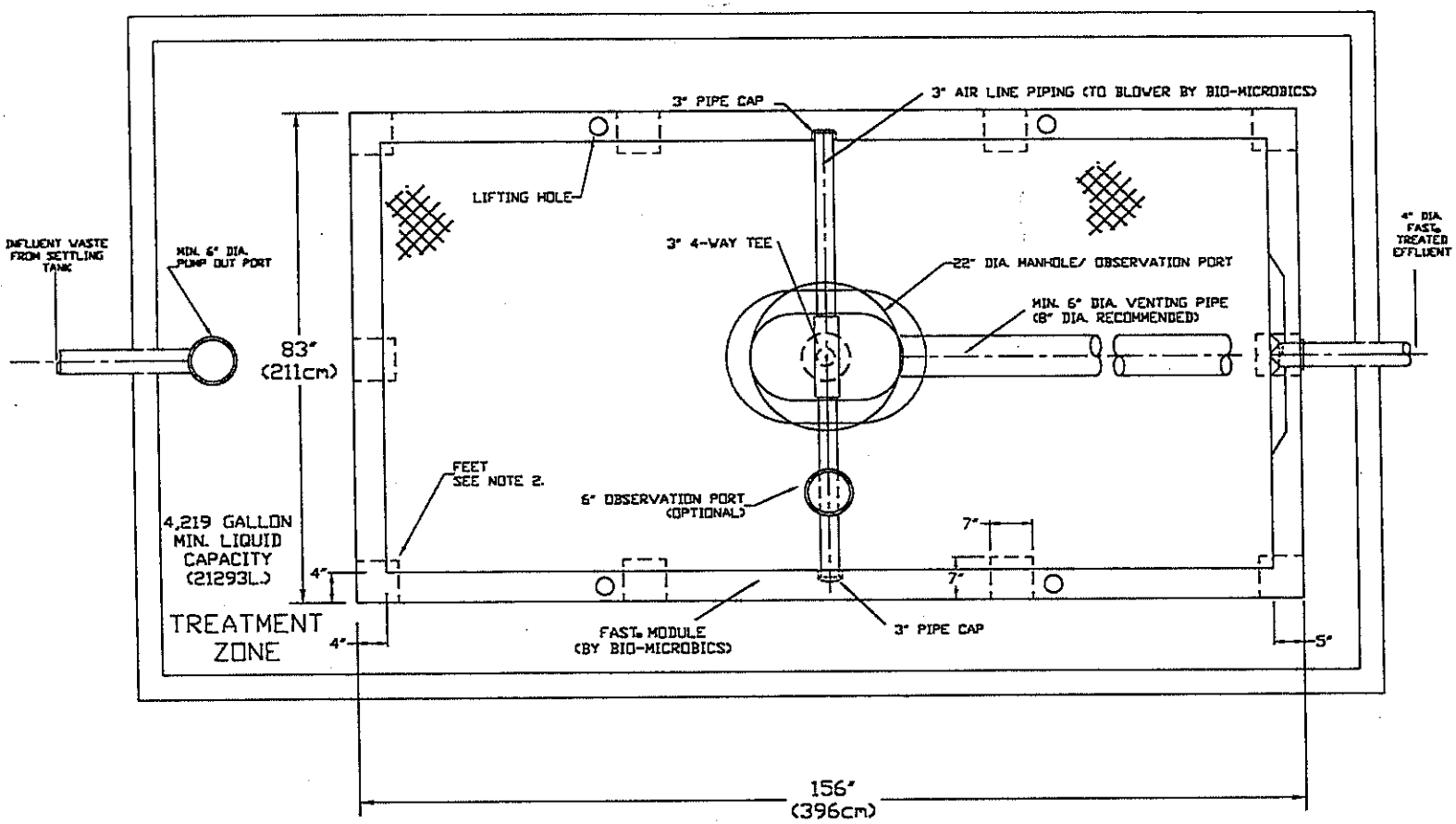
IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS A SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 8-14-01

BIO-MICROBICS® INCORPORATED

MicroFAST®4.5 (Cut View)

Drawn by SMF



NOTES

1. ELEVEN (11) ORIGINAL FEET ARE ON THE BASE OF THE FAST TREATMENT MODULE. LEG EXTENSIONS ARE TO BE ATTACHED TO THE ORIGINAL FEET TO SUPPORT THE FAST MODULE.

2. THE PROVIDED LEG EXTENSIONS SHOULD BE PLACED ON EACH CORRESPONDING FOOT OF THE FAST MODULE WITH THE PROVIDED HARDWARE. SEE ADDITIONAL VIEWS DRAWING.

3. ALL APPURTENANCES TO FAST (e.g. SEPTIC TANK, PUMP OUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. TO ELONGATE THE LEG PAST THE PROVIDED 12" (39.5cm), CUT THE 3.9" DIA. (9.8cm) FOOT EXTENSION INTO TWO SEPARATE PIECES. THEN CUT A 4" SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE END OVER THE TOP CUT SECTION AND THE BOTTOM CUT SECTION OF THE FOOT EXTENSION. ATTACH PIPE WITH STAINLESS STEEL SCREWS. ELONGATION MUST BE DONE ON ALL ELEVEN LEG EXTENSIONS WHEN THE PROVIDED 12" ELONGATION IS FOUND INSUFFICIENT.

5. ANCHOR ALL LEG EXTENSIONS INTO THE BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE FOOT EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED TO THE TANK BASE.

   NOTE: SEE ADDITIONAL VIEWS DRAWING.

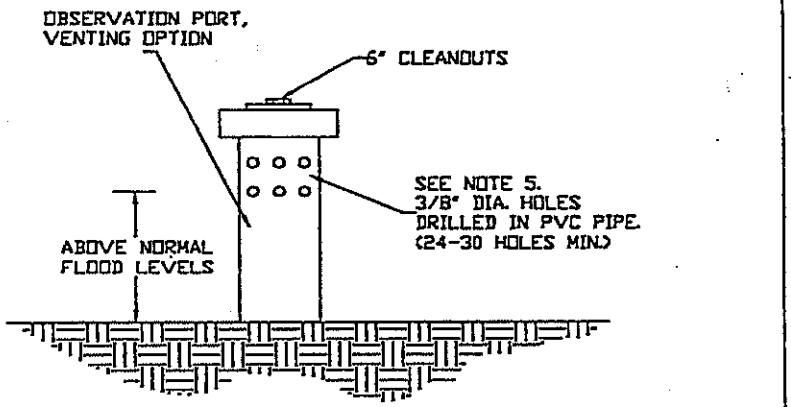
6. FOUR-WAY 3" PVC TEE IS PROVIDED BY THE FACTORY AS WELL AS 3" PVC PIPE EXTENDING FROM THE TEE HORIZONTALLY IN BOTH DIRECTIONS AND CAPPED OFF OUTSIDE OF THE MODULE LINER. THE AIRLINE MUST COME IN FROM THE TOP AND ATTACH TO THE PVC TEE.

Date 7-24-01

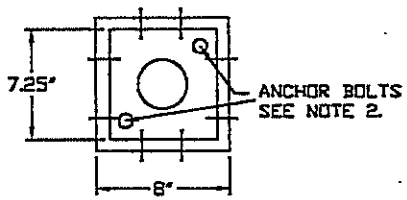
BIO-MICROBICS INCORPORATED

MicroFAST®4.5 (Plan View)

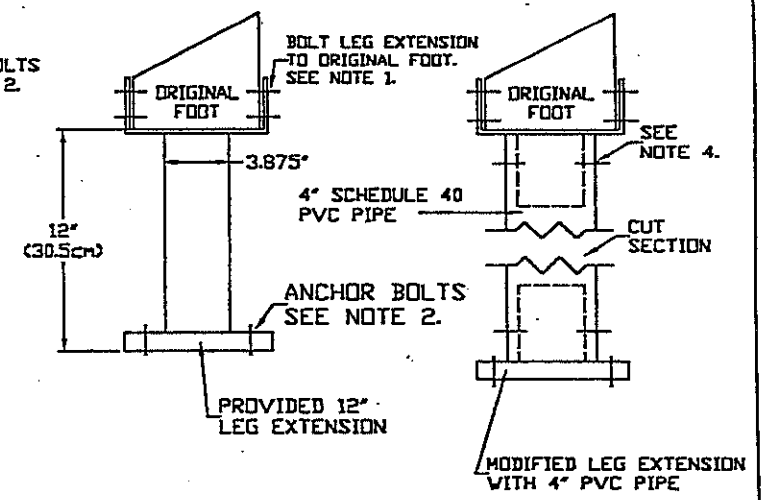
Drawn by SMF



VENTING OPTION

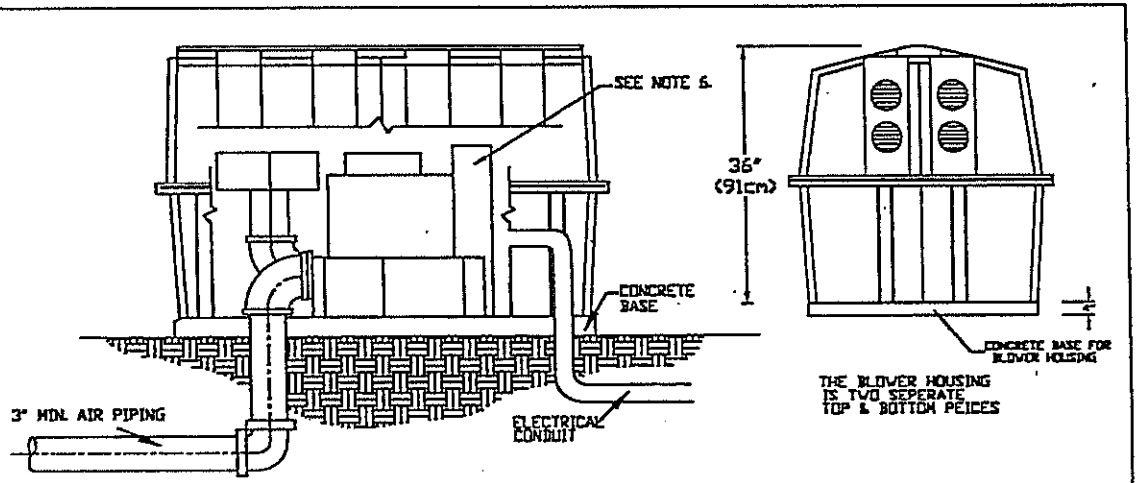


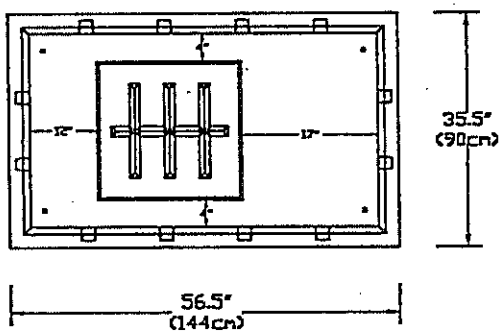
PLAN VIEW



LEG EXTENSION

SEE NOTE 3.





BLOWER HOUSING DIMENSIONS

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH LEG EXTENSIONS.
2. ANCHOR ALL LEG EXTENSIONS TO BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" DIA. LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS A VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 24-30 HOLES IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.
6. AN OPTIONAL BLOWER WITH TWO DISCHARGE PIPES MAY BE PURCHASED. (ONE BLOWER USED FOR TWO SYSTEMS) CONSULT FACTORY.

Date 7-11-01

BIO-MICROBICS INCORPORATED

MicroFAST 4.5 Additional Views

by SMF

Specifications For MicroFAST 4.5 Wastewater Treatment System

1. GENERAL

The contractor shall furnish and install (1) MicroFAST 4.5 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, leg extensions, blower assembly, blower controls and alarms. The MicroFAST 4.5 unit shall be situated within a 4,219 Gallon (15971 L) minimum tank, as shown on the plans. Settling tank(s) equalling 1/2 to 1 x daily flow must be used prior to FAST. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS

The MicroFAST 4.5 treatment system shall be capable of treating the wastewater produced by typical family activities (bath, laundry, kitchen, etc.) ranging from (18) eighteen to (63) sixty-three persons and up to 4,500 US Gallons per day (17033 LPD).

3. MEDIA

The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER

The MicroFAST 4.5 unit shall come equipped with a regenerative type blower capable of delivering 90-135 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER

The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the MicroFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the MicroFAST shall be provided and installed by the contractor.

6. ELECTRICAL

The treatment system shall be designed to operate on standard current. The input power required for the blower is 230 Volts, Single Phase, 60/50 Hertz, 11.5 Full Load Amps (Locked Rotor Amps are 67), or 208-230/460 Volts, Three Phase, 60/50 Hertz, 6.6/3.3 Full Load Amps (Locked Rotor Amps are 54/27). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS

The alarm system shall consist of a visual and audible alarm to indicate loss of power to the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS

Installation of the MicroFAST 4.5 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

To lift the FAST unit use spreader bars between lifting points. Module weighs approximately 1,600 lbs.

9. FLOW & PIPE SIZING

Each FAST module is provided with a standard (4) four inch effluent pipe hole and gasket. The maximum free or unrestricted flow with a four inch effluent pipe is 90 U.S. Gallons per minute (341 LPM), or 45 U.S. GPM (170 LPM) with a 2.0 design safety factor. An optional (6) six inch hole and gasket can be utilized on the same centerline dimension or up to 2 inches (5 cm) higher. Maximum free or unrestricted flow with a 6 inch effluent pipe is 260 GPM (984 LPM) or 130 GPM (492 LPM) with a 2.0 design safety factor.

10. WARRANTY

The manufacturer of the MicroFAST 4.5 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

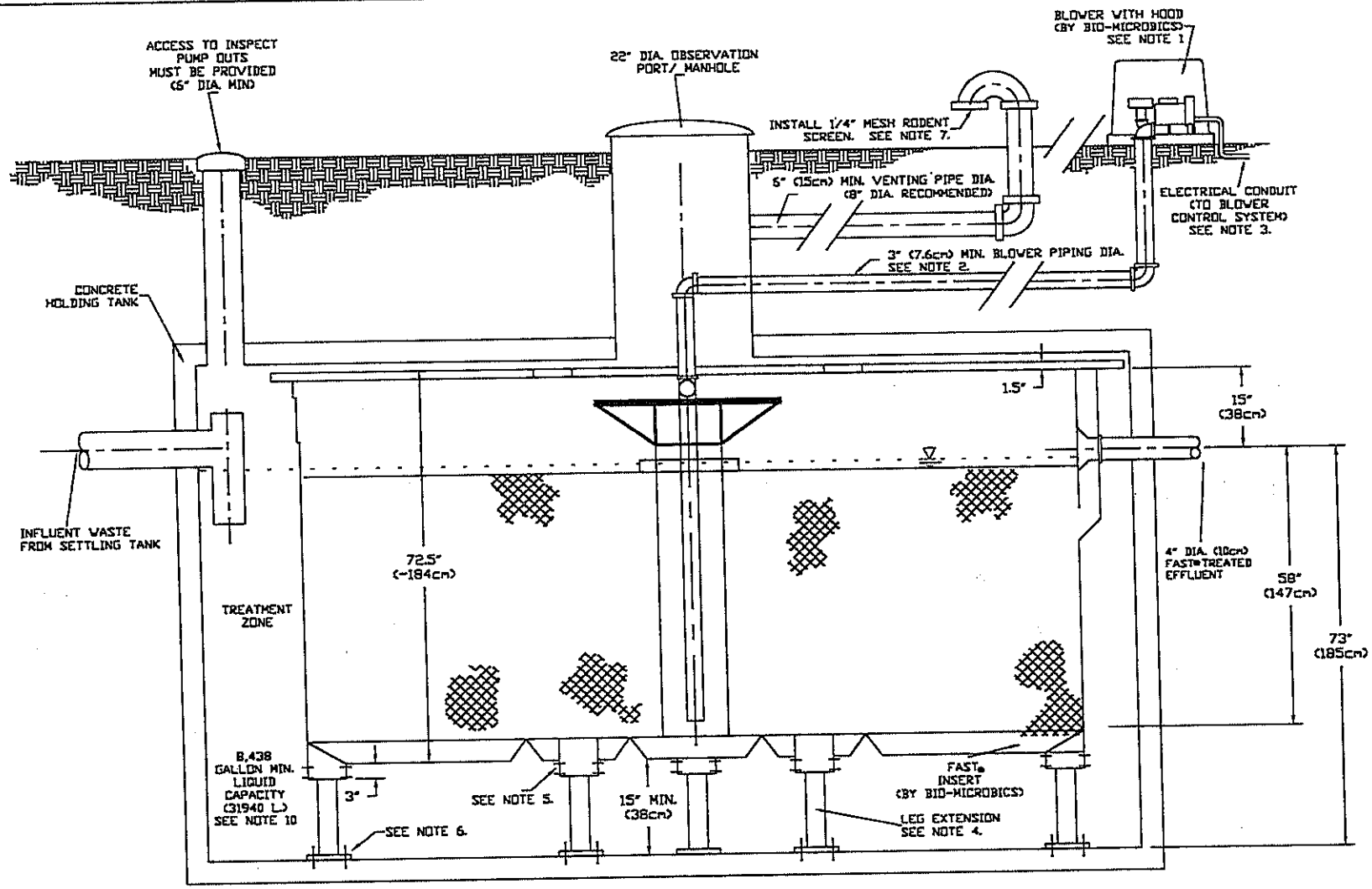
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

Date 7-11-01

BIO-MICROBICS INCORPORATED

MicroFAST 4.5 Specifications

Drawn by SMF



NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST® UNIT. FOR DISTANCES GREATER THAN 100 FEET--CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVEL.

2. THE FACTORY RECOMMENDS CONNECTING AT LEAST ONE LENGTH OF GALVANIZED PIPE TO THE DISCHARGE SIDE OF THE BLOWER TO PREVENT HEAT FATIGUE CAUSED BY BLOWER FRICTION. DO NOT RUN GALVANIZED PIPE LENGTH INTO THE CONCRETE TANK.

3. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

4. TO ELONGATE THE FOOT PAST THE PROVIDED 12" (30.5cm) EXTENSION, CUT THE 3.9" DIA. (9.8cm) LEG EXTENSION INTO TWO SEPARATE PIECES. NEXT, CUT A 4" SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP CUT SECTION AND THE BOTTOM CUT SECTION OF THE LEG EXTENSION. ATTACH PIPE WITH STAINLESS STEEL SCREWS. ELONGATION MUST BE DONE ON ALL ELEVEN LEGS WHEN THE PROVIDED 12" IS DETERMINED INSUFFICIENT EXTENSION.

5. (11) ORIGINAL FEET ARE ON THE BASE OF THE FAST TREATMENT MODULE. EACH LEG EXTENSION IS TO BE ATTACHED TO THE CORRESPONDING ORIGINAL FOOT WITH THE PROVIDED HARDWARE.

6. ANCHOR ALL LEG EXTENSIONS TO THE BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE FOOT EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED. SEE ADDITIONAL VIEWS DRAWING.

7. RUN VENT (6" DIA. MIN, 8" RECOMMENDED) TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH TO ACT AS A RODENT S[illegible]N.

OR:

CAP PIPES WITH 6" CLEANOUT. DRILL 24-30 HOLES IN 6" PIPE JUST BELOW THE PVC PIPE CAP.

NOTE: ODORS MAY BE PRESENT--SEE MANUAL.

8. PLEASE SEE ADDITIONAL VIEWS DRAWING.

9. COPYRIGHT (C) 2001, BIO-MICROBICS, INC.

10. SETTLING TANK(S) EQUALLING 1/2 TO 1 X DAILY FLOW MUST BE USED PRIOR TO FAST.

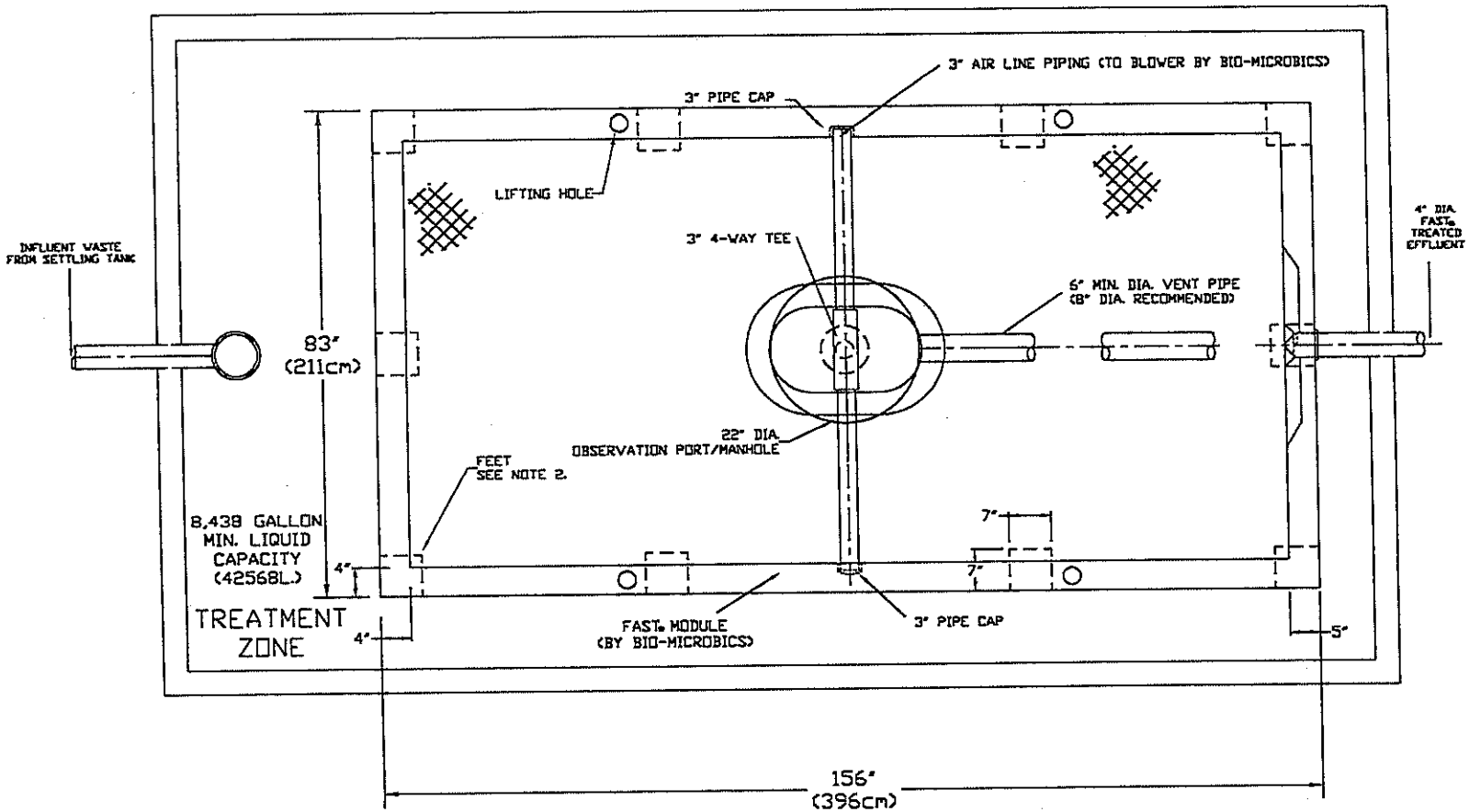
IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT CHANGE.

Date 7-24-01

BIO-MICROBICS® INCORPORATED

MicroFAST®9.0 (Cut View)

Drawn by SMF



NOTES

1. ELEVEN ORIGINAL FEET ARE ON THE BASE OF THE FAST TREATMENT MODULE. LEG EXTENSIONS MUST BE ATTACHED TO EACH CORRESPONDING LEG TO SUPPORT THE UNIT.

2. THE PROVIDED LEG EXTENSIONS SHOULD BE PLACED ON EACH CORRESPONDING LEG WITH THE PROVIDED HARDWARE. SEE ADDITIONAL VIEWS DRAWING.

3. ALL APPURTENANCES TO FAST (e.g. SEPTIC TANK, PUMP OUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. TO ELONGATE THE FOOT PAST THE PROVIDED 12" (39.5cm), CUT THE 3.9" DIA. (9.8cm) FOOT EXTENSION INTO TWO SEPARATE PIECES. THEN CUT A 4" SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE END OVER THE TOP CUT SECTION AND THE BOTTOM CUT SECTION OF THE FOOT EXTENSION. ATTACH PIPE WITH STAINLESS STEEL SCREWS. ELONGATION MUST BE DONE ON ALL LEG EXTENSIONS.

5. ANCHOR ALL LEG EXTENSIONS INTO THE BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE BASE OF THE LEG EXTENSION. IF ELONGATING LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED.

   NOTE: SEE ADDITIONAL VIEWS DRAWING.

6. PRIMARY AND SECONDARY TANKS MAY BE ONE DUAL COMPARTMENT TANK WITH A BAFFLE. NOTE: MINIMUM COMPARTMENT DIMENSIONS REMAINS THE SAME.

7. FOUR-WAY 3" PVC TEE IS PROVIDED BY THE FACTORY AS WELL AS 3" PVC PIPE EXTENDING FROM THE TEE HORIZONTALLY IN BOTH DIRECTIONS AND CAPPED OFF OUTSIDE OF THE MODULE LINER. THE AIRLINE MUST COME IN FROM THE TOP AND ATTACH TO THE PVC TEE.

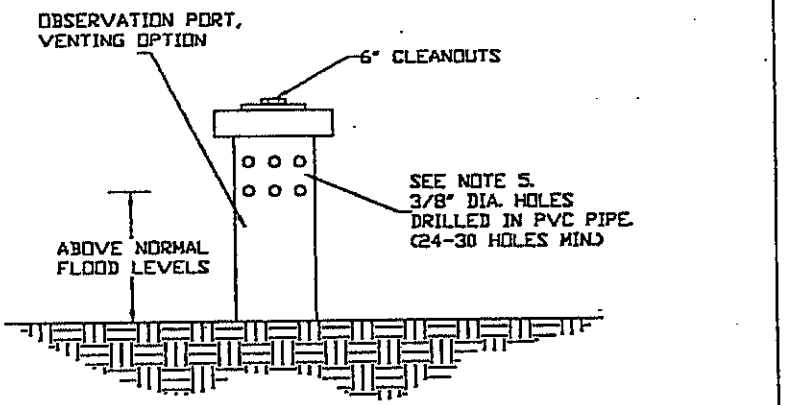
IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 7-24-01

BIO-MICROBICS INCORPORATED

MicroFAST® 9.0 (Plan View)

Drawn by SMF



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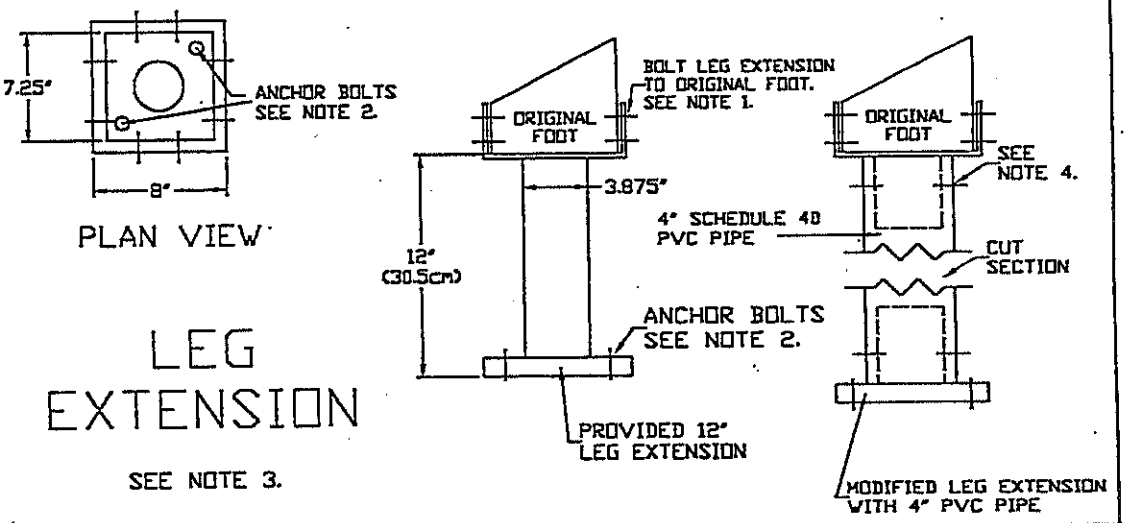
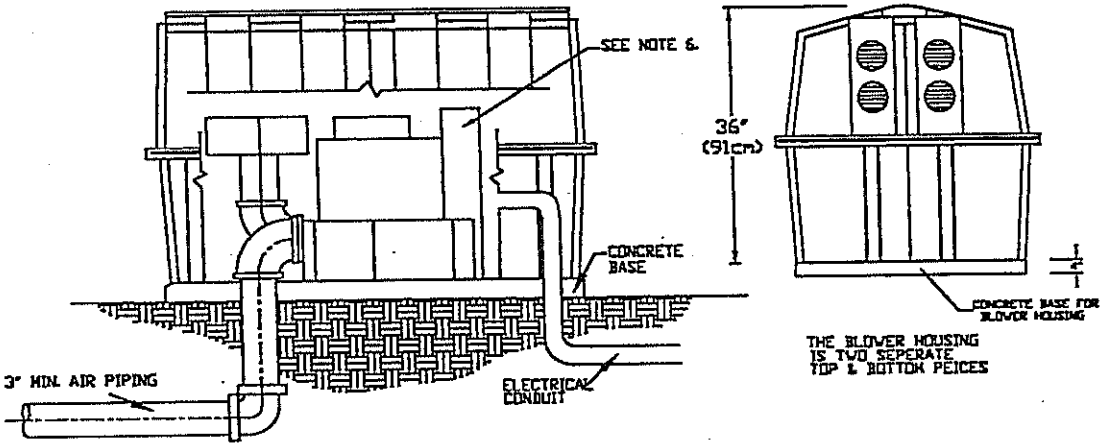
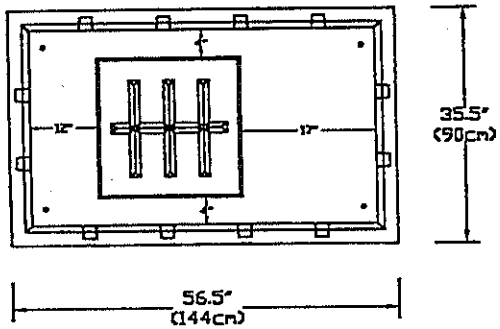






BLOWER HOUSING DIMENSIONS

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH LEG EXTENSIONS.
2. ANCHOR ALL LEG EXTENSIONS TO BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" DIA. LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS A VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 24-30 HOLES IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.
6. AN OPTIONAL BLOWER WITH TWO DISCHARGE PIPES MAY BE PURCHASED. (ONE BLOWER USED FOR TWO SYSTEMS) CONSULT FACTORY.

Date 7-11-01

BIO-MICROBICS INCORPORATED

MicroFAST 9.0 Additional Views

Drawn by SMF

Specifi .tions For MicroFAST 9.0 Wast .ater Treatment System

1. GENERAL
The contractor shall furnish and install (1) MicroFAST 9.0 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, leg extensions, blower assembly, blower controls and alarms. The MicroFAST 9.0 unit shall be situated within a 8,438 Gallon (42586 L) minimum tank, as shown on the plans. Settling tank(s) equalling 1/2 to 1 x daily flow must be used prior to FAST. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The MicroFAST 9.0 treatment system shall be capable of treating the wastewater produced by typical family activities (bath, laundry, kitchen, etc.) ranging from (30) thirty to (126) one hundred twenty-six persons and up to 9,000 US Gallons per day (34065 LPD).

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The MicroFAST 9.0 unit shall come equipped with a regenerative type blower capable of delivering 140-226 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the MicroFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the MicroFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 230 Volts, Single Phase, 60/50 Hertz, 20.8 Full Load Amps (Locked Rotor Amps are 119), or 208-230/460 Volts, Three Phase, 60/50 Hertz, 12/6 Full Load Amps (Locked Rotor Amps are 94/47). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate loss of power to the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the MicroFAST 9.0 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

To lift the FAST unit use spreader bars between lifting points. Module weighs approximately 2,300 lbs.

9. FLOW & PIPE SIZING
Each FAST module is provided with a standard (4) four inch effluent pipe hole and gasket. The maximum free or unrestricted flow with a four inch effluent pipe is 90 U.S. Gallons per minute (341 LPM), or 45 U.S. GPM (170 LPM) with a 2.0 design safety factor. An optional (6) six inch hole and gasket can be utilized on the same centerline dimension or up to 2 inches (5 cm) higher. Maximum free or unrestricted flow with a 6 inch effluent pipe is 260 GPM (984 LPM) or 130 GPM (492 LPM) with a 2.0 design safety factor.

10. WARRANTY
The manufacturer of the MicroFAST 9.0 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

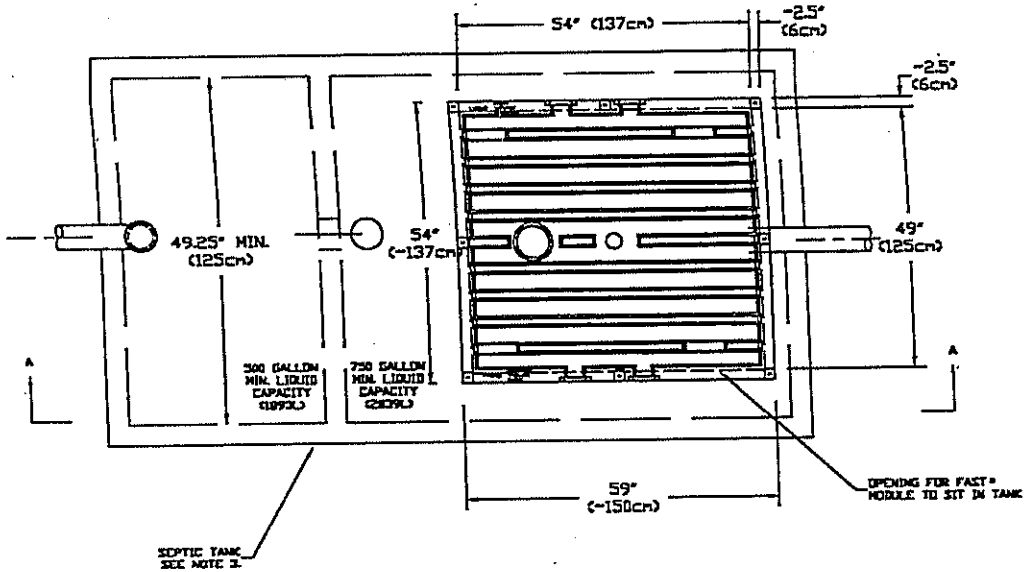
IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

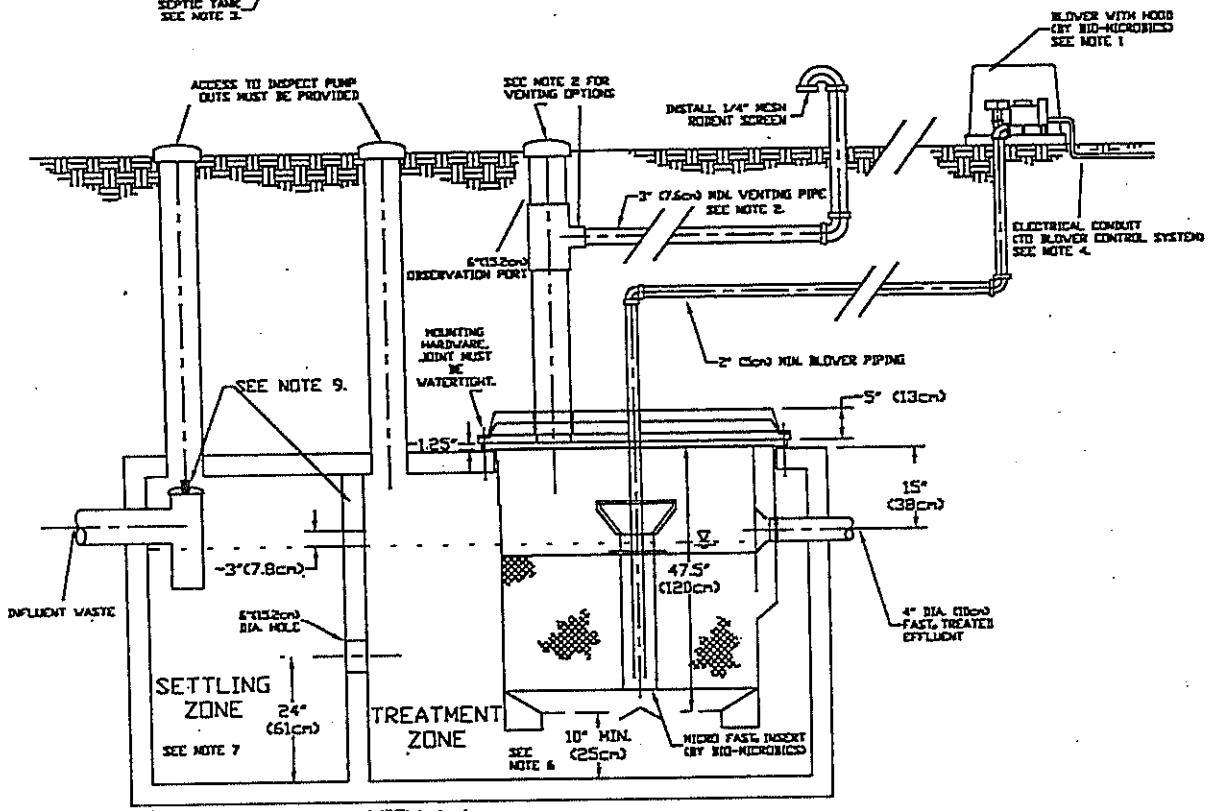
Date 7-11-01

BIO-MICROBICS INCORPORATED

MicroFAST 9.0 Specifications

Drawn by SMF





VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST UNIT. FOR DISTANCES GREATER THAN 100 FEET -- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS

2. RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH RODENT SCREEN.
   OR:
   CAP PIPES WITH 6" CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST UNDER PVC PIPE CAP. SEE ADDITIONAL VIEWS.
   NOTE: ODORS MAY BE PRESENT -- SEE MANUAL.

3. ALL APPURTENANCES TO FAST® (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5.

6. MUST INCREASE TANK SIZE BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF TANK. CONSULT FACTORY FOR APPROVAL.

7. THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.

8. FOUR LEG EXTENSIONS MAY BE USED TO STAND UNIT IN TANK ELIMINATING NEED FOR LID. SEE ADDITIONAL VIEWS AND REFER TO INSTALLATION MANUAL FOR MORE DETAILS.

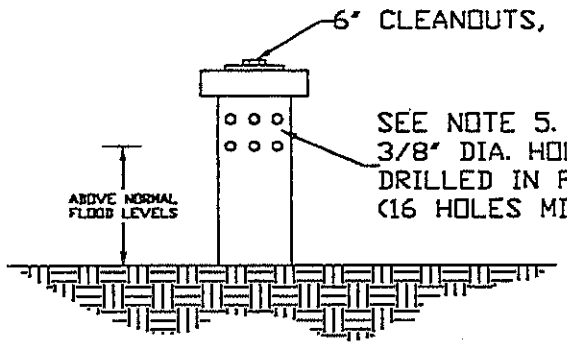
9. THE INFLUENT PIPE TEE SHALL BE FITTED WITH A PIPE CAP, OR THE BAFFLE THAT SEPARATES THE TWO ZONES NEEDS TO EXTEND ALL THE WAY TO THE TOP OF THE CONCRETE TANK. IF THE PIPE CAP OPTION IS CHOSEN, THE BAFFLE MUST EXTEND PAST THE WATER LEVEL AT LEAST THREE INCHES AS SHOWN IN THE DRAWING.

Date 7-23-01

BIO-MICROBICS® INCORPORATED

HighStrengthFAST®
1.0

by SMF



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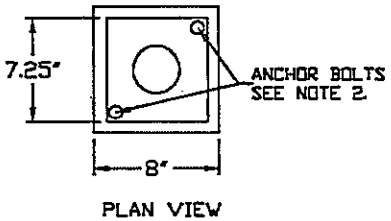
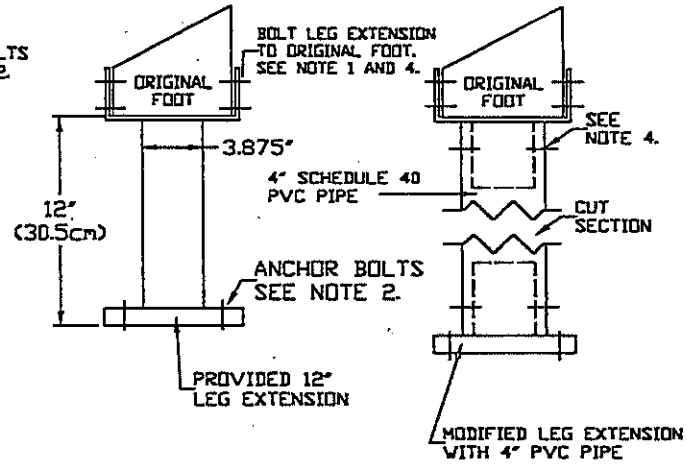


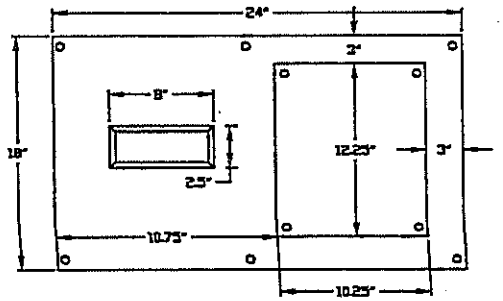
PLAN VIEW

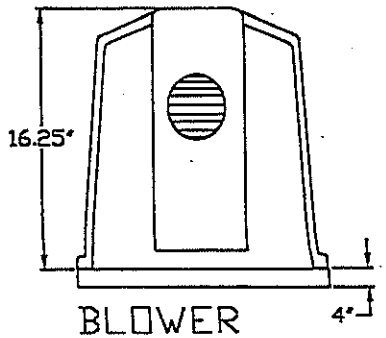
LEG EXTENSION

SEE NOTE 3.

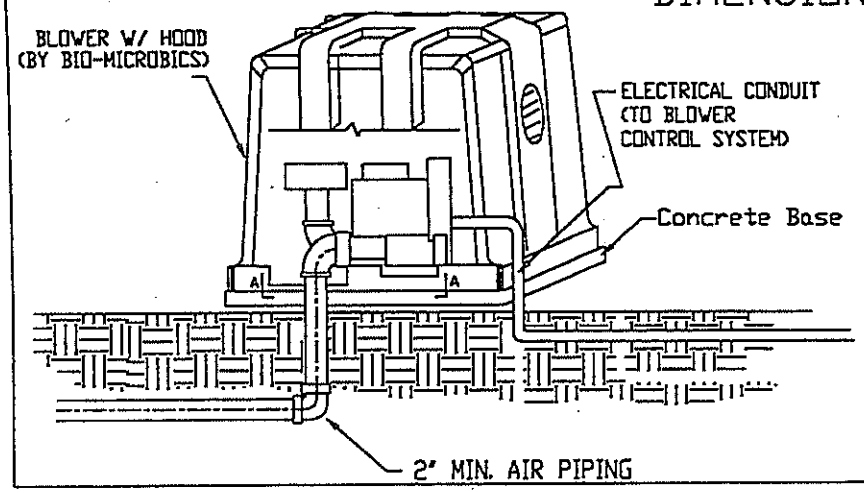


Base Dimensions
Section A-A





BLOWER
DIMENSIONS



NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH OF THE FOUR (4) CORNER LEG EXTENSIONS.

2. ANCHOR THE LEG EXTENSIONS (4 CORNER LEGS ONLY) TO THE BASE OF THE TANK. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE.

3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.

4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.

5. ACCESS PORTS MAY BE USED AS VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL A MIN. OF 16 HOLES IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.

Date 7-18-01

BIO-MICROBICS INCORPORATED

HighStrengthFAST® 1.0
Additional Views

Drawn by SMF

Specifications For HighStrengthFAST 1.0 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) HighStrengthFAST 1.0 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The HighStrengthFAST 1.0 unit shall be situated within a 1,250 Gallon (4732 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The HighStrengthFAST 1.0 treatment system shall be capable of treating the wastewater consisting of high strength waste concentrations and large oxygen demand waste strengths.

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The HighStrengthFAST 1.0 unit shall come equipped with a regenerative type blower capable of delivering 25-40 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the HighStrengthFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the HighStrengthFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 115/230 Volts, Single Phase, 60/50 Hertz, 5.6/2.8 Full Load Amps (Locked Rotor Amps are 23.2/11.6). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the HighStrengthFAST 1.0 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

9. WARRANTY
The manufacturer of the HighStrengthFAST 1.0 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

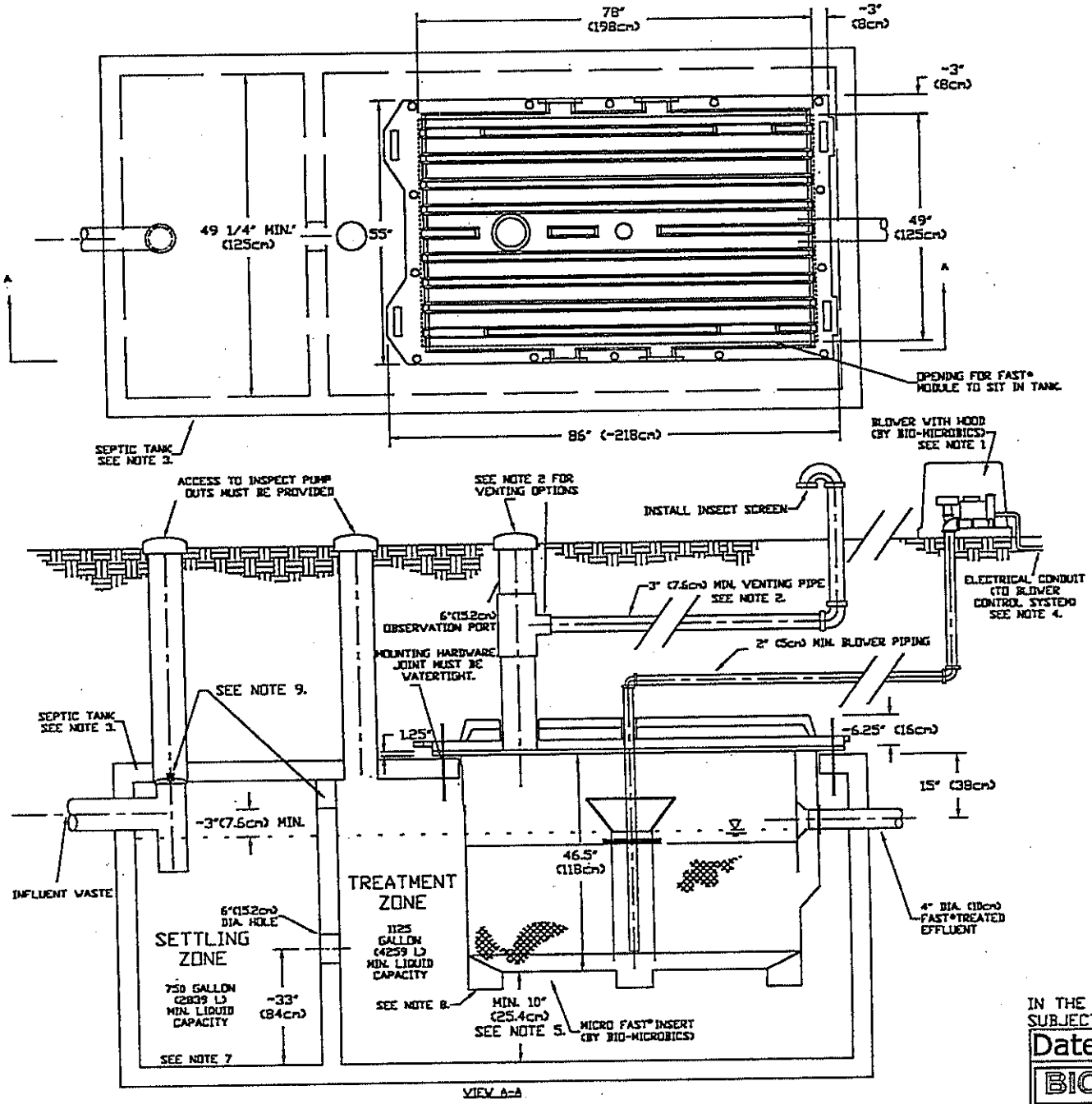
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

Date 7-16-01

BIO-MICROBICS INCORPORATED

HighStrengthFAST® 1.0 Specifications

by SMF



NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST UNIT. FOR DISTANCES GREATER THAN 100 FEET -- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS

2. RUN VENT TO DESIRED LOCATION AND COVER WITH 1/4" MESH RODENT SCREEN.
   OR:
   CAP PIPES WITH 6" CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST UNDER PVC PIPE CAP. SEE ADDITIONAL VIEWS.
   NOTE: ODORS MAY BE PRESENT -- SEE MANUAL.

3. ALL APPURTENANCES TO FAST® (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5.

6. MUST INCREASE TANK SIZE BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF TANK. CONSULT FACTORY FOR APPROVAL.

7. THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.

8. FOUR LEG EXTENSIONS MAY BE USED TO STAND UNIT IN TANK ELIMINATING NEED FOR LID. SEE ADDITIONAL VIEWS AND REFER TO INSTALLATION MANUAL FOR MORE DETAILS.

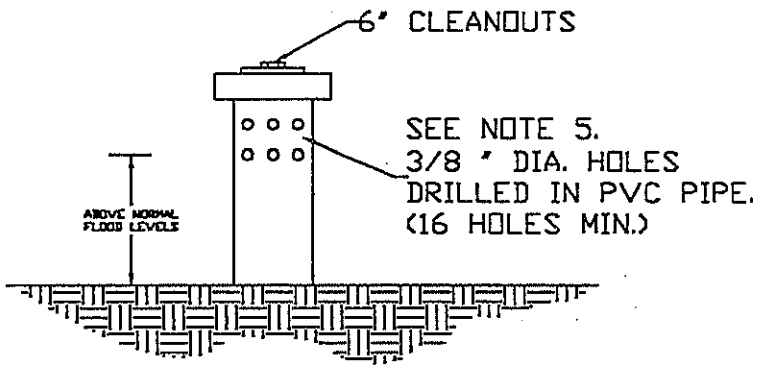
9. THERE IS AN OPTION OF EITHER PLACING A PIPE CAP ON THE TOP OF THE INFLUENT TEE OR EXTENDING THE BAFFLE SEPERATING THE TWO ZONES ALL THE WAY TO THE TOP OF THE CONCRETE TANK. IF USING THE PIPE CAP OPTION, THE BAFFLE MUST EXTEND AT LEAST 3" PAST THE WATER LEVEL IN THE TANK AS SHOWN IN THE DRAWING.

Date 7-23-01

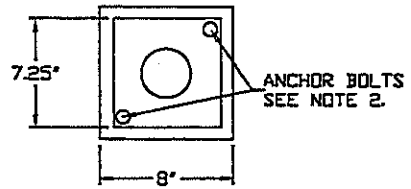
BIO-MICROBICS® INCORPORATED

HighStrengthFAST® 1.5

by SMF



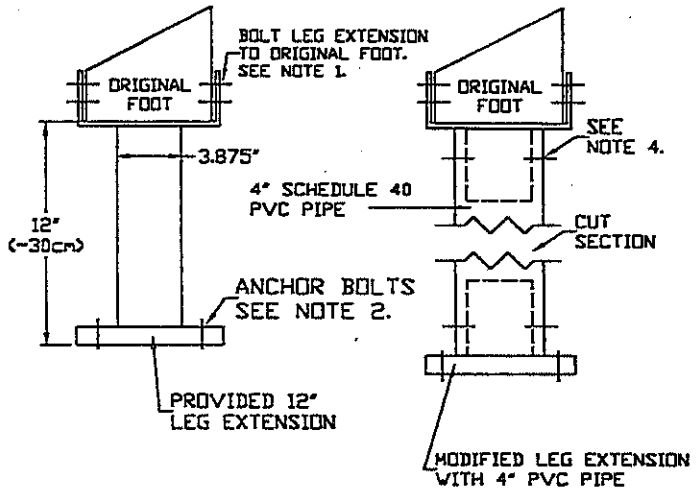
VENTING OPTION



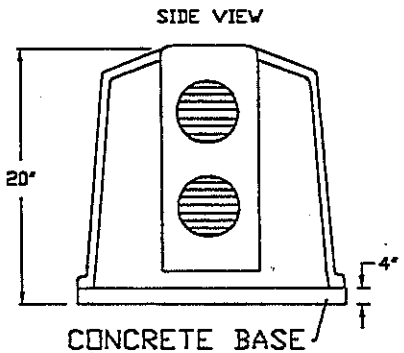
PLAN VIEW

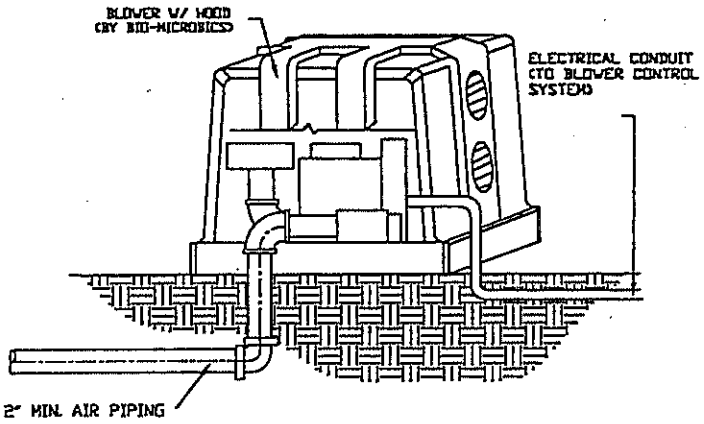
LEG EXTENSION

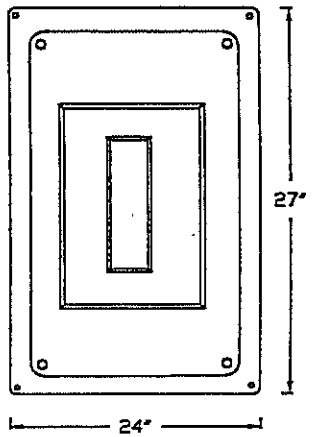
SEE NOTE 3.



BLOWER HOUSING DIMENSIONS







PLAN VIEW

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH OF THE FOUR (4) CORNER LEG EXTENSIONS.
2. ANCHOR THE LEG EXTENSIONS (4 CORNER LEGS ONLY) TO THE BASE OF THE TANK. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.

Date 7-18-01

BIO-MICROBICS INCORPORATED

HighStrengthFAST® 1.5
Additional Views

Drawn by SMF

Specifications For HighStrengthFAST 1.5 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) HighStrengthFAST 1.5 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The HighStrengthFAST 1.5 unit shall be situated within a 1,875 Gallon (7098 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The HighStrengthFAST 1.5 treatment system shall be capable of treating the wastewater consisting of high strength waste concentrations and large oxygen demand waste strengths.

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The HighStrengthFAST 1.5 unit shall come equipped with a regenerative type blower capable of delivering 44-80 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the HighStrengthFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the HighStrengthFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 230 Volts, Single Phase, 60/50 Hertz, 10.4 Full Load Amps (Locked Rotor Amps are 49), or 208-230/460 Volts, Three Phase, 60/50 Hertz, 5/2.5 Full Load Amps (Locked Rotor Amps are 37/18.5). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the HighStrengthFAST 1.5 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

9. FLOW & PIPE SIZING
Each FAST module is provided with a standard (4) four inch effluent pipe hole and gasket. The maximum free or unrestricted flow with a four inch effluent pipe is 90 U.S. Gallons per minute (341 LPM), or 45 U.S. GPM (170 LPM) with a 2.0 design safety factor. An optional (6) six inch hole and gasket can be utilized on the same centerline dimension or up to 2 inches (5 cm) higher. Maximum free or unrestricted flow with a 6 inch effluent pipe is 260 GPM (984 LPM) or 130 GPM (492 LPM) with a 2.0 design safety factor.

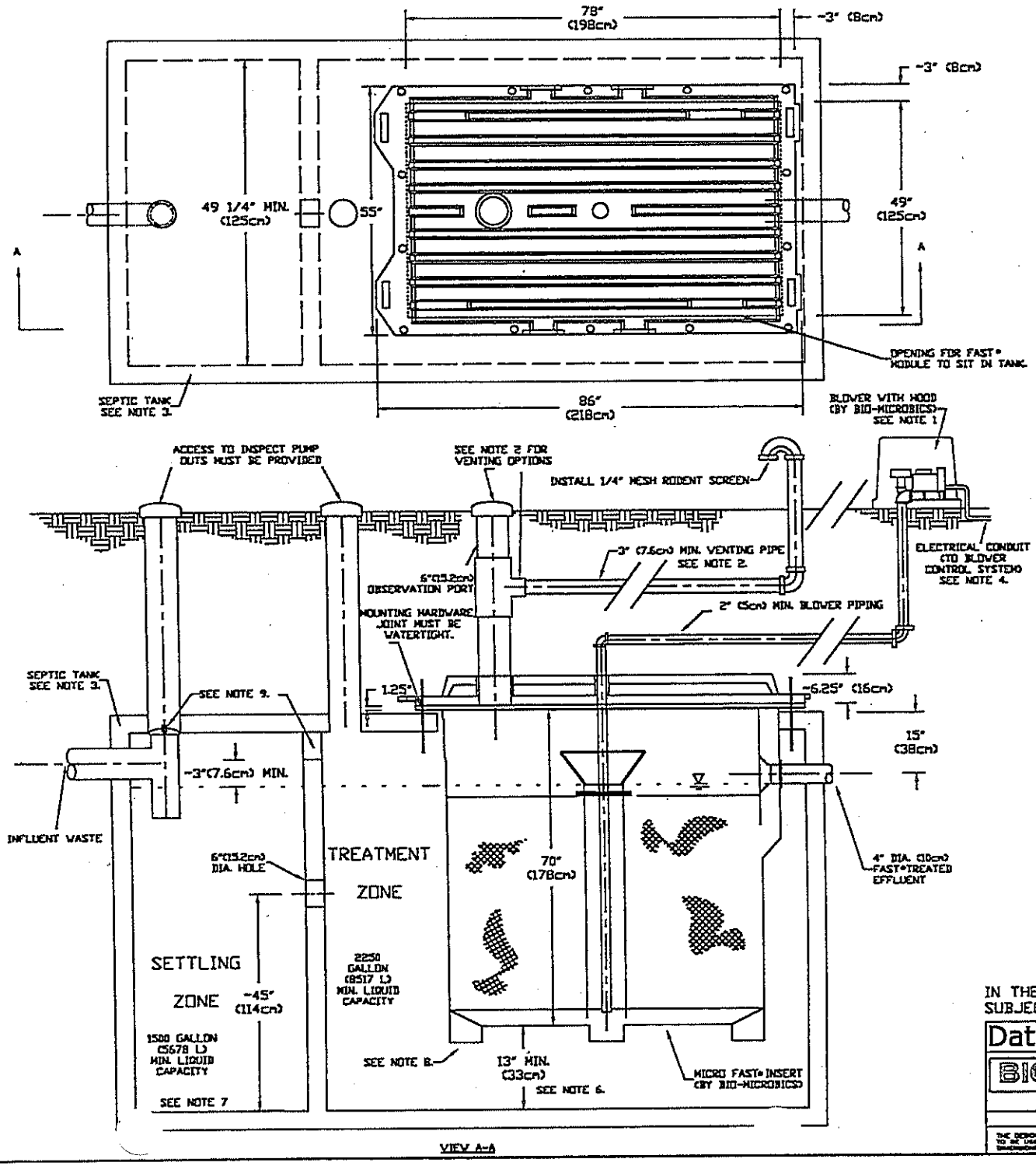
9. WARRANTY
The manufacturer of the HighStrengthFAST 1.5 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT CHANGE.

Date 7-16-01	HighStrengthFAST® 1.5 Specifications
BIO-MICROBICS® INCORPORATED	by SMF



VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST UNIT. FOR DISTANCES GREATER THAN 100 FEET -- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS
2. RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH RODENT SCREEN.

   OR:

   CAP PIPES WITH 6" CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST UNDER PVC PIPE CAP. SEE ADDITIONAL VIEWS.

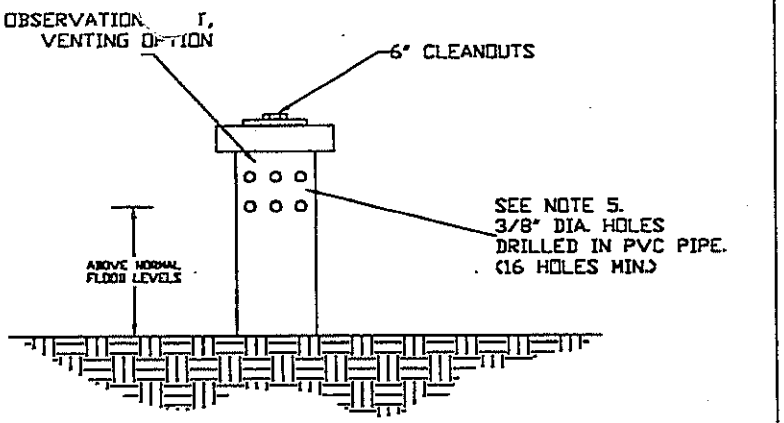
   NOTE: ODORS MAY BE PRESENT -- SEE MANUAL.
3. ALL APPURTENANCES TO FAST® (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.
4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.
5. COPYRIGHT (C) 2001, BIO-MICROBICS, INC.
6. MUST INCREASE TANK SIZE BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF TANK. CONSULT FACTORY FOR APPROVAL.
7. THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.
8. FOUR LEG EXTENSIONS MAY BE USED TO STAND UNIT IN TANK ELIMINATING NEED FOR LID. SEE ADDITIONAL VIEWS AND REFER TO INSTALLATION MANUAL FOR MORE DETAILS.
9. THERE IS AN OPTION OF EITHER PLACING A PIPE CAP ON THE TOP OF THE INFLUENT TEE OR EXTENDING THE BAFFLE SEPARATING THE TWO ZONES TO THE TOP OF THE CONCRETE TANK. IF THE PIPE CAP OPTION IS CHOSEN, THE BAFFLE MUST EXTEND AT LEAST 3" PAST THE WATER LEVEL AS SHOWN IN THE DRAWING.

Date 7-23-01

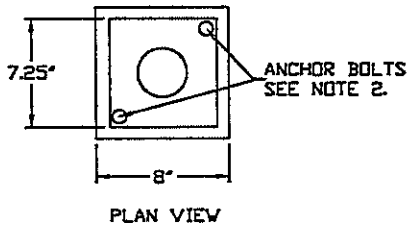
BIO-MICROBICS INCORPORATED

HighStrengthFAST®
3.0

by SMF



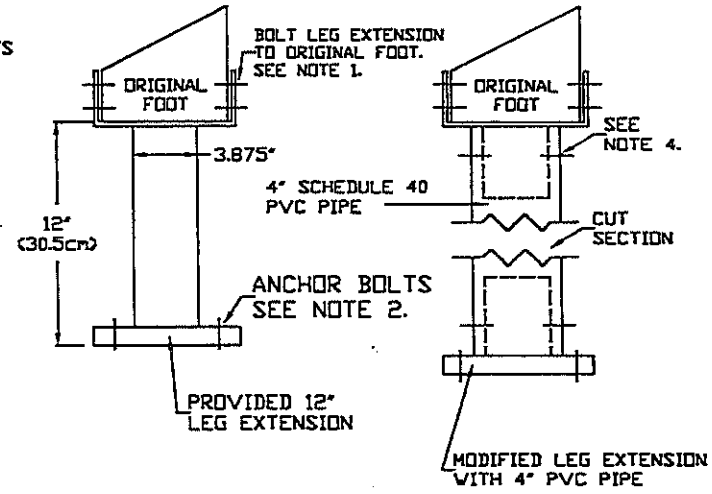
VENTING OPTION



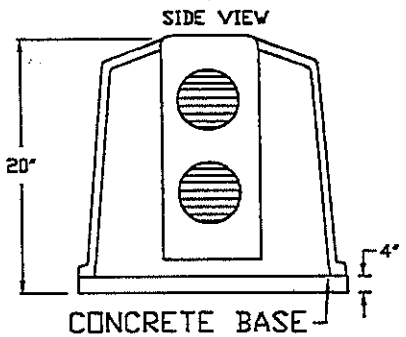
PLAN VIEW

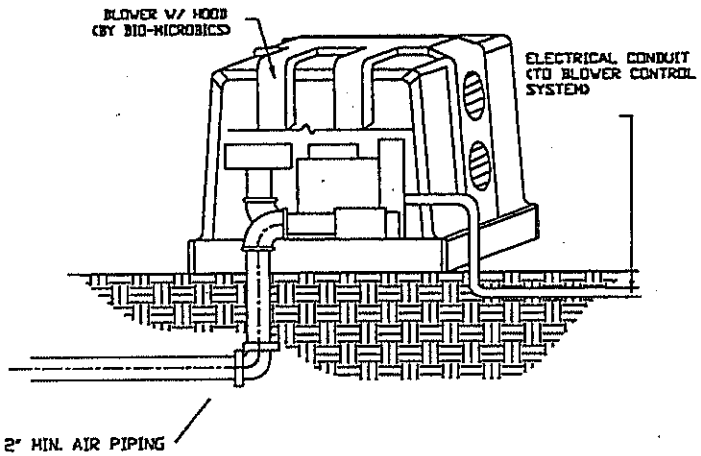
LEG EXTENSION

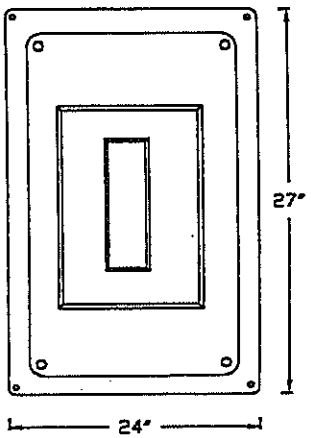
SEE NOTE 3.



BLOWER HOUSING DIMENSIONS







PLAN VIEW

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH OF THE FOUR (4) CORNER LEG EXTENSIONS.

2. ANCHOR THE LEG EXTENSIONS (4 CORNER LEGS ONLY) TO THE BASE OF THE TANK. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE.

3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.

4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.

5. ACCESS PORTS MAY BE USED AS VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.

Date 7-18-01

BIO-MICROBICS INCORPORATED

HighStrengthFAST®3.0
Additional Views

Drawn by SMF

Specifications For HighStrengthFAST 3.0 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) HighStrengthFAST 3.0 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System Insert, Insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The HighStrengthFAST 3.0 unit shall be situated within a 3,750 Gallon (14195 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The HighStrengthFAST 3.0 treatment system shall be capable of treating the wastewater consisting of high strength waste concentrations and large oxygen demand waste strengths.

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The HighStrengthFAST 3.0 unit shall come equipped with a regenerative type blower capable of delivering 72-100 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the HighStrengthFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the HighStrengthFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 230 Volts, Single Phase, 60/50 Hertz, 11.5 Full Load Amps (Locked Rotor Amps are 67), or 208-230/460 Volts, Three Phase, 60/50 Hertz, 6.6/3.3 Full Load Amps (Locked Rotor Amps are 54/27). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the HighStrengthFAST 3.0 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

9. FLOW & PIPE SIZING
Each FAST module is provided with a standard (4) four inch effluent pipe hole and gasket. The maximum free or unrestricted flow with a four inch effluent pipe is 90 U.S. Gallons per minute (341 LPM), or 45 U.S. GPM (170 LPM) with a 2.0 design safety factor. An optional (6) six inch hole and gasket can be utilized on the same centerline dimension or up to 2 inches (5 cm) higher. Maximum free or unrestricted flow with a 6 inch effluent pipe is 260 GPM (984 LPM) or 130 GPM (492 LPM) with a 2.0 design safety factor.

9. WARRANTY
The manufacturer of the HighStrengthFAST 3.0 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

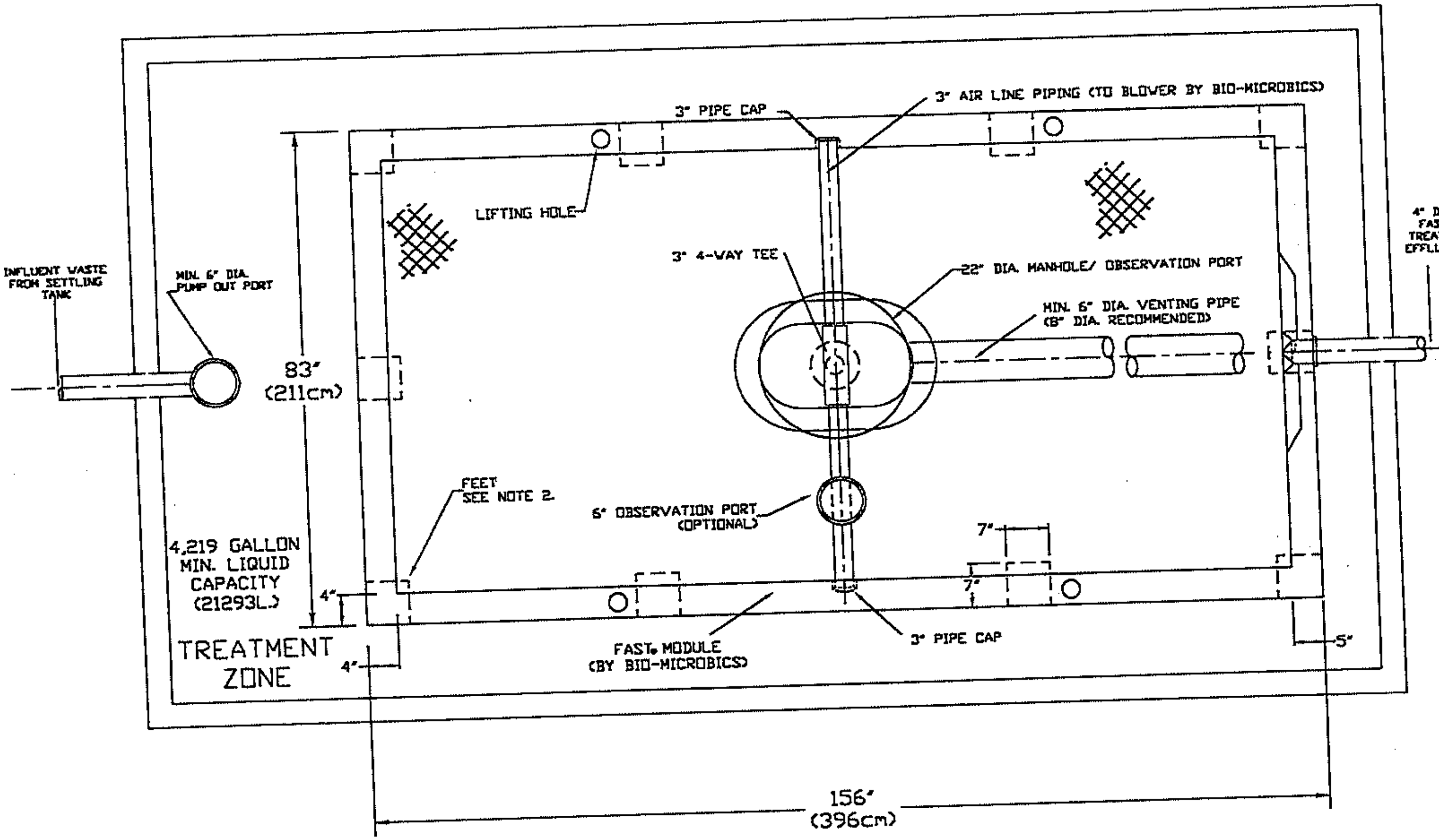
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

Date 7-16-01

BIO-MICROBICS INCORPORATED

HighStrengthFAST® 3.0 Specifications

by SMF



NOTES

1. ELEVEN (11) ORIGINAL FEET ARE ON THE BASE OF THE FAST TREATMENT MODULE. LEG EXTENSIONS ARE TO BE ATTACHED TO THE ORIGINAL FEET TO SUPPORT THE FAST MODULE.

2. THE PROVIDED LEG EXTENSIONS SHOULD BE PLACED ON EACH CORRESPONDING FOOT OF THE FAST MODULE WITH THE PROVIDED HARDWARE. SEE ADDITIONAL VIEWS DRAWING.

3. ALL APPURTENANCES TO FAST (e.g. SEPTIC TANK, PUMP OUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. TO ELONGATE THE LEG PAST THE PROVIDED 12" (39.5cm), CUT THE 3.9" DIA. (9.8cm) FOOT EXTENSION INTO TWO SEPARATE PIECES. THEN CUT A 4" SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE END OVER THE TOP CUT SECTION AND THE BOTTOM CUT SECTION OF THE FOOT EXTENSION. ATTACH PIPE WITH STAINL[illegible] STEEL SCREWS. ELONGATION MUST BE DONE ON ALL ELEVEN LEG EXTENSIONS WHEN THE PROVIDED 12" ELONGATION IS FOUND INSUFFICIENT.

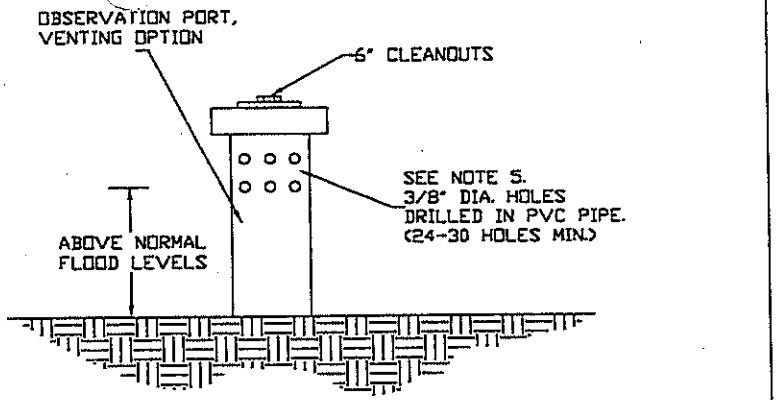
5. ANCHOR ALL LEG EXTENSIONS INTO THE BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE FOOT EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED TO THE TANK BASE.

NOTE: SEE ADDITIONAL VIEWS DRAWING.

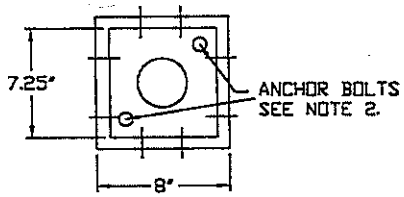
6. FOUR-WAY 3" PVC TEE IS PROVIDED BY THE FACTORY AS WELL AS 3" PVC PIPE EXTENDING FROM THE TEE HORIZONTALLY IN BOTH DIRECTIONS AND CAPPED OFF OUTSIDE OF THE MODULE LINER. THE AIRLINE MUST COME IN FROM THE TOP AND ATTACH TO THE PVC TEE.

IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 7-24-01	HighStrengthFAST®4 (Plan View)
BIO-MICROBICS® INCORPORATED	
© Bio-Microbics, Inc. 2001	Drawn by SMF



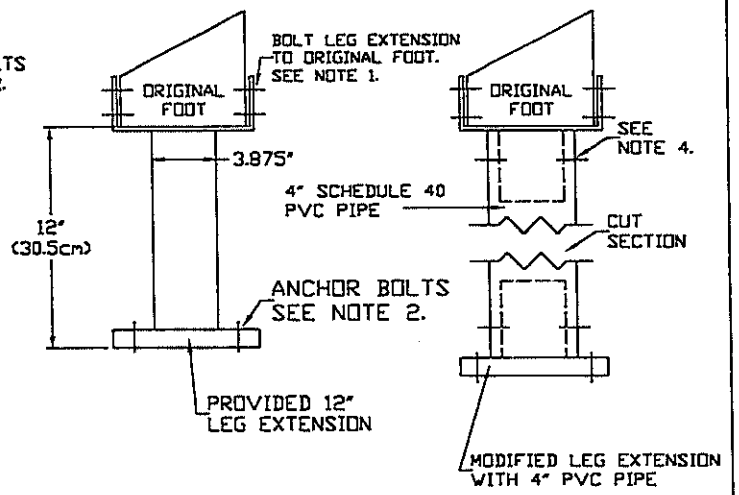
VENTING OPTION

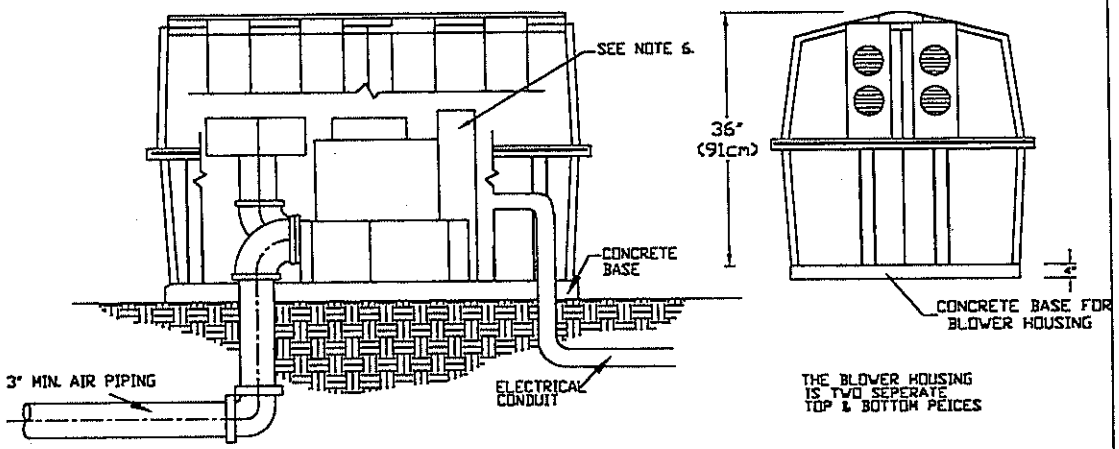


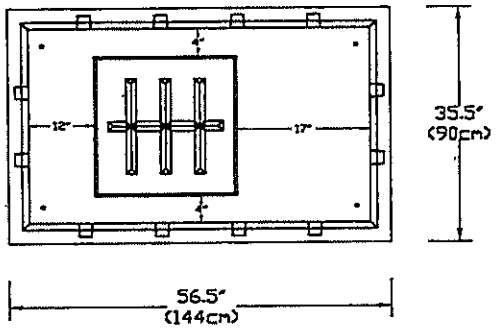
PLAN VIEW

LEG EXTENSION

SEE NOTE 3.







BLOWER HOUSING DIMENSIONS

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH LEG EXTENSION.
2. ANCHOR CORNER LEG EXTENSIONS TO BASE OF THE TANK BUT NOT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" DIA. LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS A VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 24-30 HOLES IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.
6. AN OPTIONAL BLOWER WITH TWO DISCHARGE PIPES MAY BE PURCHASED. (ONE BLOWER USED FOR TWO SYSTEMS) CONSULT FACTORY.

Date 7-18-01

BIO-MICROBICS INCORPORATED

HighStrengthFAST®4 Additional Views

Drawn by SMF

Specifications For HighStrengthFAST 4.5 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) HighStrengthFAST 4.5 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System Insert, leg extensions, blower assembly, blower controls and alarms. The HighStrengthFAST 4.5 unit shall be situated within a 4,219 Gallon (21293 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The HighStrengthFAST 4.5 treatment system shall be capable of treating the wastewater consisting of high strength waste concentrations and large oxygen demand waste strengths.

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The HighStrengthFAST 4.5 unit shall come equipped with a regenerative type blower capable of delivering 140-185 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the HighStrengthFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the HighStrengthFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 230 Volts, Single Phase, 60/50 Hertz, 20.8 Full Load Amps (Locked Rotor Amps are 119), or 208-230/460 Volts, Three Phase, 60/50 Hertz, 12/6 Full Load Amps (Locked Rotor Amps are 94/47). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate loss of power to the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the HighStrengthFAST 4.5 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

To lift the FAST unit, use spreader bars between lifting points. Module weighs approximately 1,600 lbs.

9. FLOW & PIPE SIZING
Each FAST module is provided with a standard (4) four inch effluent pipe hole and gasket. The maximum free or unrestricted flow with a four inch effluent pipe is 90 U.S. Gallons per minute (341 LPM), or 45 U.S. GPM (170 LPM) with a 2.0 design safety factor. An optional (6) six inch hole and gasket can be utilized on the same centerline dimension or up to 2 inches (5 cm) higher. Maximum free or unrestricted flow with a 6 inch effluent pipe is 260 GPM (984 LPM) or 130 GPM (492 LPM) with a 2.0 design safety factor.

9. WARRANTY
The manufacturer of the HighStrengthFAST 4.5 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 7-16-01

BIO-MICROBICS INCORPORATED

HighStrengthFAST® 4.5 Specifications

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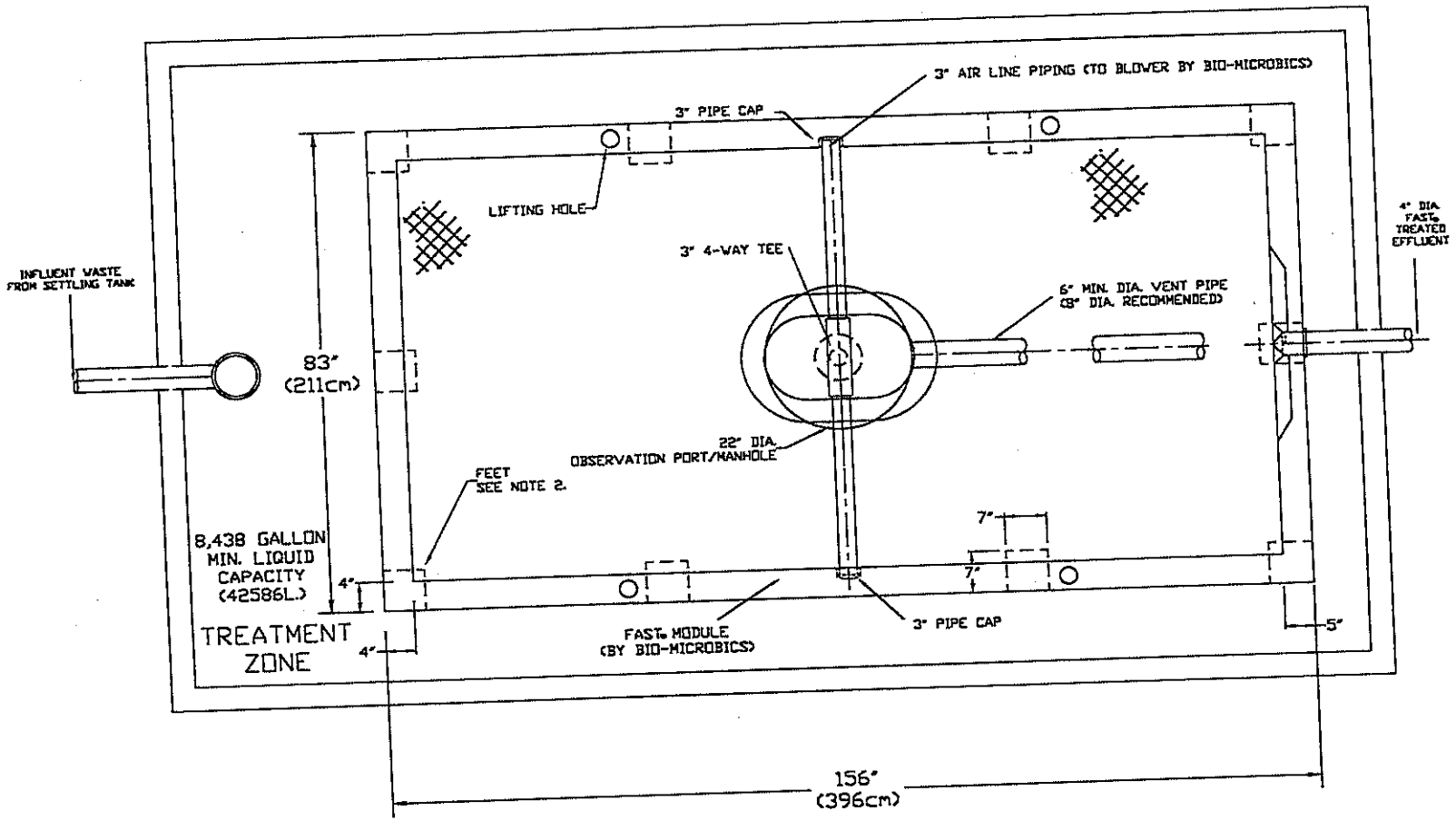


NOTES

1. ELEVEN ORIGINAL FEET ARE ON THE BASE OF THE FAST TREATMENT MODULE. LEG EXTENSIONS MUST BE ATTACHED TO EACH CORRESPONDING LEG TO SUPPORT THE UNIT.

2. THE PROVIDED LEG EXTENSIONS SHOULD BE PLACED ON EACH CORRESPONDING LEG WITH THE PROVIDED HARDWARE. SEE ADDITIONAL VIEWS DRAWING.

3. ALL APPURTENANCES TO FAST (e.g. SEPTIC TANK, PUMP OUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. TO ELONGATE THE FOOT PAST THE PROVIDED 12" (39.5cm), CUT THE 3.9" DIA. (9.8cm) FOOT EXTENSION INTO TWO SEPARATE PIECES. THEN CUT A 4" SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE END OVER THE TOP CUT SECTION AND THE BOTTOM CUT SECTION OF THE FOOT EXTENSION. ATTACH PIPE WITH STAINLESS STEEL SCREWS. ELONGATION MUST BE DONE ALL LEG EXTENSIONS.

5. ANCHOR ALL LEG EXTENSIONS INTO THE BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE BASE OF THE LEG EXTENSION. IF ELONGATING LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED.

   NOTE: SEE ADDITIONAL VIEWS DRAWING.

6. PRIMARY AND SECONDARY TANKS MAY BE ONE DUAL COMPARTMENT TANK WITH A BAFFLE. NOTE: MINIMUM COMPARTMENT DIMENSIONS REMAINS THE SAME.

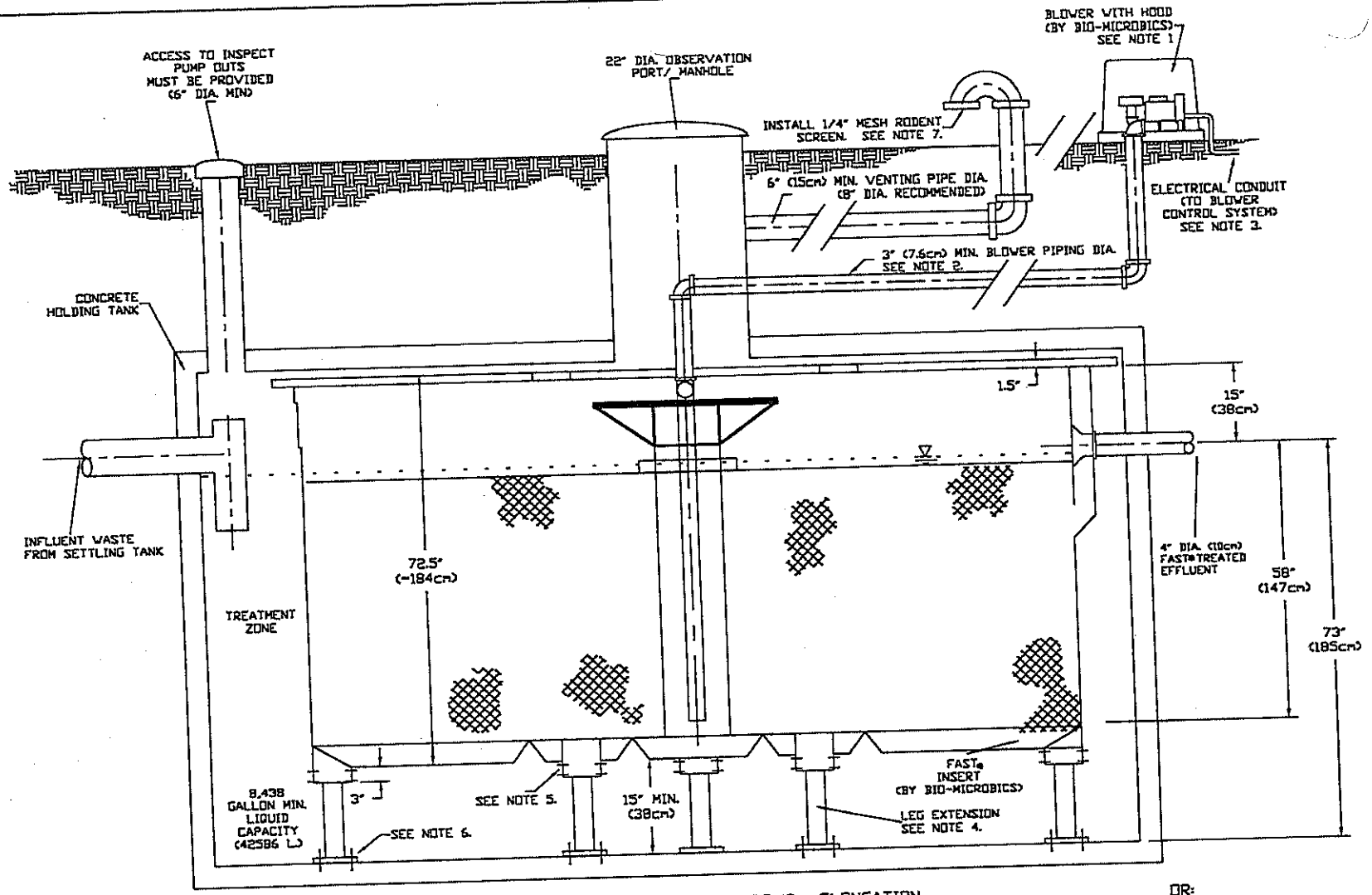
7. FOUR-WAY 3" PVC TEE IS PROVIDED BY THE FACTORY AS WELL AS 3" PVC PIPE EXTENDING FROM THE TEE HORIZONTALLY IN BOTH DIRECTIONS AND CAPPED OFF OUTSIDE OF THE MODULE LINER. THE AIRLINE MUST COME IN FROM THE TOP AND ATTACH TO THE PVC TEE.

Date 7-24-01

BIO-MICROBICS INCORPORATED

HighStrengthFAST® 9.0
(Plan View)

Drawn by SMF



NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST® UNIT. FOR DISTANCES GREATER THAN 100 FEET--CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVEL.

2. THE FACTORY RECOMMENDS CONNECTING AT LEAST ONE LENGTH OF GALVANIZED PIPE TO THE DISCHARGE SIDE OF THE BLOWER TO PREVENT HEAT FATIGUE CAUSED BY BLOWER FRICTION. DO NOT RUN GALVANIZED PIPE LENGTH INTO THE CONCRETE TANK.

3. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

4. TO ELONGATE THE FOOT PAST THE PROVIDED 12" (30.5cm) EXTENSION, CUT THE 3.9" DIA. (9.8cm) LEG EXTENSION INTO TWO SEPARATE PIECES. NEXT, CUT A 4" SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP CUT SECTION AND THE BOTTOM CUT SECTION OF THE LEG EXTENSION. ATTACH PIPE WITH STAINLESS STEEL SCREWS. ELONGATION MUST BE DONE ON ALL ELEVEN LEGS WHEN THE PROVIDED 12" IS DETERMINED INSUFFICIENT EXTENSION.

5. (11) ORIGINAL FEET ARE ON THE BASE OF THE FAST TREATMENT MODULE. EACH LEG EXTENSION IS TO BE ATTACHED TO THE CORRESPONDING ORIGINAL FOOT WITH THE PROVIDED HARDWARE.

6. ANCHOR ALL LEG EXTENSIONS TO THE BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE FOOT EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED. SEE ADDITIONAL VIEWS DRAWING.

7. RUN VENT (6" DIA. MIN, 8" RECOMMENDED) TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH TO ACT AS A RODENT SCREEN.

OR:

CAP PIPES WITH 6" CLEANOUT. DRILL 24-30 HOLES IN 6" PIPE JUST BELOW THE PVC PIPE CAP.

NOTE: ODORS MAY BE PRESENT--SEE MANUAL.

8. PLEASE SEE ADDITIONAL VIEWS DRAWING.

9. COPYRIGHT (C) 2001, BIO-MICROBICS, INC.

IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 7-24-01

BIO-MICROBICS® INCORPORATED

HighStrengthFAST® 9.0 (Cut View)

Drawn by SMF

Specifications For HighStrengthFAST 9.0 Wastewater Treatment System

. GENERAL

The contractor shall furnish and nstall (1) HighStrengthFAST 9.0 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, leg extensions, blower assembly, blower controls and alarms. The HighStrengthFAST 9.0 unit shall be situated within a 8,438 Gallon (42586 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS

The HighStrengthFAST 9.0 treatment system shall be capable of treating the wastewater consisting of high strength waste concentrations and large oxygen demand waste strengths.

3. MEDIA

The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER

The HighStrengthFAST 9.0 unit shall come equipped with a regenerative type blower capable of delivering 180-310 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER

The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the HighStrengthFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the HighStrengthFAST shall be provided and installed by the contractor.

6. ELECTRICAL

The treatment system shall be designed to operate on standard current. The input power required for the blower is 208-230/460 Volts, Three Phase, 60/50 Hertz, 17.2/8.6 Full Load Amps (Locked Rotor Amps are 138/69). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS

The alarm system shall consist of a visual and audible alarm to indicate loss of power to the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS

Installation of the HighStrengthFAST 9.0 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

To lift the FAST unit, use spreader bars between lifting points. Module weighs approximately 2,300 lbs.

9. FLOW & PIPE SIZING

Each FAST module is provided with a standard (4) four inch effluent pipe hole and gasket. The maximum free or unrestricted flow with a four inch effluent pipe is 90 U.S. Gallons per minute (341 LPM), or 45 U.S. GPM (170 LPM) with a 2.0 design safety factor. An optional (6) six inch hole and gasket can be utilized on the same centerline dimension or up to 2 inches (5 cm) higher. Maximum free or unrestricted flow with a 6 inch effluent pipe is 260 GPM (984 LPM) or 130 GPM (492 LPM) with a 2.0 design safety factor.

9. WARRANTY

The manufacturer of the HighStrengthFAST 4.5 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

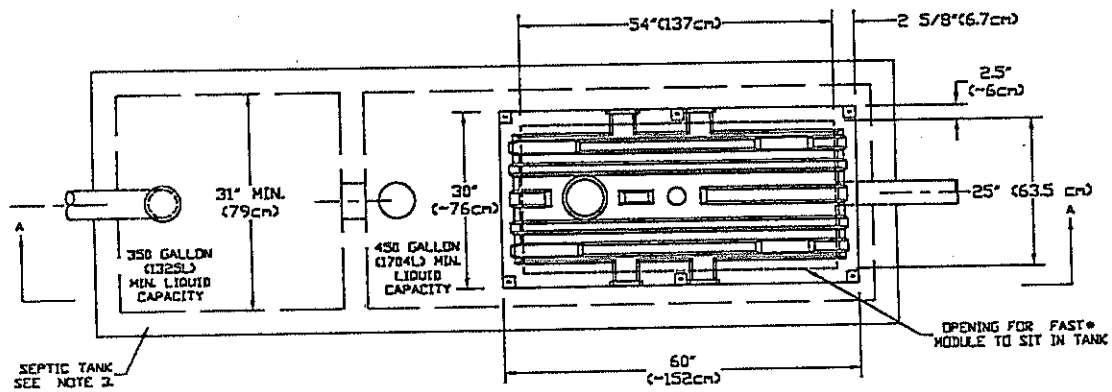
IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

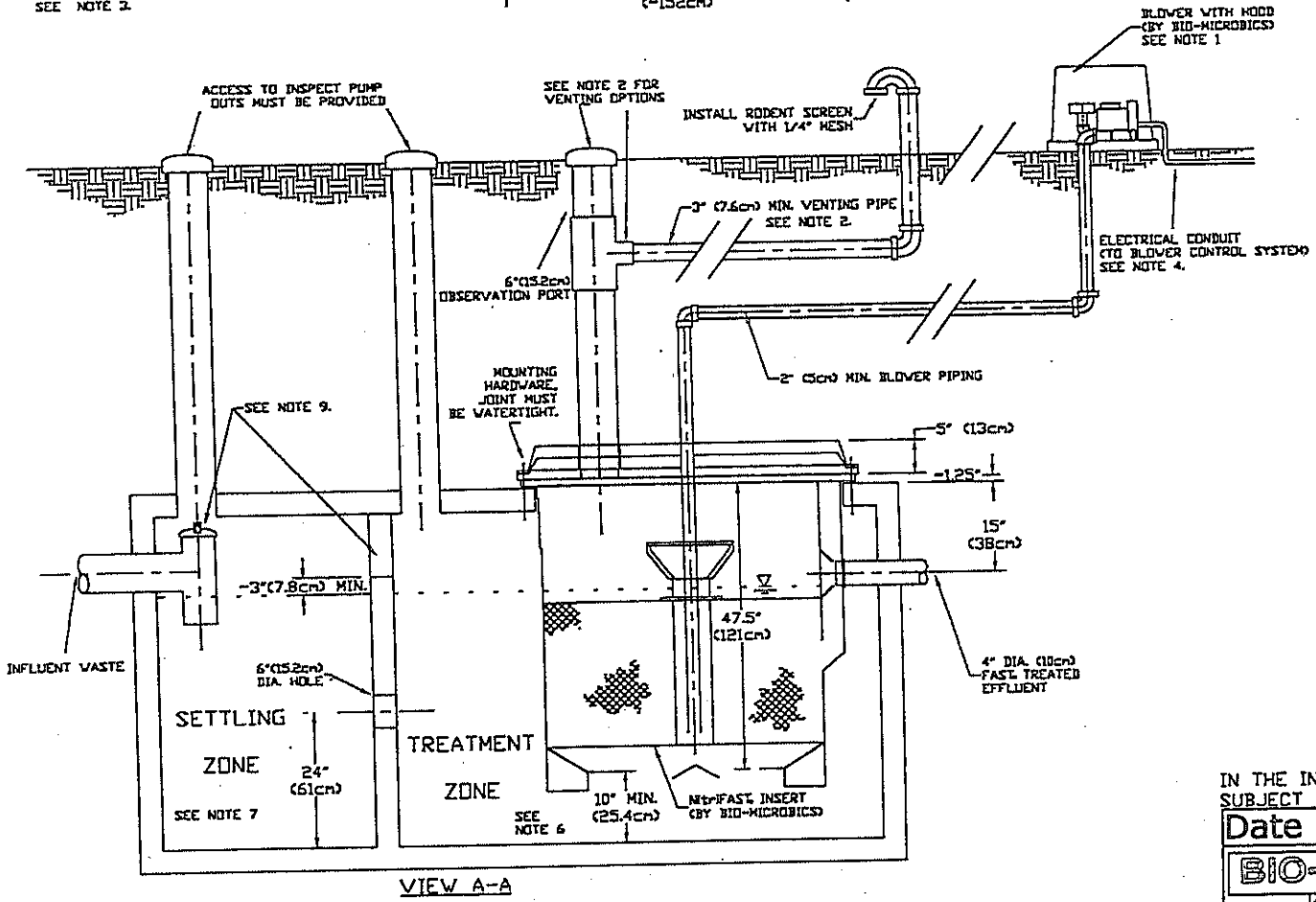
Date 7-16-01

BIO-MICROBICS INCORPORATED

HighStrengthFAST® 9.0 Specifications

Drwr SMF





VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST UNIT AND USE A MAXIMUM OF 4 ELBOWS IN THE PIPING SYSTEM(@100FT). FOR DISTANCES GREATER THAN 100 FEET-- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS.

2. RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH RODENT SCREEN.

OR:

CAP PIPES WITH 6" CLEANOUT. DRILL A MINIMUM OF 16 HOLES (3/8"DIA.) IN 6" PIPE JUST UNDER PVC PIPE PIPE CAP. SEE ADDITIONAL VIEWS DRAWING.

NOTE: ODORS MAY BE PRESENT--SEE MANUAL.

3. ALL APPURTENANCES TO THE FAST (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5. COPYRIGHT (C) 2001, BIO-MICROBICS, INC.

6. MUST INCREASE TANK SIZE BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF THE TANK. CONSULT FACTORY FOR APPROVAL.

7. THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.

8. FOUR LEG EXTENSIONS MAY BE USED TO STAND UNIT IN TANK ELIMINATING THE NEED FOR LID. SEE ADDITIONAL VIEWS AND REFER TO INSTALLATION MANUAL FOR MORE DETAILS.

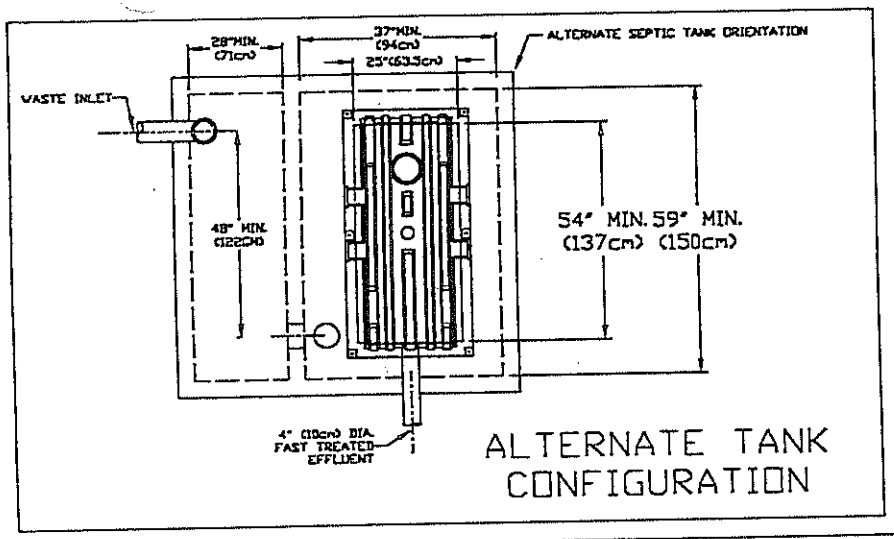
9. EITHER PLACE A PIPE CAP ON THE TOP OF THE INFLUENT PIPE TEE, OR EXTEND THE BAFFLE SEPARATING THE TWO ZONES ALL THE WAY TO THE TOP OF THE CONCRETE TANK. IF USING THE PIPE CAP, THE BAFFLE MUST EXTEND PAST THE WATER LEVEL 3" MIN. AS SHOWN ON THE DRAWING.

Date 7-16-01

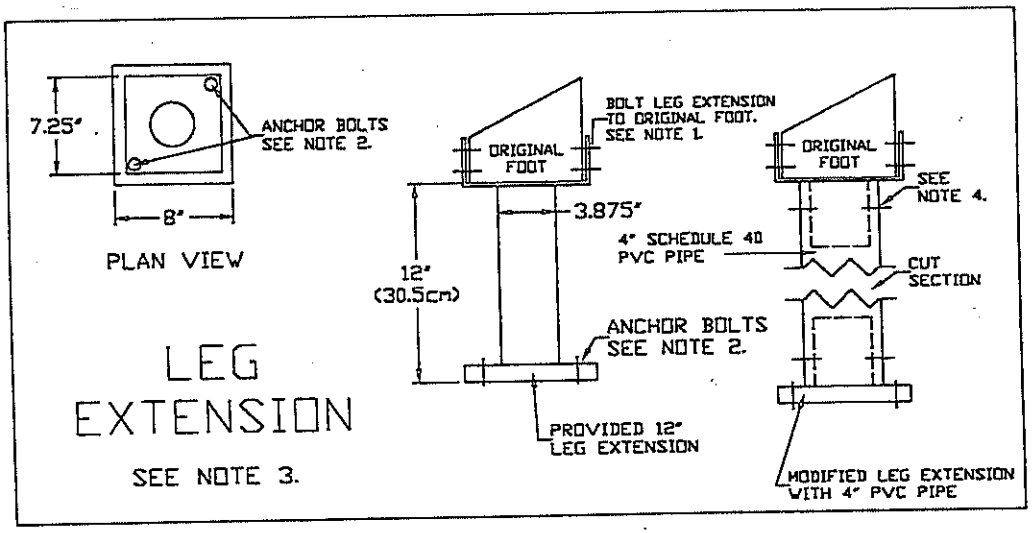
BIO-MICROBICS® INCORPORATED

NitriFAST®
0.5

by SMF

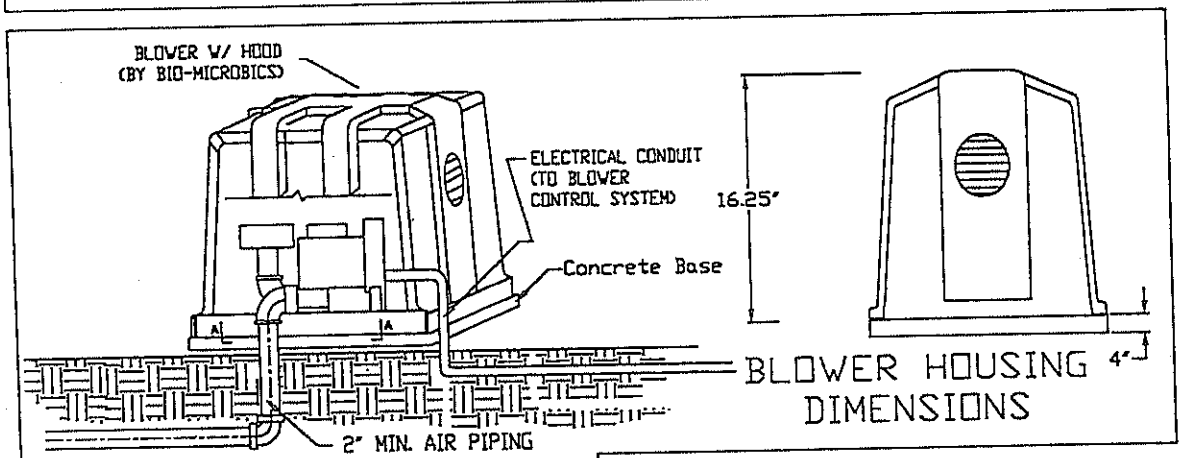


ALTERNATE TANK CONFIGURATION



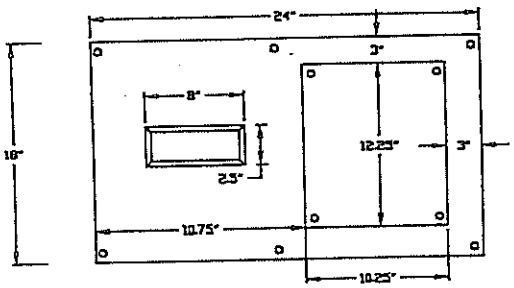
LEG EXTENSION

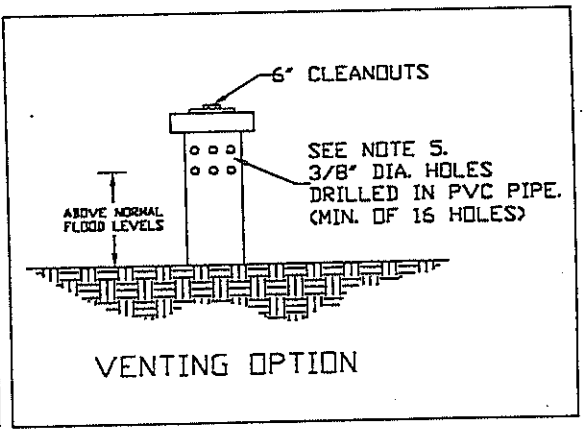
SEE NOTE 3.



BLOWER HOUSING DIMENSIONS

Base Dimensions
Section A-A





VENTING OPTION

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH OF THE FOUR (4) CORNER LEG EXTENSIONS.
2. ANCHOR THE LEG EXTENSIONS (4 CORNER LEGS ONLY) TO THE BASE OF THE TANK. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 8-12 HOLES IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.

Date 7-06-01

BIO-MICROBICS INCORPORATED

NitriFAST® 0.5
Additional Views

Drawn by SMF

Specifications For NitriFAST 0.5 Wastewater Treatment System

1. GENERAL

The contractor shall furnish and install (1) NitriFAST 0.5 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The NitriFAST 0.5 unit shall be situated within a 800 Gallon (3028 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS

The NitriFAST 0.5 treatment system shall be capable of nitrifying the wastewater consisting of high total Nitrogen levels and having a greater oxygen demand than normal domestic strength waste with regard to Nitrification.

3. MEDIA

The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER

The NitriFAST 0.5 unit shall come equipped with a regenerative type blower capable of delivering 11-25 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER

The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the NitriFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the NitriFAST shall be provided and installed by the contractor.

6. ELECTRICAL

The treatment system shall be designed to operate on standard current. The input power required for the blower is 115/230 Volts, Single Phase, 60/50 Hertz, 3.8/1.9 Full Load Amps (Locked Rotor Amps are 18.6/9.3). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS

The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS

Installation of the NitriFAST 0.5 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

9. WARRANTY

The manufacturer of the NitriFAST 0.5 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component falls to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

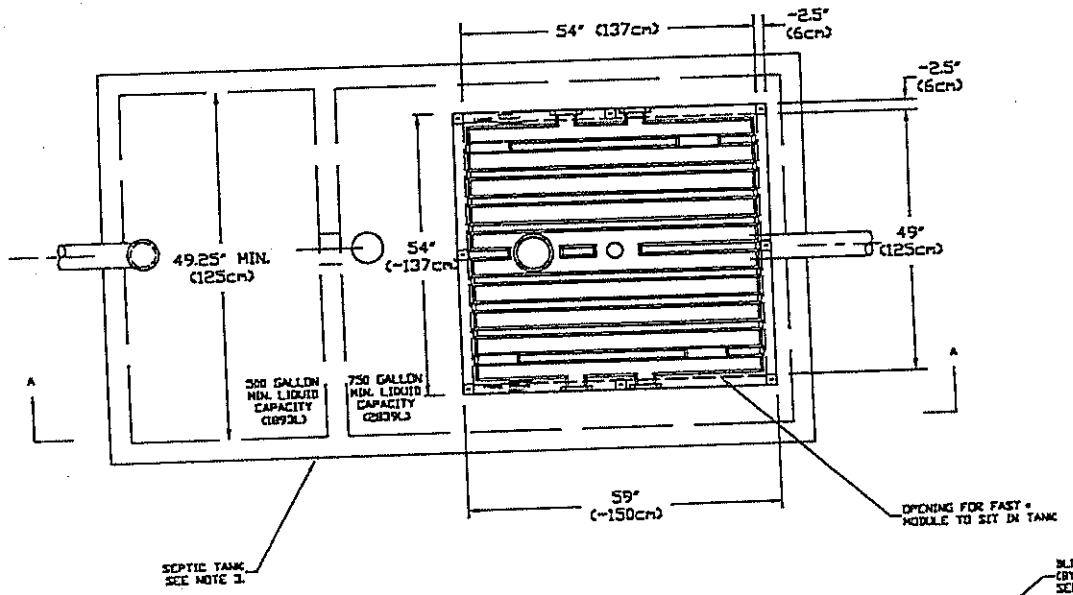
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

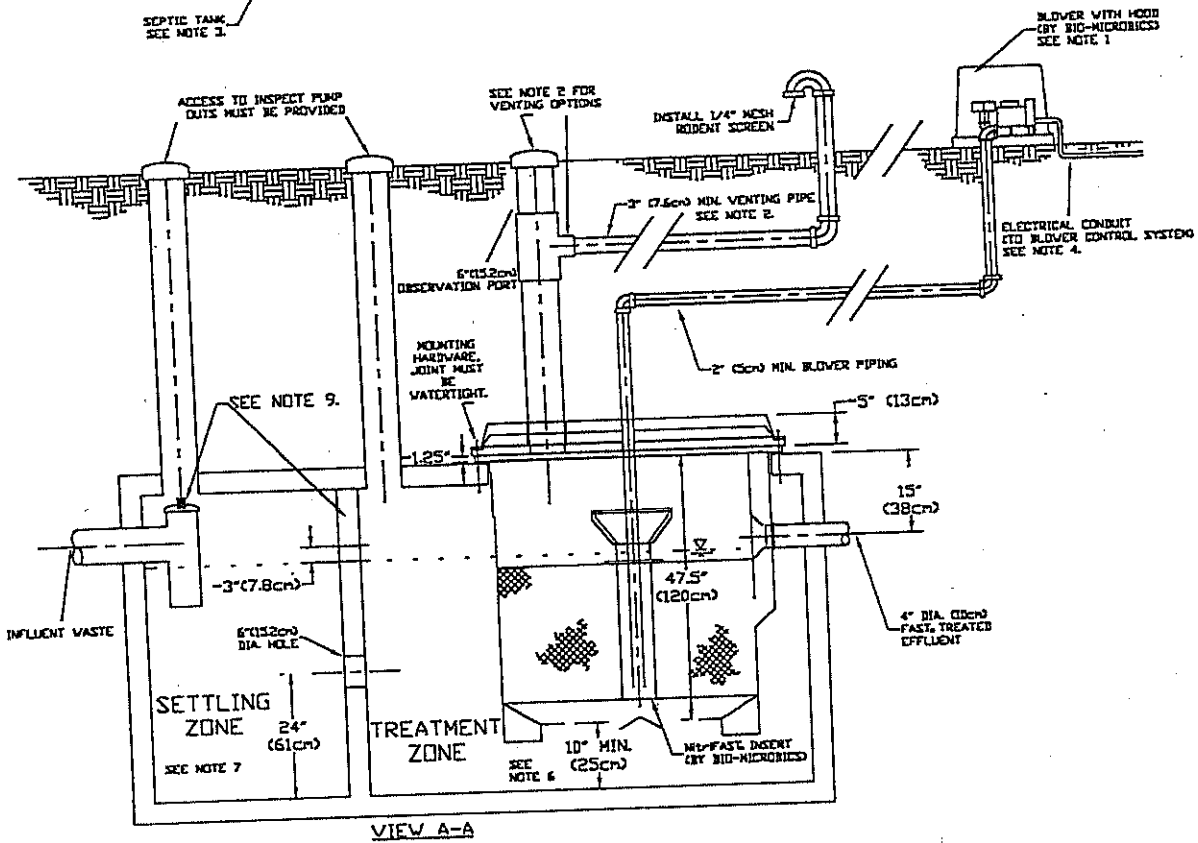
Date 7-16-01

BIO-MICROBICS INCORPORATED

NitriFAST 0.5 Specifications

by SMF





VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST UNIT. FOR DISTANCES GREATER THAN 100 FEET -- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS

2. RUN VENT TO DESIRED LOCATION AND COVER WITH 1/4" MESH RODENT SCREEN.
   OR:
   CAP PIPES WITH 6" CLEANOUT. DRILL 16 HOLES MIN. (3/8"DIA.) IN 6" PIPE JUST UNDER PVC PIPE CAP. SEE ADDITIONAL VIEWS DRAWING.

   NOTE: ODORS MAY BE PRESENT -- SEE MANUAL.

3. ALL APPURTENANCES TO FAST® (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5. COPYRIGHT (C) 2001, BIO-MICROBICS, INC.

6. MUST INCREASE TANK SIZE BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF TANK. CONSULT FACTORY FOR APPROVAL.

7. THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.

8. FOUR LEG EXTENSIONS MAY BE USED TO STAND UNIT IN TANK ELIMINATING NEED FOR LID. SEE ADDITIONAL VIEWS AND REFER TO INSTALLATION MANUAL FOR MORE DETAILS.

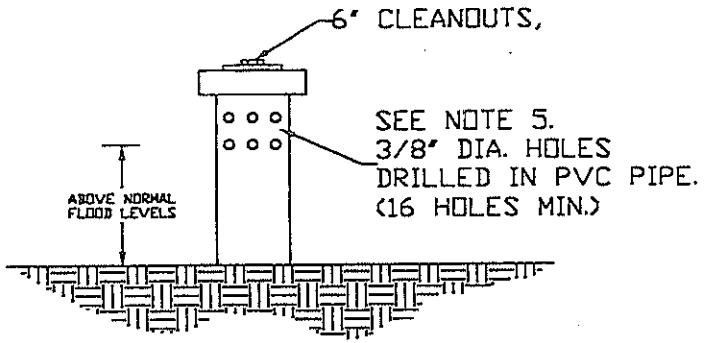
9. THE INFLUENT PIPE TEE SHALL BE FITTED WITH A PIPE CAP, OR THE BAFFLE THAT SEPARATES THE TWO ZONES NEEDS TO EXTEND ALL THE WAY TO THE TOP OF THE CONCRETE TANK. IF THE PIPE CAP OPTION IS CHOSEN, THE BAFFLE MUST EXTEND PAST THE WATER LEVEL AT LEAST THREE INCHES AS SHOWN IN THE DRAWING.

Date 7-24-01

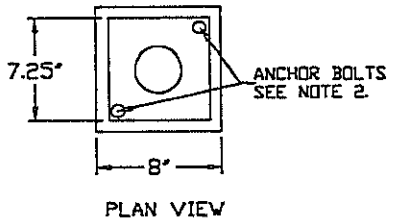
BIO-MICROBICS® INCORPORATED

NitriFAST®
0.9

n by SMF



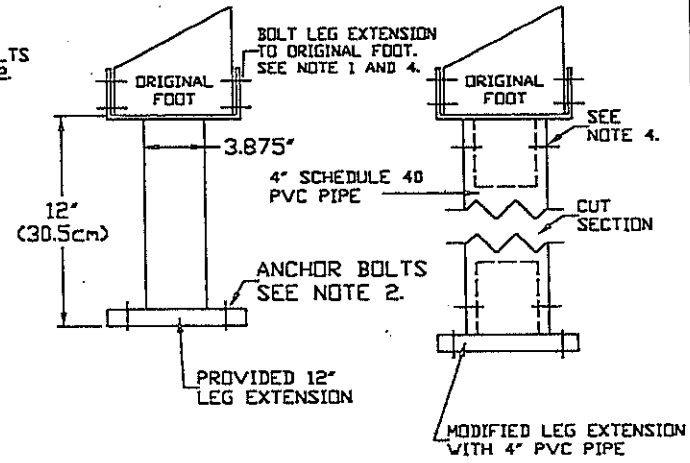
VENTING OPTION



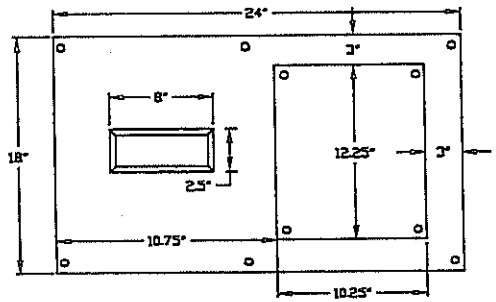
PLAN VIEW

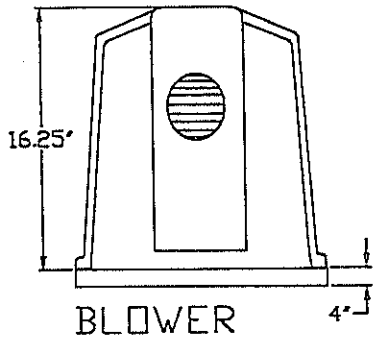
LEG EXTENSION

SEE NOTE 3.

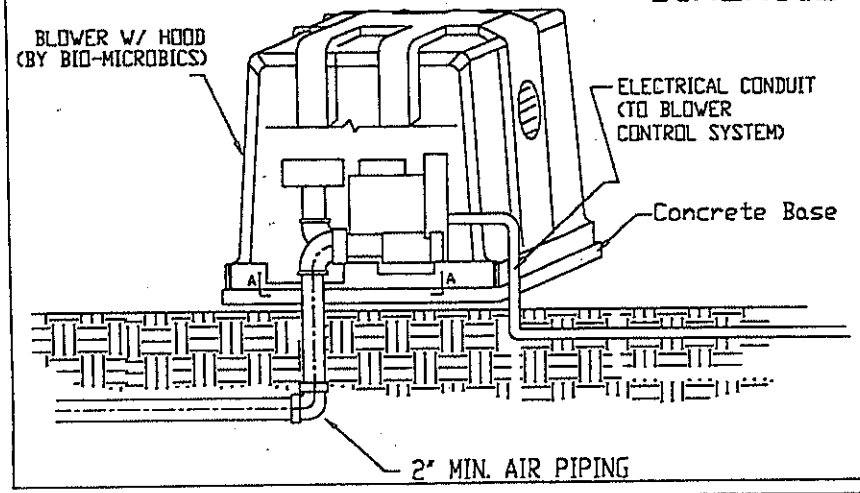


Base Dimensions
Section A-A





BLOWER DIMENSIONS



NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH OF THE FOUR (4) CORNER LEG EXTENSIONS.
2. ANCHOR THE LEG EXTENSIONS (4 CORNER LEGS ONLY) TO THE BASE OF THE TANK. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL A MIN. OF 16 HOLES IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.

Date 7-09-01

BIO-MICROBICS INCORPORATED

NitriFAST® 0.9
Additional Views

Drawn by SMF

Specifications For NitriFAST 0.9 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) NitriFAST 0.9 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The NitriFAST 0.9 unit shall be situated within a 1,250 Gallon (4732 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The NitriFAST 0.9 treatment system shall be capable of nitrifying the wastewater consisting of high total Nitrogen levels and having a greater oxygen demand than normal domestic strength waste with regard to Nitrification.

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The NitriFAST 0.9 unit shall come equipped with a regenerative type blower capable of delivering 17-25 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the NitriFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the NitriFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 115/230 Volts, Single Phase, 60/50 Hertz, 3.8/1.9 Full Load Amps (Locked Rotor Amps are 18.6/9.3). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the NitriFAST 0.9 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

9. WARRANTY
The manufacturer of the NitriFAST 0.9 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

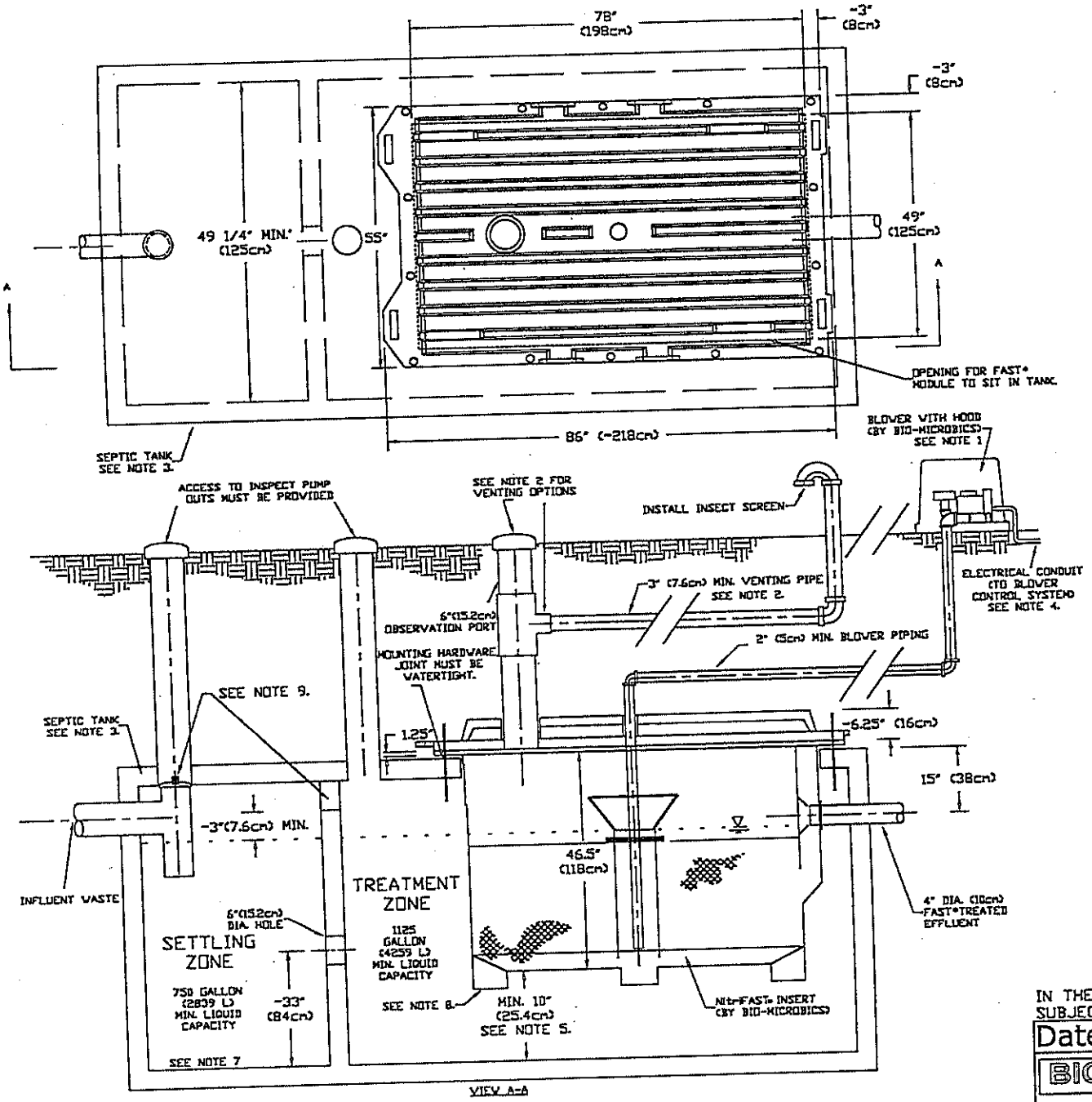
IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 7-16-01

BIO-MICROBICS INCORPORATED

NitriFAST 0.9 Specifications

SMF



VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST UNIT. FOR DISTANCES GREATER THAN 100 FEET -- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS

2. RUN VENT TO DESIRED LOCATION AND COVER WITH 1/4" MESH RODENT SCREEN.
   OR:
   CAP PIPES WITH 6" CLEANOUT. DRILL 16 HOLES MIN. (3/8" DIA.) IN 6" PIPE JUST UNDER PVC PIPE CAP. SEE ADDITIONAL VIEWS DRAWING.

   NOTE: ODORS MAY BE PRESENT -- SEE MANUAL.

3. ALL APPURTENANCES TO FAST® (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5.

6. MUST INCREASE TANK SIZE BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF TANK. CONSULT FACTORY FOR APPROVAL.

7. THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.

8. FOUR LEG EXTENSIONS MAY BE USED TO STAND UNIT IN TANK ELIMINATING NEED FOR LID. SEE ADDITIONAL VIEWS AND REFER TO INSTALLATION MANUAL FOR MORE DETAILS.

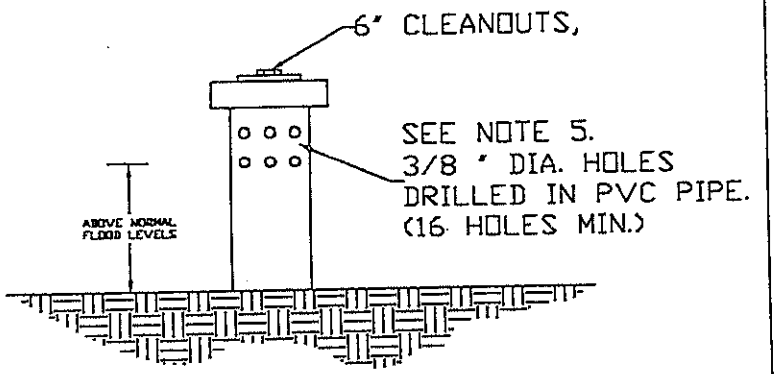
9. THERE IS AN OPTION OF EITHER PLACING A PIPE CAP ON THE TOP OF THE INFLUENT TEE OR EXTENDING THE BAFFLE SEPARATING THE TWO ZONES ALL THE WAY TO THE TOP OF THE CONCRETE TANK. IF USING THE PIPE CAP OPTION, THE BAFFLE MUST EXTEND AT LEAST 3" PAST THE WATER LEVEL IN THE TANK AS SHOWN IN THE DRAWING.

Date 7-16-01

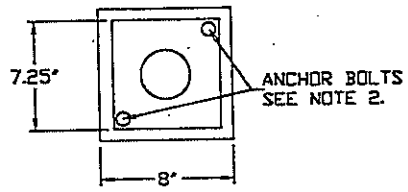
BIO-MICROBICS INCORPORATED

NitriFAST®
1.5

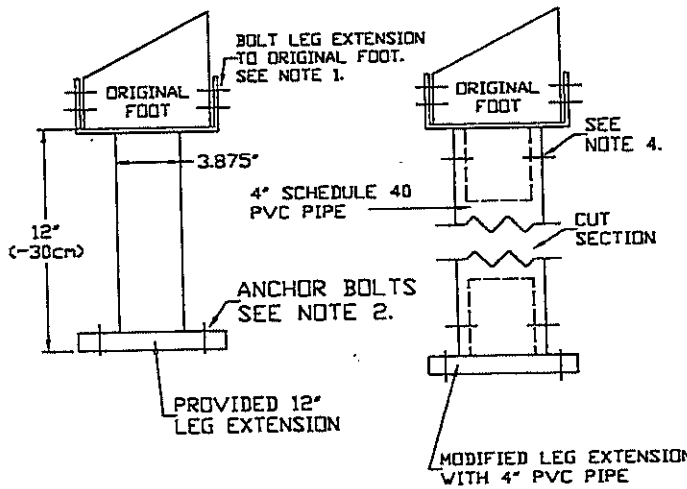
by SMF



VENTING OPTION



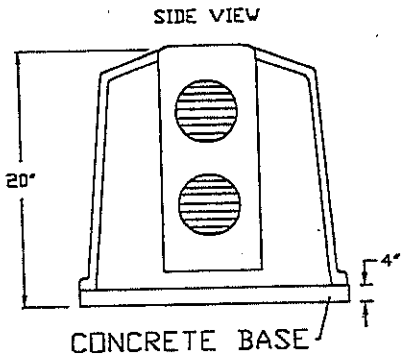
PLAN VIEW

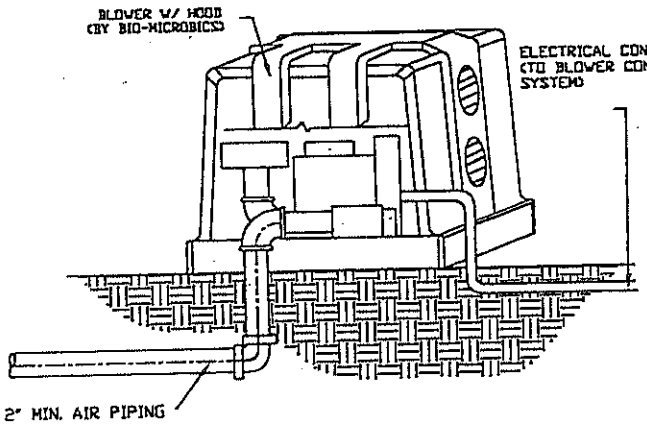


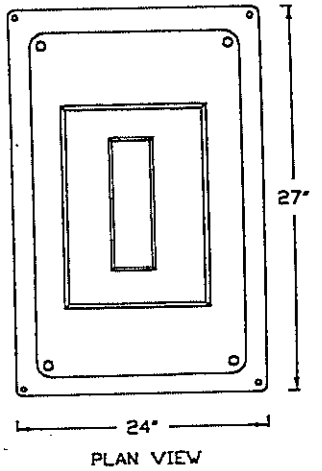
LEG
EXTENSION

SEE NOTE 3.

BLOWER
HOUSING
DIMENSIONS







PLAN VIEW

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH OF THE FOUR (4) CORNER LEG EXTENSIONS.

2. ANCHOR THE LEG EXTENSIONS (4 CORNER LEGS ONLY) TO THE BASE OF THE TANK. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE.

3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.

4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.

5. ACCESS PORTS MAY BE USED AS VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.

IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 7-13-01

BIO-MICROBICS INCORPORATED

NitriFAST® 1.5
Additional Views

Drawn by SMF

Specifications For NitriFAST 1.5 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) NitriFAST 1.5 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The NitriFAST 1.5 unit shall be situated within a 1,875 Gallon (7098 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The NitriFAST 1.5 treatment system shall be capable of nitrifying the wastewater consisting of high total Nitrogen levels and having a greater oxygen demand than normal domestic strength waste with regard to Nitrification.

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The NitriFAST 1.5 unit shall come equipped with a regenerative type blower capable of delivering 25-40 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the NitriFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the NitriFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 115/230 Volts, Single Phase, 60/50 Hertz, 5.6/2.8 Full Load Amps (Locked Rotor Amps are 23.2/11.6). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the NitriFAST 1.5 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

9. FLOW & PIPE SIZING
Each FAST module is provided with a standard (4) four inch effluent pipe hole and gasket. The maximum free or unrestricted flow with a four inch effluent pipe is 90 U.S. Gallons per minute (341 LPM), or 45 U.S. GPM (170 LPM) with a 2.0 design safety factor. An optional (6) six inch hole and gasket can be utilized on the same centerline dimension or up to 2 inches (5 cm) higher. Maximum free or unrestricted flow with a 6 inch effluent pipe is 260 GPM (984 LPM) or 130 GPM (492 LPM) with a 2.0 design safety factor.

10. WARRANTY
The manufacturer of the NitriFAST 1.5 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

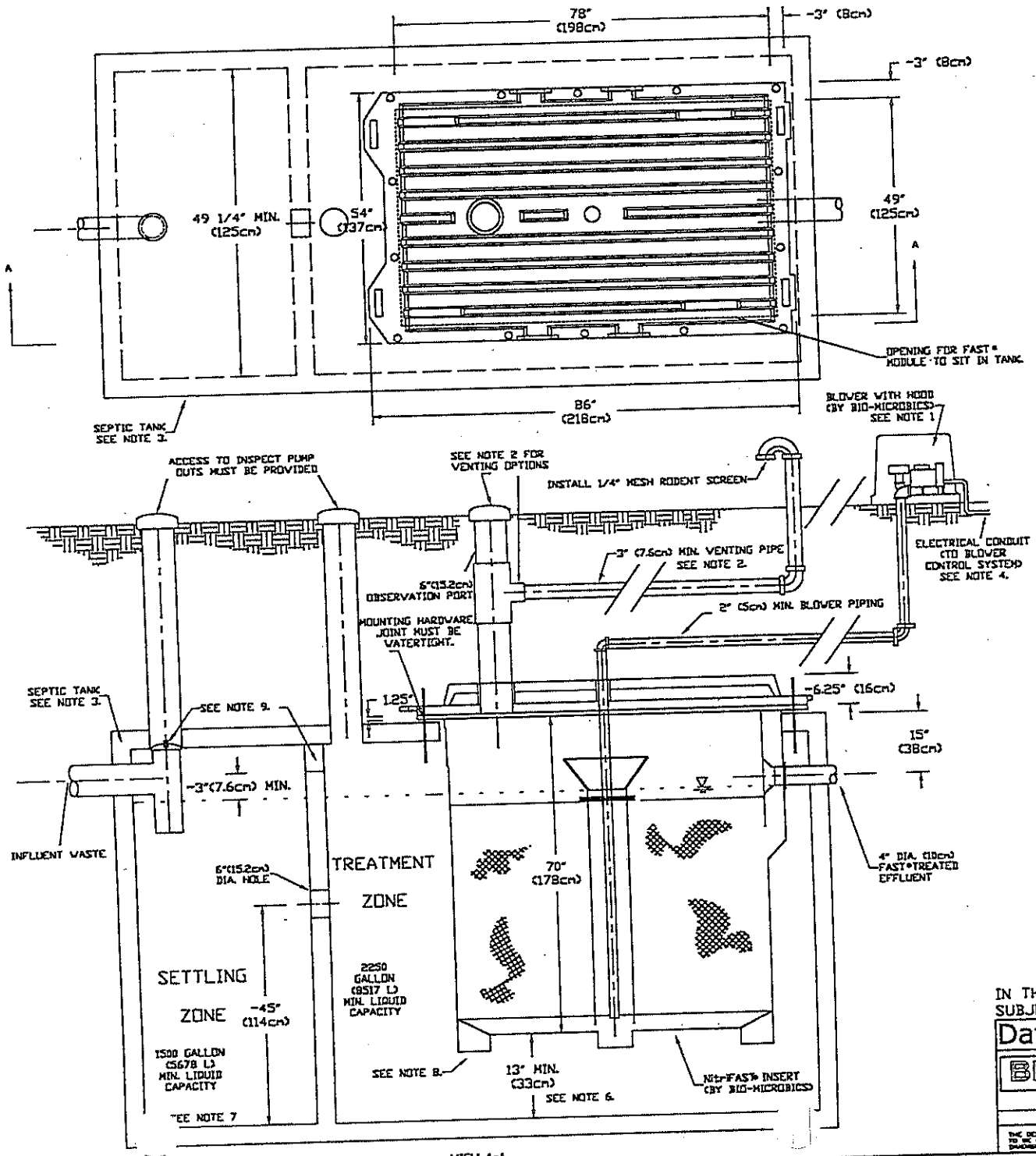
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

Date 7-16-01

BIO-MICROBICS INCORPORATED

NitriFAST® 1.5 Specifications

Drawn by SMF



VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST UNIT. FOR DISTANCES GREATER THAN 100 FEET -- CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVELS

2. RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH INSECT SCREEN.
   OR:
   CAP PIPES WITH 6" CLEANOUT. DRILL 8-12 HOLES IN 6" PIPE JUST UNDER PVC PIPE CAP. SEE ADDITIONAL VIEWS.
   NOTE: ODORS MAY BE PRESENT -- SEE MANUAL.

3. ALL APPURTENANCES TO FAST® (e.g. SEPTIC TANK, PUMPOUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

5.

6. MUST INCREASE TANK SIZE BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF TANK. CONSULT FACTORY FOR APPROVAL.

7. THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.

8. FOUR LEG EXTENSIONS MAY BE USED TO STAND UNIT IN TANK ELIMINATING NEED FOR LID. SEE ADDITIONAL VIEWS AND REFER TO INSTALLATION MANUAL FOR MORE DETAILS.

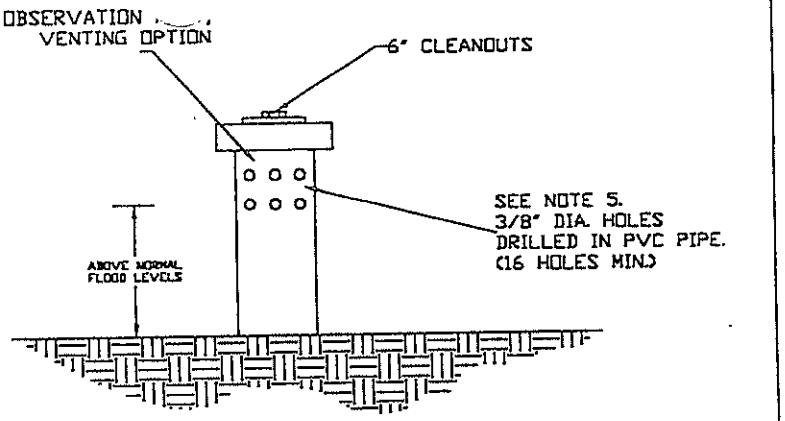
9. THERE IS AN OPTION OF EITHER PLACING A PIPE CAP ON THE TOP OF THE INFLUENT TEE OR EXTENDING THE BAFFLE SEPERATING THE TWO ZONES TO THE TOP OF THE CONCRETE TANK. IF THE PIPE CAP OPTION IS CHOSEN, THE BAFFLE MUST EXTEND AT LEAST 3" PAST THE WATER LEVEL AS SHOWN IN THE DRAWING.

Date 7-16-01

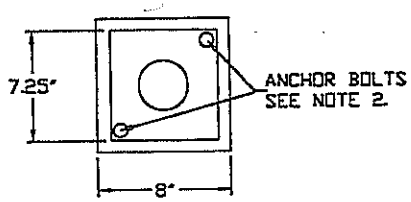
BIO-MICROBICS® INCORPORATED

NitriFAST®
3.0

SMF



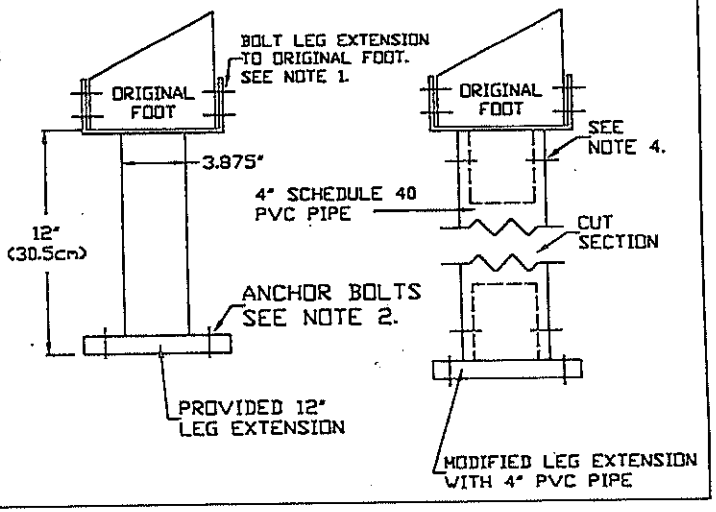
VENTING OPTION



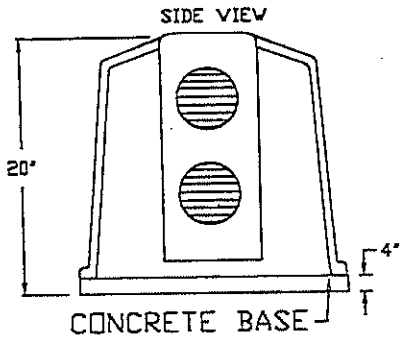
PLAN VIEW

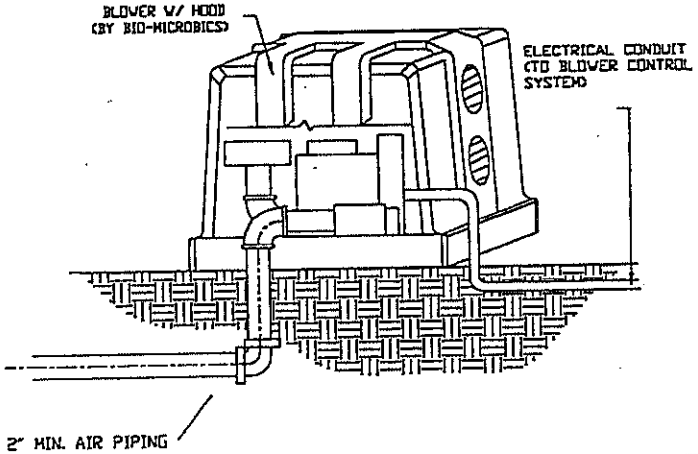
LEG EXTENSION

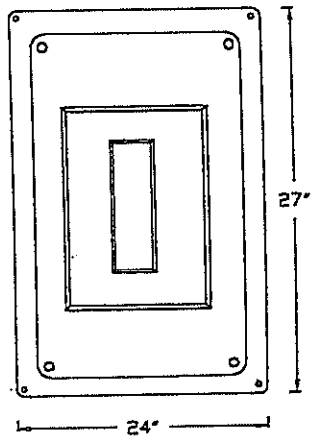
SEE NOTE 3.



BLOWER HOUSING DIMENSIONS







PLAN VIEW

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH OF THE FOUR (4) CORNER LEG EXTENSIONS.
2. ANCHOR THE LEG EXTENSIONS (4 CORNER LEGS ONLY) TO THE BASE OF THE TANK. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 16 HOLES MIN. IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.

Date 7-18-01

BIO-MICROBICS INCORPORATED

NitriFAST® 3.0
Additional Views

Drawn by SMF

Specifications For NitriFAST 3.0 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) NitriFAST 3.0 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The NitriFAST 3.0 unit shall be situated within a 3,750 Gallon (14195 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The NitriFAST 3.0 treatment system shall be capable of nitrifying the wastewater consisting of high total Nitrogen levels and having a greater oxygen demand than normal domestic strength waste with regard to Nitrification.

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The NitriFAST 3.0 unit shall come equipped with a regenerative type blower capable of delivering 44-80 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the NitriFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the NitriFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 230 Volts, Single Phase, 60/50 Hertz, 10.4 Full Load Amps (Locked Rotor Amps are 49), or 208-230/460 Volts, Three Phase, 60/50 Hertz, 5/2.5 Full Load Amps (Locked Rotor Amps are 37/18.5). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the NitriFAST 3.0 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

9. FLOW & PIPE SIZING
Each FAST module is provided with a standard (4) four inch effluent pipe hole and gasket. The maximum free or unrestricted flow with a four inch effluent pipe is 90 U.S. Gallons per minute (341 LPM), or 45 U.S. GPM (170 LPM) with a 2.0 design safety factor. An optional (6) six inch hole and gasket can be utilized on the same centerline dimension or up to 2 inches (5 cm) higher. Maximum free or unrestricted flow with a 6 inch effluent pipe is 260 GPM (984 LPM) or 130 GPM (492 LPM) with a 2.0 design safety factor.

10. WARRANTY
The manufacturer of the NitriFAST 3.0 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

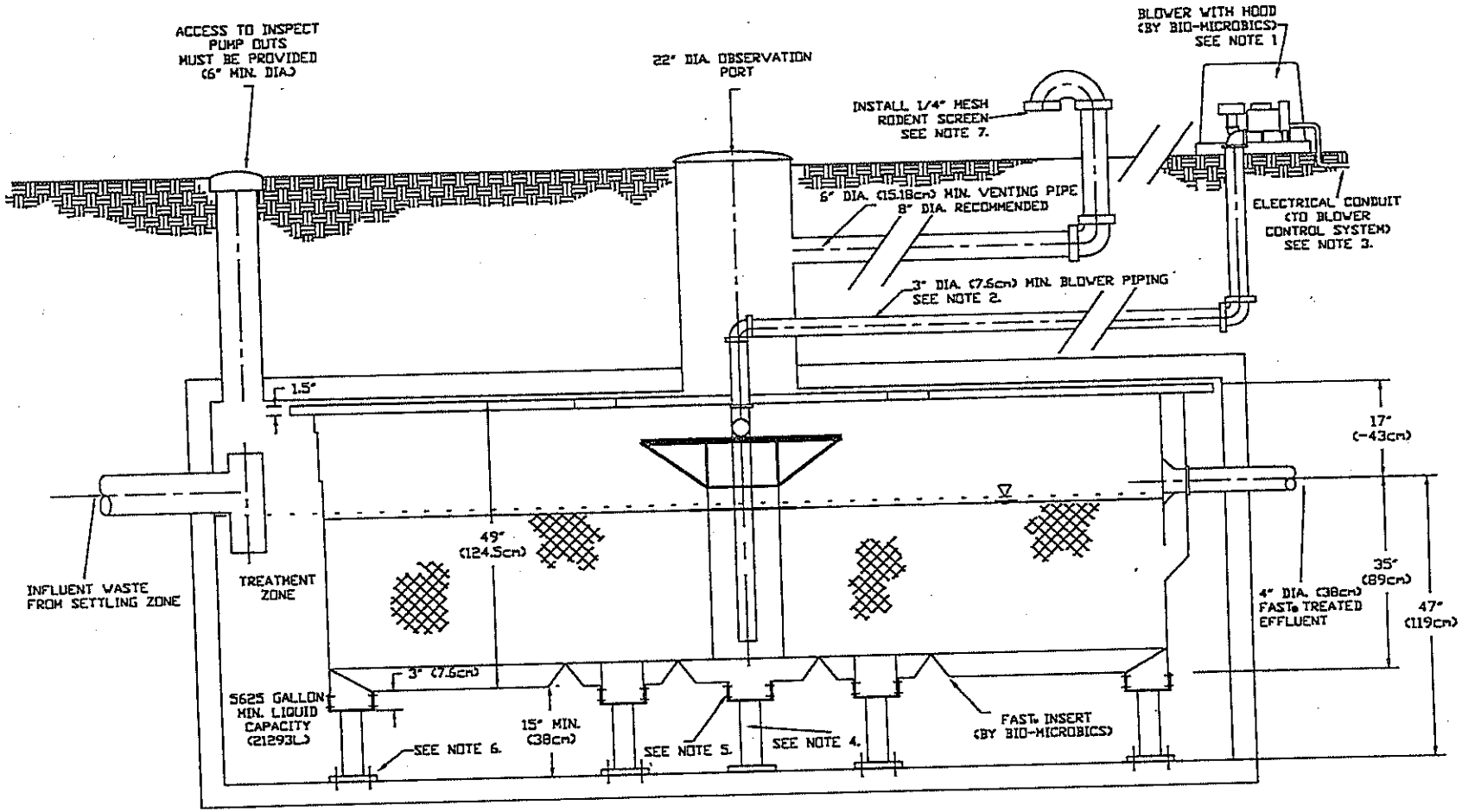
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

Date 7-16-01

BIO-MICROBICS INCORPORATED

NitriFAST 3.0 Specifications

Drawn by SMF



NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST® UNIT WITH LESS THAN 4 ELBOWS. FOR DISTANCES GREATER THAN 100 FEET--CONSULT FACTORY. BLOWER BASE MUST BE ABOVE NORMAL FLOOD LEVEL.

2. THE FACTORY RECOMMENDS CONNECTING AT LEAST ONE LENGTH OF GALVANIZED PIPE TO THE DISCHARGE SIDE OF THE BLOWER TO PREVENT HEAT FATIGUE CAUSED BY BLOWER FRICTION. DO NOT RUN GALVANIZED PIPE LENGTH INTO THE CONCRETE TANK.

3. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

4. TO ELONGATE THE FOOT PAST THE PROVIDED 12" (30.5cm) EXTENSION, CUT THE 3.9" DIA. (9.8cm) LEG EXTENSION INTO TWO SEPARATE PIECES. NEXT, CUT A 4" SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP CUT SECTION AND THE BOTTOM CUT SECTION OF THE LEG EXTENSION. ATTACH PIPE WITH STAINLESS STEEL SCREWS. EQUAL ELONGATION MUST BE DONE ON EACH LEG WHEN THE PROVIDED 12" IS FOUND INSUFFICIENT.

5. (11) ORIGINAL FEET ARE ON THE BASE OF THE FAST TREATMENT MODULE. EACH LEG EXTENSION IS TO BE ATTACHED TO THEIR CORRESPONDING FOOT WITH THE PROVIDED HARDWARE.

6. ANCHOR ALL LEG EXTENSIONS TO THE BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE FOOT EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED. SEE ADDITIONAL VIEWS DRAWING.

7. RUN VENT (6" DIA. MIN, 8" RECOMMENDED) TO DESIRED LOCATION AND COVER OPENING WITH 1/4" MESH RODENT SCREEN.

OR:

CAP PIPES WITH 6" CLEANOUT. DRILL 16-20 HOLES IN 6" PIPE JUST BELOW THE PVC PIPE CAP.

NOTE: ODORS MAY BE PRESENT--SEE MANUAL.

8. PLEASE SEE ADDITIONAL VIEWS DRAWING.

9.

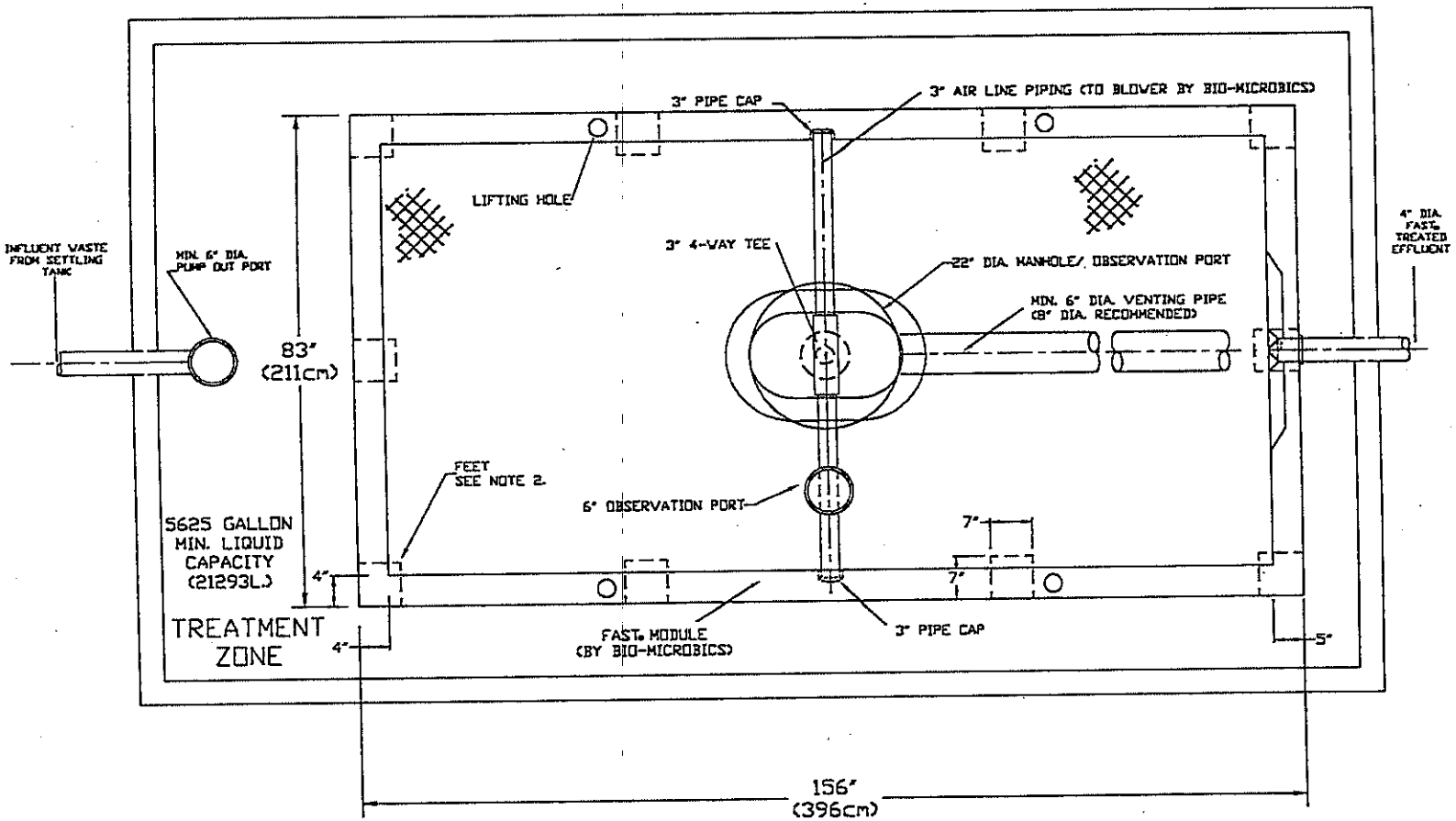
IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 7-24-01

BIO-MICROBICS INCORPORATED

NitriFAST® 4.5 (Cut View)

SMF



NOTES

1. ELEVEN (11) ORIGINAL FEET ARE ON THE BASE OF THE FAST TREATMENT MODULE. LEG EXTENSIONS ARE TO BE ATTACHED TO THE ORIGINAL FEET TO SUPPORT THE FAST MODULE.

2. THE PROVIDED LEG EXTENSIONS SHOULD BE PLACED ON EACH CORRESPONDING FOOT OF THE FAST MODULE WITH THE PROVIDED HARDWARE. SEE ADDITIONAL VIEWS DRAWING.

3. ALL APPURTENANCES TO FAST (e.g. SEPTIC TANK, PUMP OUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.

4. TO ELONGATE THE LEG PAST THE PROVIDED 12" (39.5cm), CUT THE 3.9" DIA. (9.8cm) FOOT EXTENSION INTO TWO SEPARATE PIECES. THEN CUT A 4" SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE END OVER THE TOP CUT SECTION AND THE BOTTOM CUT SECTION OF THE FOOT EXTENSION. ATTACH PIPE WITH STAINLESS STEEL SCREWS. ELONGATION MUST BE DONE ON ALL ELEVEN LEG EXTENSIONS WHEN THE PROVIDED 12" ELONGATION IS FOUND INSUFFICIENT.

5. ANCHOR ALL LEG EXTENSIONS INTO THE BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE FOOT EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED TO THE TANK BASE.

   NOTE: SEE ADDITIONAL VIEWS DRAWING.

6. PRIMARY AND SECONDARY TANKS MAY BE ONE DUAL COMPARTMENT TANK WITH A BAFFLE. NOTE: MINIMUM COMPARTMENT DIMENSIONS REMAINS THE SAME.

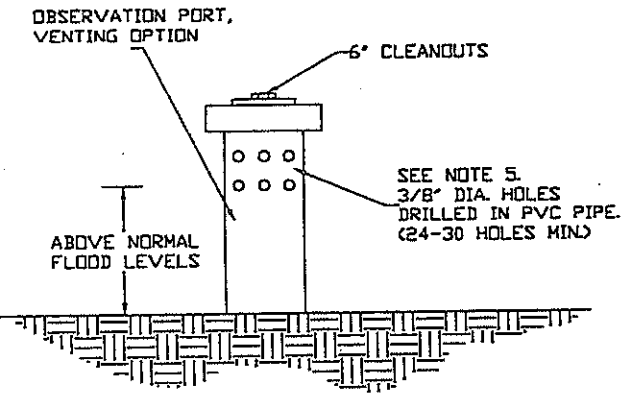
7. FOUR-WAY 3" PVC TEE IS PROVIDED BY THE FACTORY AS WELL AS 3" PVC PIPE EXTENDING FROM THE TEE HORIZONTALLY IN BOTH DIRECTIONS AND CAPPED OFF OUTSIDE OF THE MODULE LINER. THE AIRLINE MUST COME IN FROM THE TOP AND ATTACH TO THE PVC TEE.

Date 7-24-01

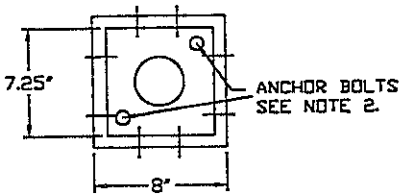
BIO-MICROBICS INCORPORATED

NitriFAST® 4.5 (Plan View)

Drawn by SMF



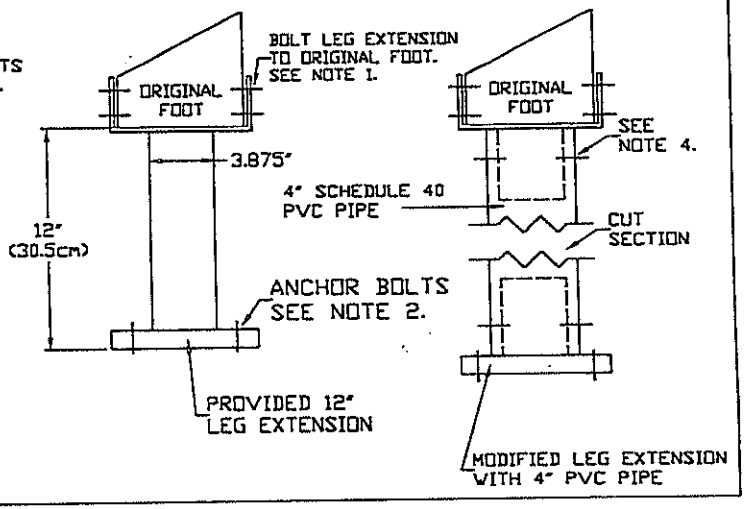
VENTING OPTION

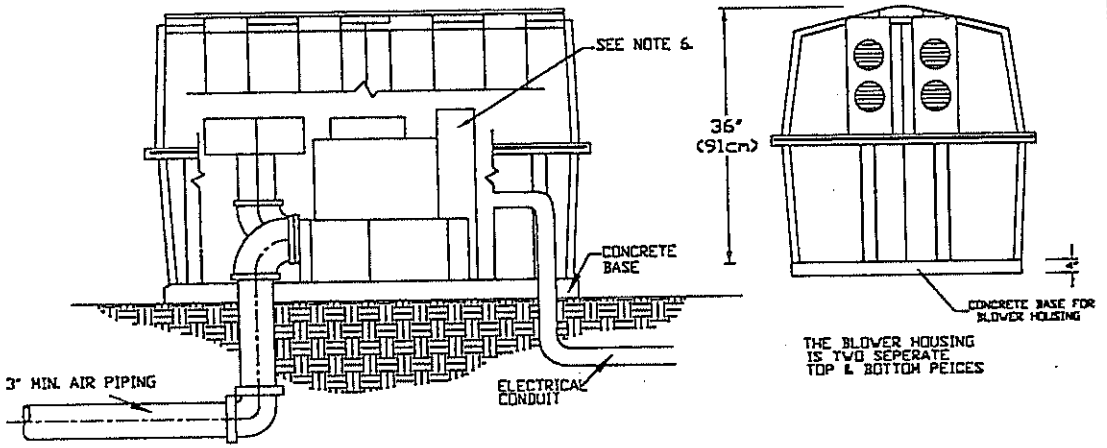


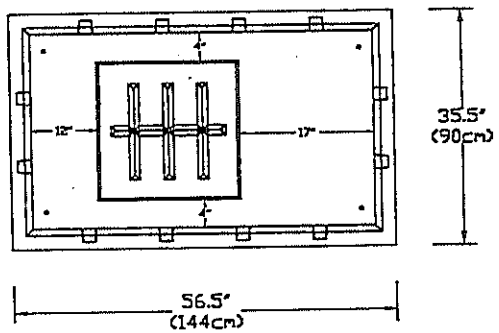
PLAN VIEW

LEG EXTENSION

SEE NOTE 3.







BLOWER HOUSING
DIMENSIONS

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH LEG EXTENSIONS.
2. ANCHOR ALL LEG EXTENSIONS TO BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" DIA. LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS A VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 24-30 HOLES IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.
6. AN OPTIONAL BLOWER WITH TWO DISCHARGE PIPES MAY BE PURCHASED. (ONE BLOWER USED FOR TWO SYSTEMS) CONSULT FACTORY.

IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT CHANGE.

Date 7-11-01

BIO-MICROBICS INCORPORATED

NitriFAST® 4.5
Additional Views

by SMF

Specifications For NitriFAST 4.5 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) NitriFAST 4.5 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System insert, insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The NitriFAST 4.5 unit shall be situated within a 5,625 Gallon (21293 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The NitriFAST 4.5 treatment system shall be capable of nitrifying the wastewater consisting of high total Nitrogen levels and having a greater oxygen demand than normal domestic strength waste with regard to Nitrification.

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The NitriFAST 4.5 unit shall come equipped with a regenerative type blower capable of delivering 90-135 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the NitriFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the NitriFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 230 Volts, Single Phase, 60/50 Hertz, 11.5 Full Load Amps (Locked Rotor Amps are 67), or 208-230/460 Volts, Three Phase, 60/50 Hertz, 6.6/3.3 Full Load Amps (Locked Rotor Amps are 54/27). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the NitriFAST 4.5 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

To lift the FAST unit, use spreader bars between lifting points. Module weighs approximately 1,600 lbs.

9. FLOW & PIPE SIZING
Each FAST module is provided with a standard (4) four inch effluent pipe hole and gasket. The maximum free or unrestricted flow with a four inch effluent pipe is 90 U.S. Gallons per minute (341 LPM), or 45 U.S. GPM (170 LPM) with a 2.0 design safety factor. An optional (6) six inch hole and gasket can be utilized on the same centerline dimension or up to 2 inches (5 cm) higher. Maximum free or unrestricted flow with a 6 inch effluent pipe is 260 GPM (984 LPM) or 130 GPM (492 LPM) with a 2.0 design safety factor.

10. WARRANTY
The manufacturer of the NitriFAST 4.5 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

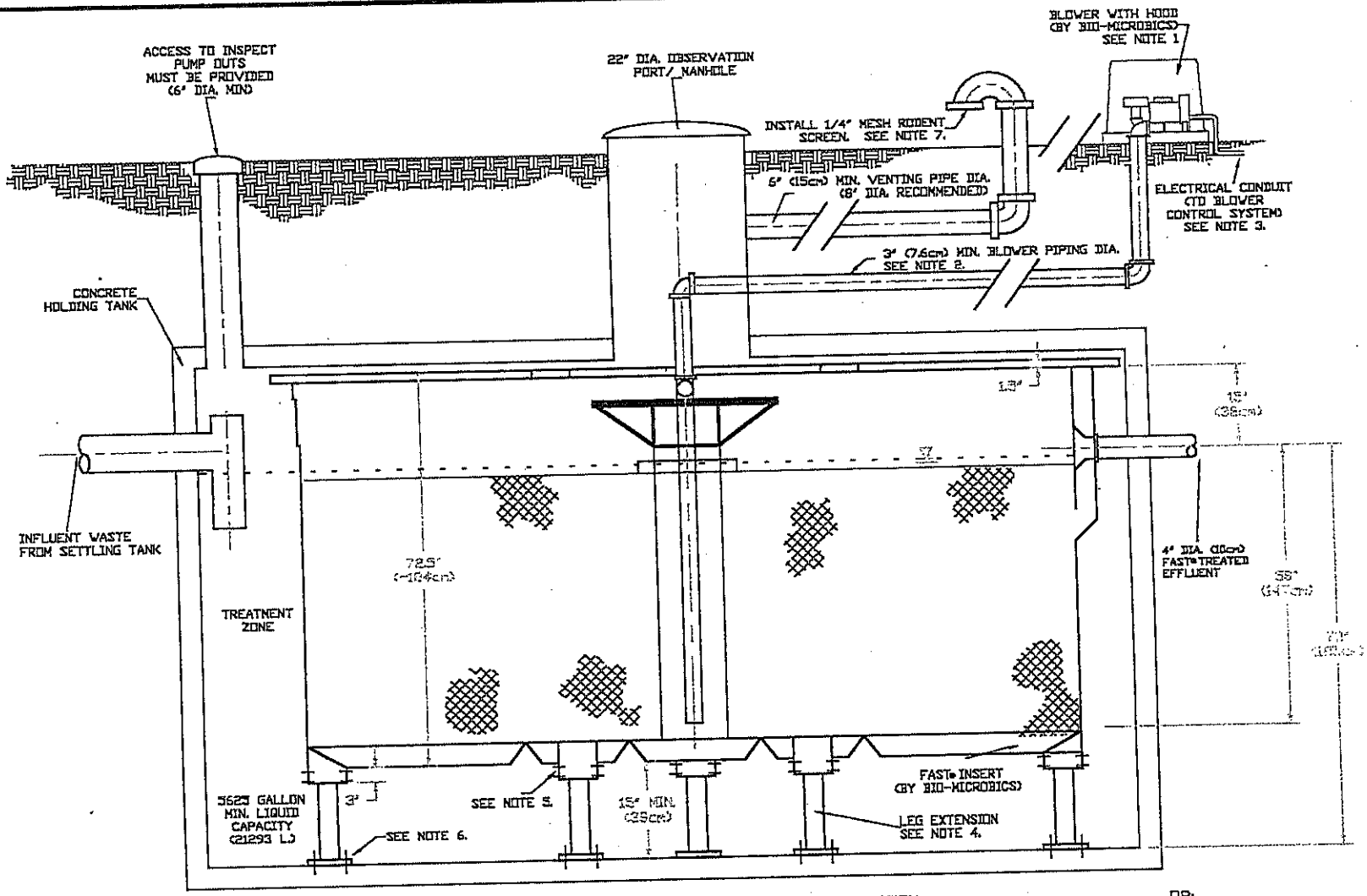
It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

Date 7-16-01

BIO-MICROBICS INCORPORATED

NitriFAST•4.5 Specifications

Drawn by SMF



NOTES

1. BLOWER MUST BE WITHIN 100 FEET (30.5M) OF FAST® UNIT. FOR DISTANCES GREATER THAN 100 FEET—CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE NORMAL FLOOD LEVEL.

2. THE FACTORY RECOMMENDS CONNECTING AT LEAST ONE LENGTH OF GALVANIZED PIPE TO THE DISCHARGE SIDE OF THE BLOWER TO PREVENT HEAT FATIGUE CAUSED BY BLOWER FRICTION. DO NOT RUN GALVANIZED PIPE LENGTH INTO THE CONCRETE TANK.

3. BLOWER CONTROL SYSTEM BY BIO-MICROBICS, INC.

4. TO ELONGATE THE FOOT PAST THE PROVIDED 12" (30.5cm) EXTENSION, CUT THE 3.9" DIA. (9.8cm) LEG EXTENSION INTO TWO SEPARATE PIECES. NEXT, CUT A 4" SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP CUT SECTION AND THE BOTTOM C[illegible]ECTION OF THE LEG EXTENSION. ATTACH PIPE WITH STAINLESS STEEL SCREWS. ELONGATION MUST BE DONE ON ALL ELEVEN LEGS WHEN THE PROVIDED 12" IS DETERMINED INSUFFICIENT EXTENSION.

5. (11) ORIGINAL FEET ARE ON THE BASE OF THE FAST TREATMENT MODULE. EACH LEG EXTENSION IS TO BE ATTACHED TO THE CORRESPONDING ORIGINAL FOOT WITH THE PROVIDED HARDWARE.

6. ANCHOR ALL LEG EXTENSIONS TO THE BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE FOOT EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED. SEE ADDITIONAL VIEWS DRAWING.

7. RUN VENT (6" DIA. MIN, 8" RECOMMENDED) TO DESIRED LOCATION AND COVER OPEN[illegible] WITH 1/4" MESH TO ACT AS A RODENT SCR

OR:

CAP PIPES WITH 6" CLEANOUT. DRILL 24-30 HOLES IN 6" PIPE JUST BELOW THE PVC PIPE CAP.

NOTE: ODORS MAY BE PRESENT—SEE MANUAL.

8. PLEASE SEE ADDITIONAL VIEWS DRAWING.

9. COPYRIGHT (C) 2001, BIO-MICROBICS, INC.

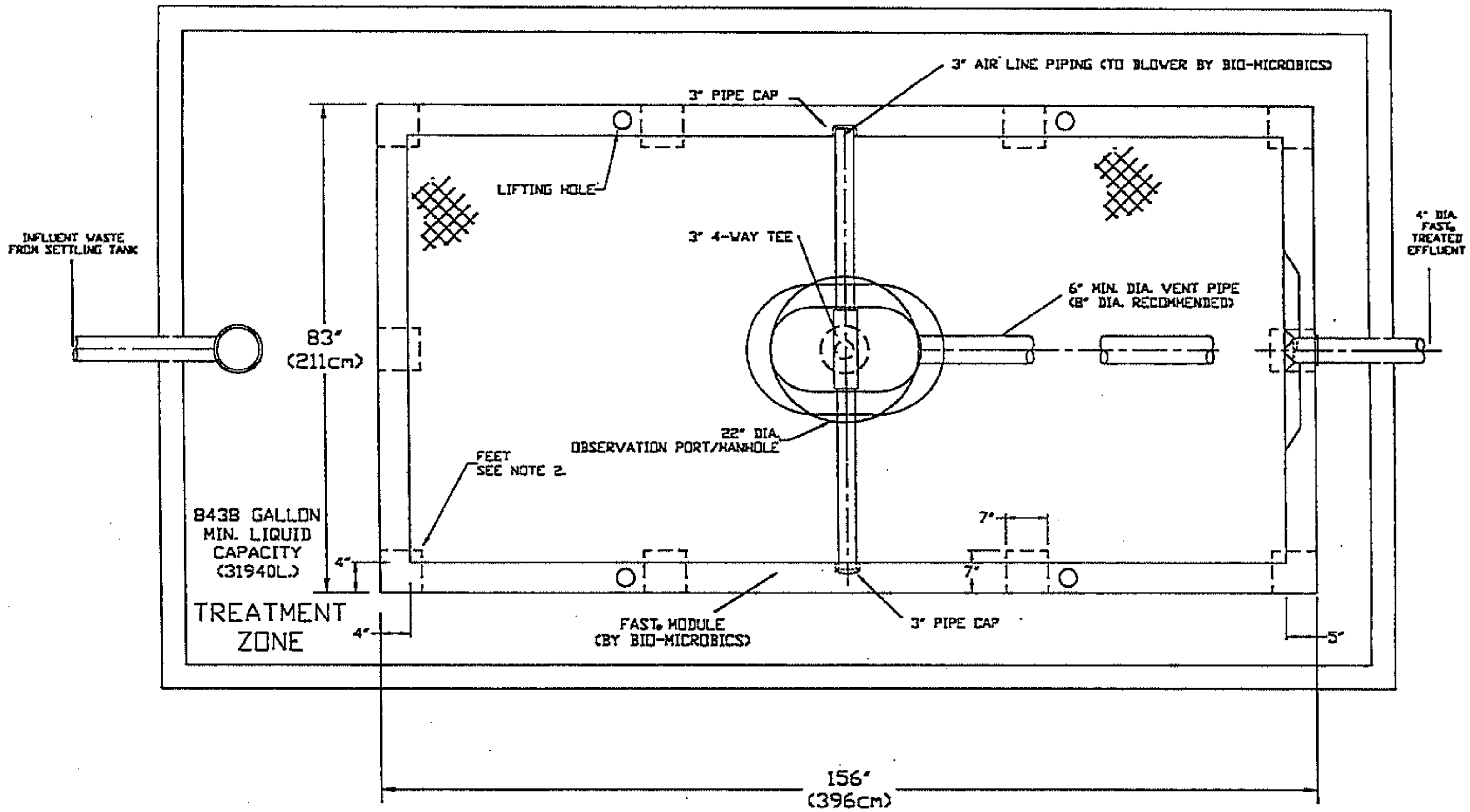
IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 7-24-01

BIO-MICROBICS® INCORPORATED

NitriFAST®9.0 (Cut View)

by SMF



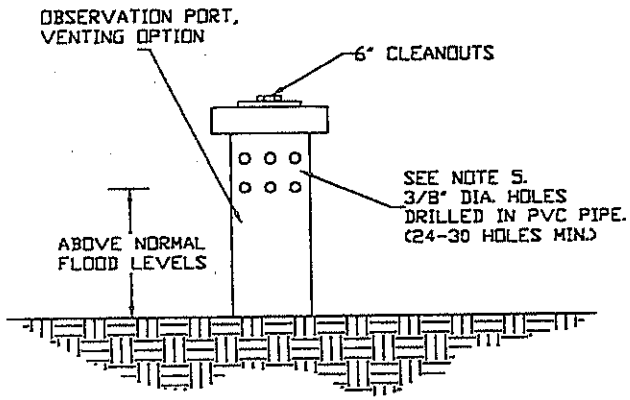
NOTES

1. ELEVEN ORIGINAL FEET ARE ON THE BASE OF THE FAST TREATMENT MODULE. LEG EXTENSIONS MUST BE ATTACHED TO EACH CORRESPONDING LEG TO SUPPORT THE UNIT.
2. THE PROVIDED LEG EXTENSIONS SHOULD BE PLACED ON EACH CORRESPONDING LEG WITH THE PROVIDED HARDWARE. SEE ADDITIONAL VIEWS DRAWING.
3. ALL APPURTENANCES TO FAST (e.g. SEPTIC TANK, PUMP OUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.
4. TO ELONGATE THE FOOT PAST THE PROVIDED 12" (39.5cm), CUT THE 3.9" DIA. (9.8cm) FOOT EXTENSION INTO TWO SEPARATE PIECES. THEN CUT A 4" SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE END OVER THE TOP CUT SECTION AND THE BOTTOM CUT SECTION OF THE FOOT EXTENSION. ATTACH PIPE WITH STAINLESS STEEL SCREWS. ELONGATION MUST BE DONE ON ALL LEG EXTENSIONS.
5. ANCHOR ALL LEG EXTENSIONS INTO THE BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE BASE OF THE LEG EXTENSION. IF ELONGATING LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED.

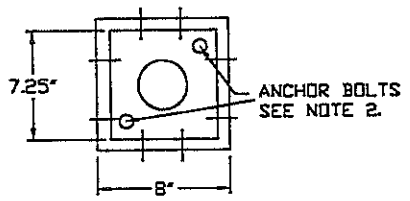
   NOTE: SEE ADDITIONAL VIEWS DRAWING.
6. PRIMARY AND SECONDARY TANKS MAY BE ONE DUAL COMPARTMENT TANK WITH A BAFFLE. NOTE: MINIMUM COMPARTMENT DIMENSIONS REMAINS THE SAME.
7. FOUR-WAY 3" PVC TEE IS PROVIDED BY THE FACTORY AS WELL AS 3" PVC PIPE EXTENDING FROM THE TEE HORIZONTALLY IN BOTH DIRECTIONS AND CAPPED OFF OUTSIDE OF THE MODULE LINER. THE AIRLINE MUST COME IN FROM THE TOP AND ATTACH TO THE PVC TEE.

IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 7-16-01	NitriFAST® 9.0 (Plan View)
BIO-MICROBICS® INCORPORATED	
Drawn by	SMF



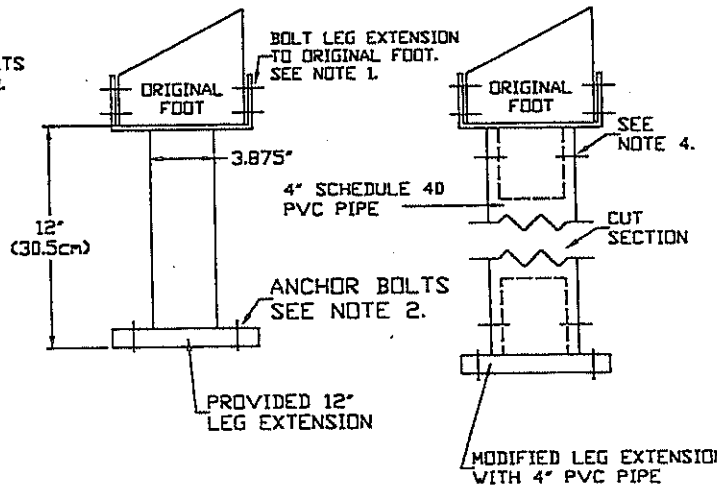
VENTING OPTION

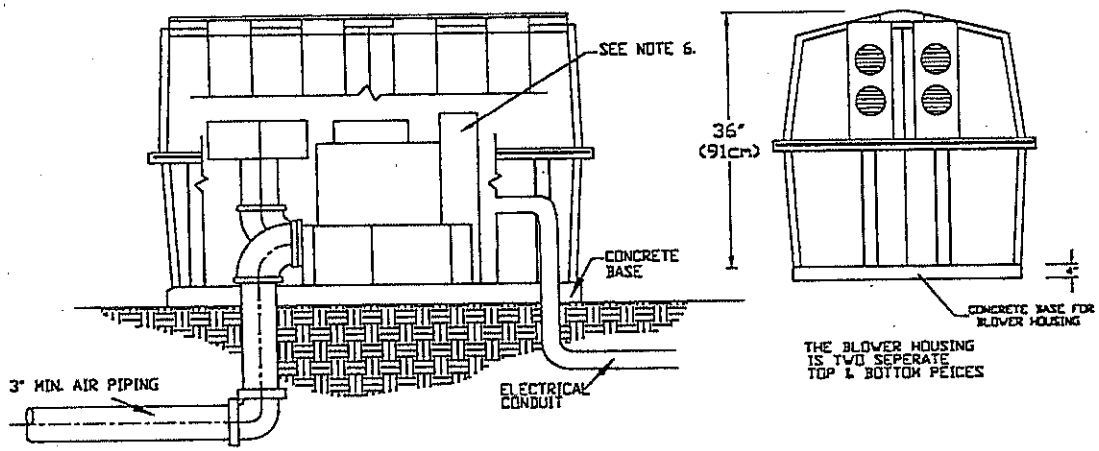


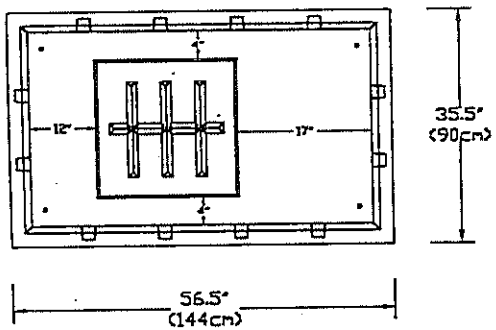
PLAN VIEW

LEG EXTENSION

SEE NOTE 3.







BLOWER HOUSING DIMENSIONS

NOTES

1. SECURE ORIGINAL 7" X 7" FOOT TO LEG EXTENSION BY PLACING TWO (2) SCREWS IN EACH SIDE OF THE LEG EXTENSION. EIGHT (8) SCREWS PER FOOT ARE INCLUDED AND SHOULD BE USED ON EACH LEG EXTENSIONS.
2. ANCHOR ALL LEG EXTENSIONS TO BASE OF THE TANK EXCEPT THE CENTER LEG EXTENSION. PLACE BOLTS AT OPPOSITE CORNERS OF THE LEG EXTENSION BASE. IF ELONGATING THE LEG EXTENSIONS PAST 23" (58.4cm) IN HEIGHT, THE CENTER LEG EXTENSION MUST ALSO BE BOLTED DOWN. ANCHOR BOLTS ARE NOT PROVIDED.
3. TO ELONGATE FOOT PAST THE PROVIDED 12", CUT THE 3.9" DIA. LEG EXTENSION IN THE CENTER INTO TWO SEPARATE PIECES. THEN CUT A SCH 40 PVC PIPE TO THE DESIRED LENGTH AND SLIP THE PIPE OVER THE TOP AND BOTTOM CUT SECTIONS OF THE LEG EXTENSIONS.
4. ATTACH PIPES WITH STAINLESS STEEL SCREWS.
5. ACCESS PORTS MAY BE USED AS A VENT. CAP PIPES WITH 6" PVC CLEANOUT. DRILL 24-30 HOLES IN 6" PIPE JUST BELOW THE PVC CAP OR IN THE CAP.
6. AN OPTIONAL BLOWER WITH TWO DISCHARGE PIPES MAY BE PURCHASED. (ONE BLOWER USED FOR TWO SYSTEMS) CONSULT FACTORY.

IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 7-11-01

BIO-MICROBICS INCORPORATED

NitriFAST® 9.0
Additional Views

by SMF

Specifications For NitriFAST 9.0 Wastewater Treatment System

1. GENERAL
The contractor shall furnish and install (1) NitriFAST 9.0 treatment system as manufactured by Bio-Microbics, Inc. The treatment system shall be complete with all needed equipment as shown on the drawings and specified herein.

The principal items of equipment shall include FAST System Insert, insert lid (or leg extensions if that option is chosen), blower assembly, blower controls and alarms. The NitriFAST 9.0 unit shall be situated within a 11,250 Gallon (42586 L) minimum tank, as shown on the plans. Tank(s) must conform to local, state, and all other applicable codes. The contractor shall provide coordination between the FAST system and tank supplier with regard to fabrication of the tank, installation of the FAST unit and delivery to the job site.

2. OPERATING CONDITIONS
The NitriFAST 9.0 treatment system shall be capable of nitrifying the wastewater consisting of high total Nitrogen levels and having a greater oxygen demand than normal domestic strength waste with regard to Nitrification.

3. MEDIA
The FAST media shall be manufactured of rigid PVC or polyethylene and it shall be supported by the polyethylene insert. The media shall be of such a design that bacterial growth is uniform over all media surfaces. The media shall be fixed in position and contain no moving or wearing parts and shall not corrode. The media shall be designed and installed to ensure that sloughed solids immediately descend through the media to the bottom of the septic tank.

4. BLOWER
The NitriFAST 9.0 unit shall come equipped with a regenerative type blower capable of delivering 140-226 CFM. The blower assembly shall include an inlet filter with metal filter element.

5. REMOTE MOUNTED BLOWER
The blower shall be mounted remote, up to 100 feet (30.5 M) maximum, from the NitriFAST unit on a contractor supplied concrete base. The blower elevation must be higher than the normal flood level. A one-piece, rectangular housing shall be provided with tamper-proof screws. The discharge air line from the blower to the NitriFAST shall be provided and installed by the contractor.

6. ELECTRICAL
The treatment system shall be designed to operate on standard current. The input power required for the blower is 230 Volts, Single Phase, 60/50 Hertz, 20.8 Full Load Amps (Locked Rotor Amps are 119), or 208-230/460 Volts, Three Phase, 60/50 Hertz, 12/6 Full Load Amps (Locked Rotor Amps are 94/47). All conduit and wiring between the electrical control panel, the power supply, and the blower shall be furnished and installed by the contractor.

7. ALARMS
The alarm system shall consist of a visual and audible alarm to indicate failure of the blower. The alarm shall be located as shown on the plans. A manual silence switch is included.

8. INSTALLATION AND OPERATING INSTRUCTIONS
Installation of the NitriFAST 9.0 shall be done in accordance with the written instructions provided by the manufacturer. An operation and maintenance manual shall be furnished which will include a description of system installation, operation, and maintenance procedures.

To lift the FAST unit, use spreader bars between lifting points. Module weighs approximately 2,300 lbs.

9. FLOW & PIPE SIZING
Each FAST module is provided with a standard (4) four inch effluent pipe hole and gasket. The maximum free or unrestricted flow with a four inch effluent pipe is 90 U.S. Gallons per minute (341 LPM), or 45 U.S. GPM (170 LPM) with a 2.0 design safety factor. An optional (6) six inch hole and gasket can be utilized on the same centerline dimension or up to 2 inches (5 cm) higher. Maximum free or unrestricted flow with a 6 inch effluent pipe is 260 GPM (984 LPM) or 130 GPM (492 LPM) with a 2.0 design safety factor.

10. WARRANTY
The manufacturer of the NitriFAST 9.0 treatment system shall warrant for eighteen months from the date of shipment or one year form the date of start-up, whichever occurs first, that the equipment they provide will be free from defects in material and workmanship.

In the event a mechanical component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall repair or replace such defective parts. (Cost of labor on repair/replacement is not covered under this warranty.) The replacement or repair of those items normally consumed in service such as air filter, etc., shall be considered as part of routine maintenance and upkeep.

It is not intended that the manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material or workmanship, or delays in delivery, replacement, or otherwise.

IN THE INTEREST OF TECHNOLOGICAL PROGRESS, ALL PRODUCTS ARE SUBJECT TO DESIGN AND/OR MATERIAL CHANGE WITHOUT NOTICE.

Date 7-16-01	NitriFAST 9.0 Specifications
BIO-MICROBICS INCORPORATED	
Drawn by	SMF

STATE OF MAINE
DEPARTMENT OF HUMAN SERVICES
DIVISION OF HEALTH ENGINEERING
10 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0010

ANGUS S. KING, JR.
GOVERNOR

KEVIN W. CONCANNON
COMMISSIONER

April 23, 1998

J&R Engineered Products, Inc.
Attn.: Lewis B. Paine
P. O. Box 417
Auburn, Maine 04212-4752

Subject: Product Registration, Single Home FAST Treatment Plant

Dear Mr. Paine:

Thank you for your application received March 6, 1998 regarding the *Single Home FAST Treatment Plant*, and the accompanying manufacturing literature and engineering data.

Under provisions of Section 1802 of the Maine State Plumbing Code, Subsurface Wastewater Disposal Rules any manufacturer or distributor submitting a new product for code registration needs to demonstrate that:

1. The product is designed to protect public health, prevent the creation of any nuisance, and prevent environmental pollution to the same extent as comparable products presently authorized by Department for use in this code, and

2. The product is based on sound engineering principles and can be expected to provide the same level of protection to public health and the environment as offered by the authorized products presently authorized by the Department for use in this code.

Such demonstration may be achieved by submitting a letter to the Division of Health Engineering from: a) a certifying organization, such as the International Association of Plumbing and Mechanical Officials (IAPMO), Building Officials and Code Administrators (BOCA), or other suitable organization stating their approval of the product, or b) the American Society for Testing and Materials (ASTM) indicating the requested product (used as indicated in the request) meets the ASTM standard as specifically listed in the appropriate section of any nationally recognized plumbing code, such as BOCA, IAPMO (same as International Plumbing Code), or equal.

According to the information you provided, the *Single Home FAST Treatment Plant* has received approval from the National Sanitation Foundation (NSF) on August 28, 1996. NSF determined that the *Single Home FAST Treatment Plant*, Model #23-001-750 conforms to provisions of NSF Standard 40. On that basis, the Division has determined that the *Single Home FAST Treatment Plant* is acceptable for use in the State of Maine, provided that it is installed, operated, and maintained in conformance with the manufacturer's directions.

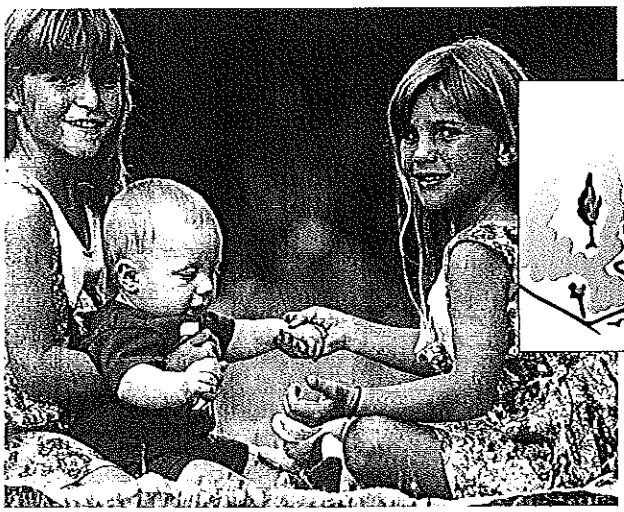
Because installation and owner maintenance has a significant effect on the working order of onsite sewage disposal systems, including their components, the Division makes no representation or guarantee as to the efficiency and/or operation of *Single Home FAST Treatment Plant*. Further, registration of this product for use in the State of Maine does not represent Division preference or recommendation for this product over similar products.

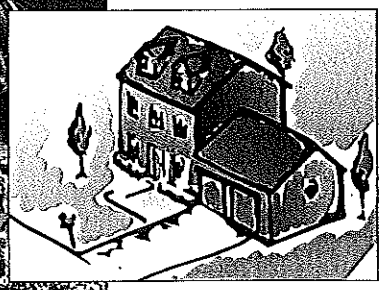
If you have any questions please feel free to contact me at (207) 287-5695.

Sincerely,

James A. Jacobsen, Manager
Wastewater and Plumbing Control Program
Division of Health Engineering
e-mail: james.jacobsen@state.me.us

xc: File





Single Family Dwellings

FAST wastewater treatment systems

J&R ENGINEERED PRODUCTS, INC.

LEWIS B. PAINE

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534 New State Hwy.
Raynham, MA
02767

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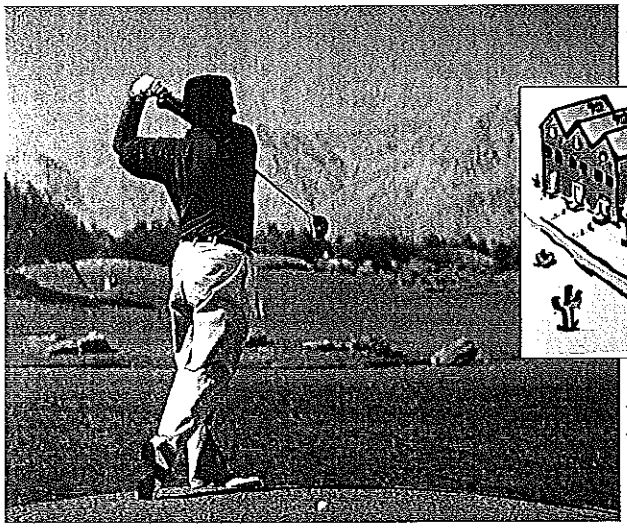
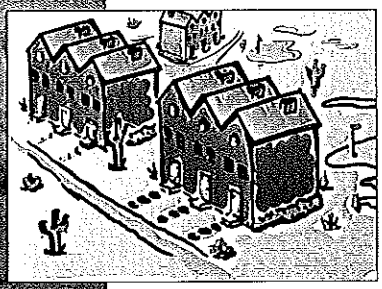
Auburn, ME
04212-4752

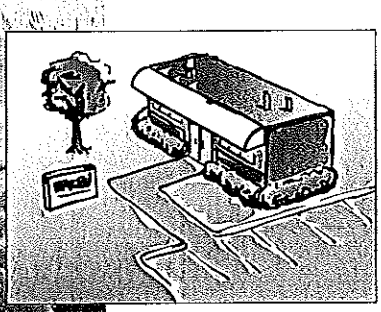
Tel. 508-823-9566
FAX 508-880-7232

Tel: 207-782-4752
Fax: 207-777-7165

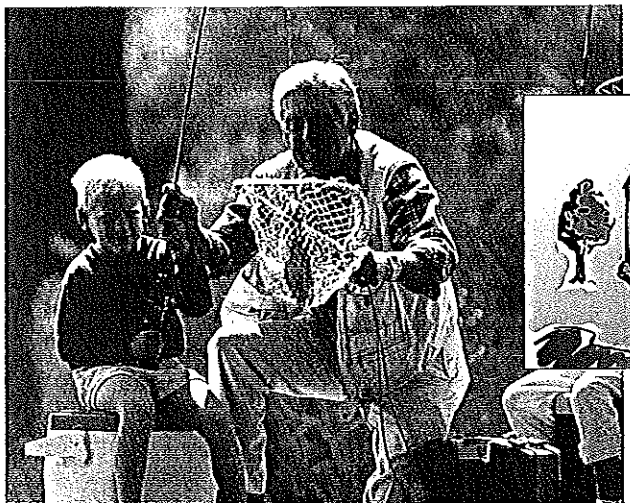




Clustered Subdivisions

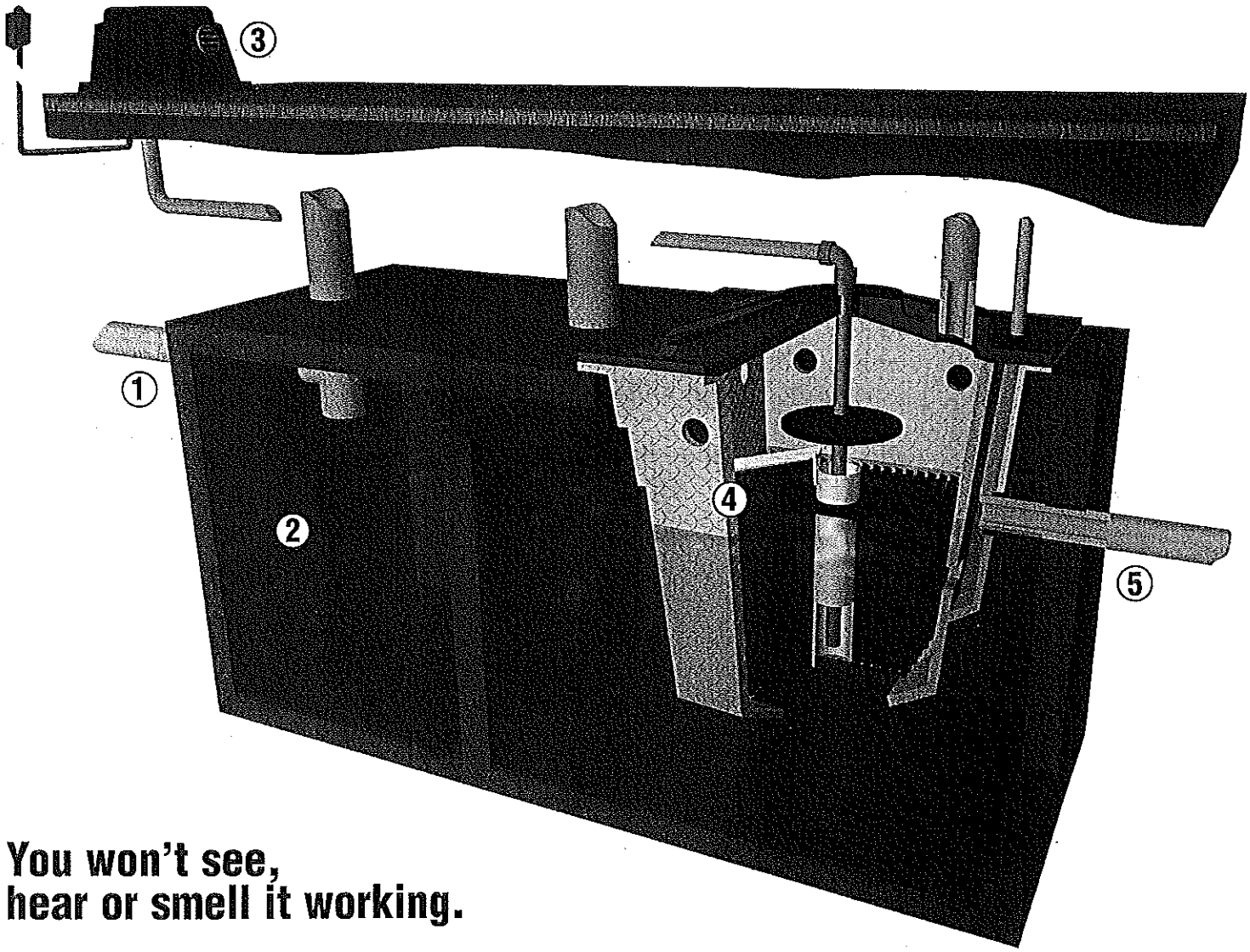


High Strength Commercial



Failed System Renovation

Introducing FAST® Wastewater Treatment Systems



You won't see, hear or smell it working.

(1) FAST® wastewater treatment systems process all the wastewater from single family homes, clusters of homes, small communities or even the high strength wastes from restaurants or commercial facilities.

(2) Natural separation and settling processes occur in the first compartment of the underground tank.

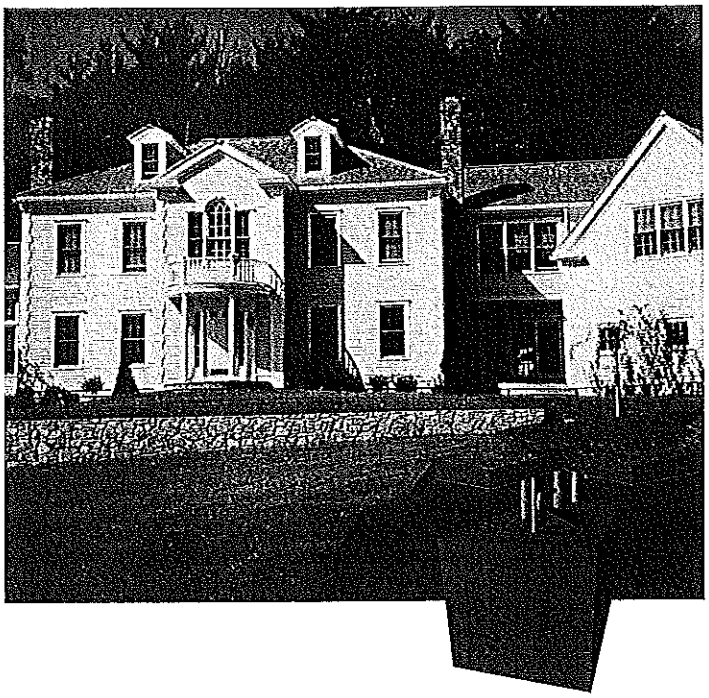
(3) Remote blower (the system's only moving part) delivers large volumes of air into the heart of the system, creating vigorous water movement. FAST is oxygen-rich and self-cleaning.

(4) Proven, reliable FAST treatment module provides the perfect environment for "friendly bacteria" to grow and multiply. FAST consistently processes and removes more than 95% of common impurities. Special patented technology allows exceptional Total Nitrogen reductions (including nitrates) of more than 70%.

(5) Clear, odorless treated water is ready for standard or innovative dispersal.

Dependable, Affordable FAST®

FAST® is simply great technology. Ideally suited for use in single family dwellings, clustered residential developments and subdivisions, restaurants or other high strength commercial applications, a versatile FAST system is ready to serve your needs. FAST can even be used to retrofit a failed conventional septic system, giving homeowners and small communities the innovative solutions they seek. Dependable, affordable...FAST.



Nothing to disturb your view.

You'll like the view your FAST wastewater treatment system affords—because you can't see it. Everything is tucked neatly underground, except for an unobtrusive blower housing that can be located up to 100 feet away. For years to come you won't notice a thing about your FAST system except how well it's working. And the beautiful view.

FAST® wastewater treatment systems

The real beauty of this remarkable system is how well it works.

The science behind a FAST® wastewater treatment system is environmentally sound and simple. FAST is an acronym for Fixed Activated Sludge Treatment. Here's why this technology is so effective:

A FAST wastewater treatment system is a pre-engineered modular apparatus designed to treat wastewater from residential, commercial, high strength and small community applications.

FAST is a fixed film, aerated system utilizing a combination of attached and suspended growth, capable of nitrification/denitrification in a single tank. This innovative combination includes the stability of fixed film media and the effectiveness of proven activated sludge treatment, making FAST technologically advanced and extraordinarily reliable.

A FAST system provides an ideal home for large volumes of friendly organisms in the inner aerated media chamber to digest the wastewater and turn it into a clear, odorless, high-quality effluent. The attached growth system assures that more organisms remain inside the system instead of being flushed out, even during times of peak hydraulic flows (for example, during large social gatherings or on multiple-washload laundry days). During times of low usage, the large volumes of thriving organisms prevent a dying-off of the system, making FAST equally well suited to intermittent use applications.

Sufficient conditions are present which allows nitrification and denitrification to occur in the same tank—without any system modifications. Special patented technology allows FAST to consistently reduce nitrogen levels—including nitrates and all other nitrogen species—by over 70%.

Installation of the lightweight and durable FAST system is easy. It simply mounts into a septic tank. FAST is designed to be efficient, dependable, user-friendly and very easy to install.

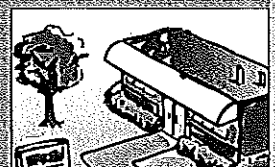
Once installed, the FAST system is virtually maintenance free. Tastefully located below ground level, the clean, odorless system blends beautifully into any landscaping design. The only moving part is the quiet aerating blower, placed above ground level in the most convenient location. FAST needs no other filters or pumps.

FAST is ideally suited for residential development, high strength waste, light commercial applications and renovation of failing systems on marginal or severely limited sites.

FAST wastewater treatment systems share many advantages:

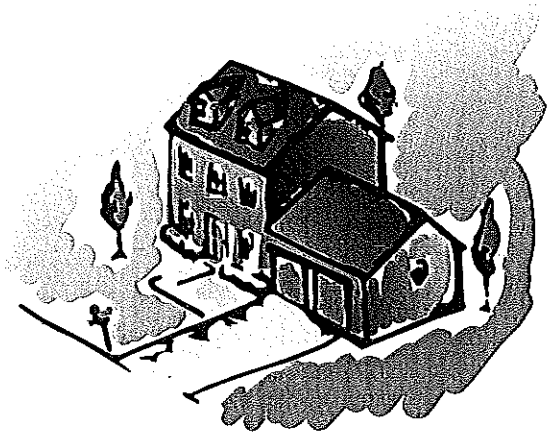
Single Family Dwellings	Clustered Subdivisions	High Strength Commercial	Failed System Renovation
Hidden, installs underground	Makes marginal sites buildable	Robust process handles even the toughest applications	Simple, dependable retrofit
Quiet, automatic operation	Flexible development and landscape planning	Virtually maintenance free—less mess	Minimal disruption
Garbage disposal and dishwasher compatible	Saves money versus centralized system	Pretreatment or complete treatment	Low cost, long-lasting solution
Affordable options			Renovates soil and leach fields





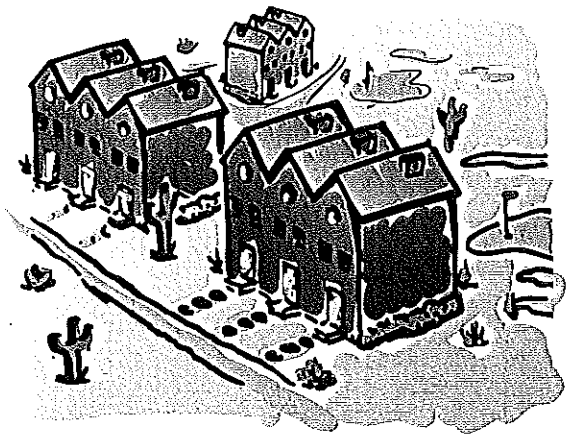

Single Family Dwellings

- Environmentally safe treatment allows full use of property by homeowners, children and pets
- Proven high performance levels could mean reductions in lot size, separation distances and other limiting factors
- Possible innovative re-use of precious water resources for irrigation
- Advanced wastewater treatment system ready for next generation requirements



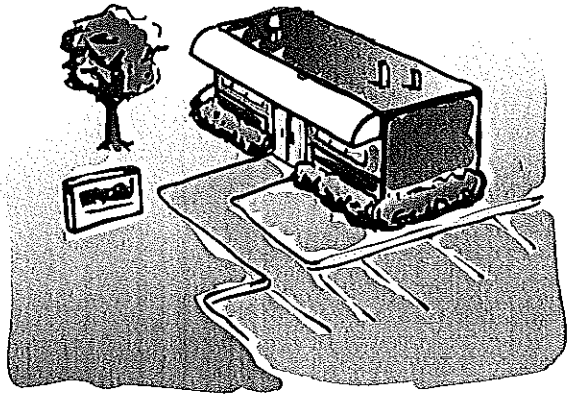
Clustered Subdivisions

- FAST may make previously unbuildable land useful and profitable
- Modular design of FAST system allows project planners maximum flexibility
- Builders and developers are able to purchase and install only when and where needed, saving large capital expenditures of a costly centralized system



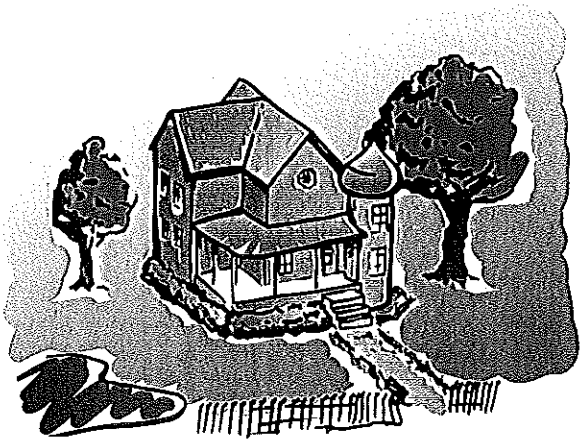
High Strength Commercial

- Restaurants and other difficult high strength waste applications are effortlessly treated with FAST's robust aerobic process
- Clubhouses, schools, trailer parks, office buildings and other commercial properties are natural fits for a FAST wastewater treatment system
- With FAST's reliable process engineering design, operation is simple and virtually maintenance free



Failed System Renovation

- Failing septic systems can easily be retrofitted and upgraded with the simple, affordable design of FAST
- Small communities now have a practical, proven alternative to cost prohibitive centralized sewer systems
- Modernizing the wastewater treatment system with FAST increases value and usefulness of the property



Proven, safe, reliable.

The advanced technology behind FAST® was originally developed by Smith & Loveless, Inc., a worldwide leader in the design and manufacture of wastewater treatment equipment since 1946. FAST has been used successfully for many years in municipal, industrial, marine, commercial and residential applications. Known globally for superior engineering and manufacturing, the Smith & Loveless companies are one of the most recognized water and wastewater transfer and treatment groups in the world. This innovative group of companies is known for high standards, proven technology, engineering expertise and manufacturing quality.

Environmental Protection

FAST systems greatly reduce groundwater contamination and help protect the delicate ecosystem. Potentially harmful nitrates and all other forms of nitrogen are removed at unparalleled rates (more than 70%) through the patented FAST process. FAST is made with post-consumer recycled materials. Use of this remarkable system allows for responsible new development and the renovation of failed conventional systems.

FAST Certifications

U. S. Coast Guard
Canadian Great Lakes
UK Department of Trade
NSF Standard 40, Class I
International Maritime Organization (IMO)

NSF

NSF's Certification Program is accredited by the American National Standards Institute

NSF's Certification Program is accredited by the Dutch Council for Certification

Technical Specifications

Power required: Normal household current (120v, 60Hz). Other options (220v and international requirements) are available.

Materials of construction: Made with 100% corrosion resistant materials and contains post-consumer recycled materials.

Underground housing: FAST systems can be housed in concrete, fiberglass, steel or plastic tanks. Always check local regulations before installing or altering a wastewater system. Contact Bio-Microbics or a dealer near you for more information on the availability of proper tankage in your area.

Dispersal Options: Check your local regulations. The extraordinarily high treatment levels may allow reductions in drain field areas, use of treated water for irrigation or other innovative discharge methods.

Capacity: Available in several convenient, affordable sizes and configurations. Please contact Bio-Microbics or a dealer near you for more information on the FAST system that's right for your application.

Bio-Microbics, Inc.
8271 Melrose Drive
Lenexa, KS 66214

913-492-0707

1-800-753-FAST

Fax: 913-492-0808

E-mail: onsite@biomicrobics.com
Web site: www.biomicrobics.com

BIO-MICROBICS® INCORPORATED

NSF International
Ann Arbor • Atlanta • Los Angeles • Sacramento • Washington D.C. • Brussels

August 28, 1996

To whom it may concern:

NSF International has determined by performance evaluation under the provisions of NSF Standard 40 (July 1990) that the Single Home FAST Treatment Plant Model 23-001-750, manufactured by Bio-Microbics, Inc. (formerly Scienco/FAST®) has fulfilled the requirements of Standard 40 Class I. The Model 23-001-750 has therefore been authorized to bear the NSF Mark so long as Bio-Microbics, Inc. continues to meet the requirements of Standard 40 and NSF General and Program Specific Policies.

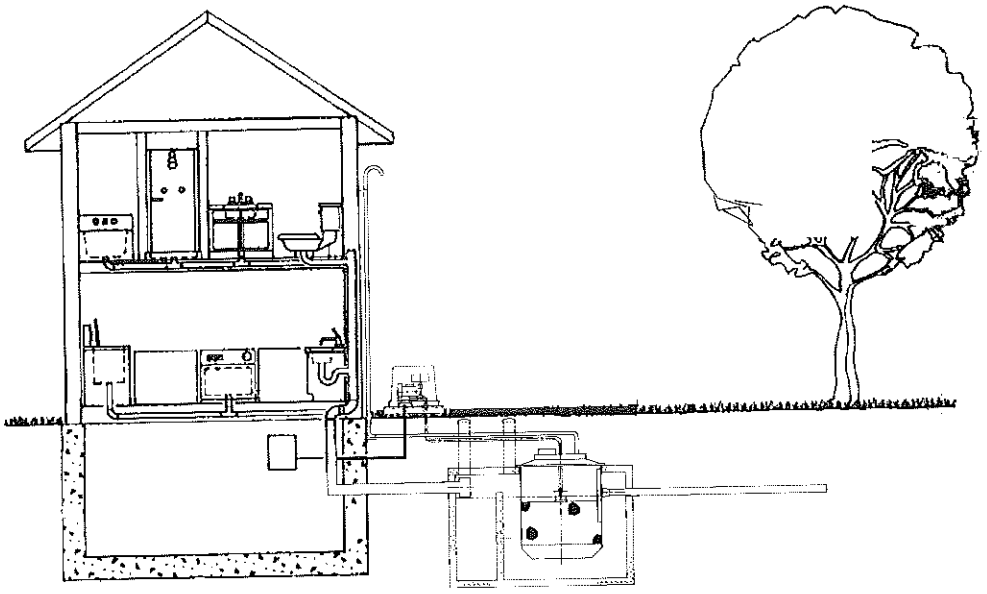
Sincerely,

Thomas J. Bruursema
General Manager,
Wastewater Treatment
Unit Certification

P.O. Box 130140 Ann Arbor, Michigan 48113-0140 USA
313-769-8010 1-800-NSF-MARK Fax 313-769-0109
E-Mail: info@nsf.org Web:http://www.nsf.org

Single Home FAST®

Onsite Wastewater Treatment System



Tastefully located below ground level, the clean, odorless Single Home FAST® blends beautifully into any landscaping design. Only the small, unobtrusive blower housing is above ground and can be located anywhere — up to 60 feet away.

The Problem

Traditional residential septic systems and even enhanced onsite treatment systems frequently fail to meet the effluent requirements dictated by current environmental health laws and regulations. Affected homeowners must upgrade their sanitary systems.

The FAST® Solution

The proven Single Home FAST® (Fixed Activated Sludge Treatment) system meets or exceeds regulations governing treatment and effluent requirements. This low profile, landscape-friendly system features a main treatment insert which installs underground inside a concrete or fiberglass tank, similar in size and shape to a standard septic tank. Constructed of mostly corrosion-resistant materials, the Single Home FAST® system has no filters to clean or replace and contains only one moving part — the air blower. No maintenance is required by the homeowner.

In addition to its aesthetic features and its waste treatment abilities, Single Home FAST® achieves denitrification (the reduction of nitrate based pollutants which adversely affect groundwater) in a single tank. The treatment insert's high surface-to-volume ratio and two settling zones maintain constant bacterial growth during both low and peak usage. Constant bacterial growth ensures a continuous level of treated effluent.

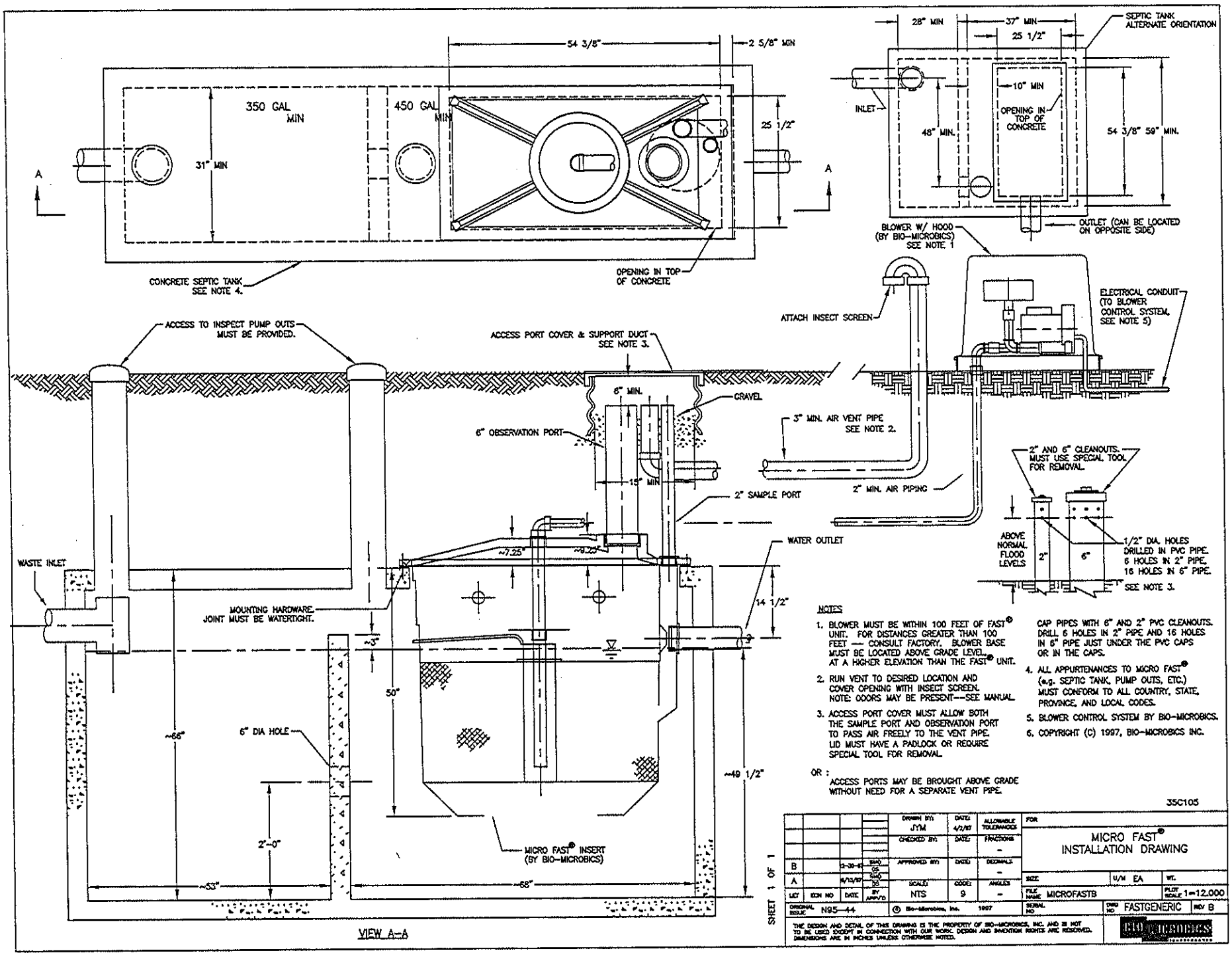
Founded in 1946, Smith & Loveless, Inc. is a worldwide leader in the design and manufacture of wastewater treatment equipment. Bio-Microbics, Inc. has been granted a license to use certain patents, trademarks, copyrights and technological know-how for use in leading the industry through the challenges of the future.

BIO-MICROBICS® INCORPORATED

Modular FAST Partial Installation List

	S/N	Owner	Location	Contact/Operator	Telephone
	MF0100 - MF0101	Perly, Pennbrook Middle HighSchool	Georgetown, MA	Ellis Neofotistos	978-957-1983
	MF0103	Coonamesset Inn	Falmouth, MA	Bill Everett	508-823-9566
	MF0105	99 Restaurant-Pubs	Mashpee, MA	Bill Everett	508-823-9566
	MF0106	Nantucket Golf Course	Nantucket, MA	Unit installed, not running, project	not complete
	MF0107	Nantucket Golf Course	Nantucket, MA	Unit installed, not running, project	not complete
	MF0108	Howie's Restaurant	Dennis, MA	Bill Everett	508-823-9566
	MF0113	Halifax Housing Authority	Halifax, MA	Bill Everett	508-823-9566
*	MF0116	Stop & Shop Supermarket	Richmond, RI		
*	MF0117	Liberty Commons Nursing Home	Chatham, MA		
*	MF0119	Seekonk Public Schools	Seekonk, MA		
*	MF0120	Harvard Green Condo's	Harvard, MA		
*	MF0121	Stop & Shop Supermrket	Plymouth, MA		

*Systems sold but not installed as of 3/18/98



VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET OF FAST® UNIT. FOR DISTANCES GREATER THAN 100 FEET — CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE GRADE LEVEL, AT A HIGHER ELEVATION THAN THE FAST® UNIT.
2. RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH INSECT SCREEN. NOTE: ODORS MAY BE PRESENT—SEE MANUAL.
3. ACCESS PORT COVER MUST ALLOW BOTH THE SAMPLE PORT AND OBSERVATION PORT TO PASS AIR FREELY TO THE VENT PIPE. LID MUST HAVE A PADLOCK OR REQUIRE SPECIAL TOOL FOR REMOVAL.

OR :

ACCESS PORTS MAY BE BROUGHT ABOVE GRADE WITHOUT NEED FOR A SEPARATE VENT PIPE.

CAP PIPES WITH 6" AND 2" PVC CLEANOUTS. DRILL 6 HOLES IN 2" PIPE AND 16 HOLES IN 6" PIPE JUST UNDER THE PVC CAPS OR IN THE CAPS.

4. ALL APPURTENANCES TO MICRO FAST® (e.g. SEPTIC TANK, PUMP OUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.
5. BLOWER CONTROL SYSTEM BY BIO-MICROBICS.
6. COPYRIGHT (C) 1997, BIO-MICROBICS INC.

35C105

					DRAWN BY: JYM	DATE: 4/2/97	ALLOWABLE TOLERANCE	FOR	
					CHECKED BY:	DATE:	FRACTIONS ±	MICRO FAST® INSTALLATION DRAWING	
B		3-28-97	BMO		APPROVED BY:	DATE:	DECIMALS ±	SIZE:	U/M: EA	WT.
A		4/13/97	BMO		SCALE: NTS	CODE: 9	ANGLES ±	FILE NAME: MICROFASTB		PLOT SCALE: 1=12.000
LET	ECN NO	DATE	BY APP'D		ORIGINAL ISSUE: N95-44	© Bio-Microbics, Inc. 1997		SERIAL NO:	DWG NO: FASTGENERIC	REV: B

SHEET 1 OF 1

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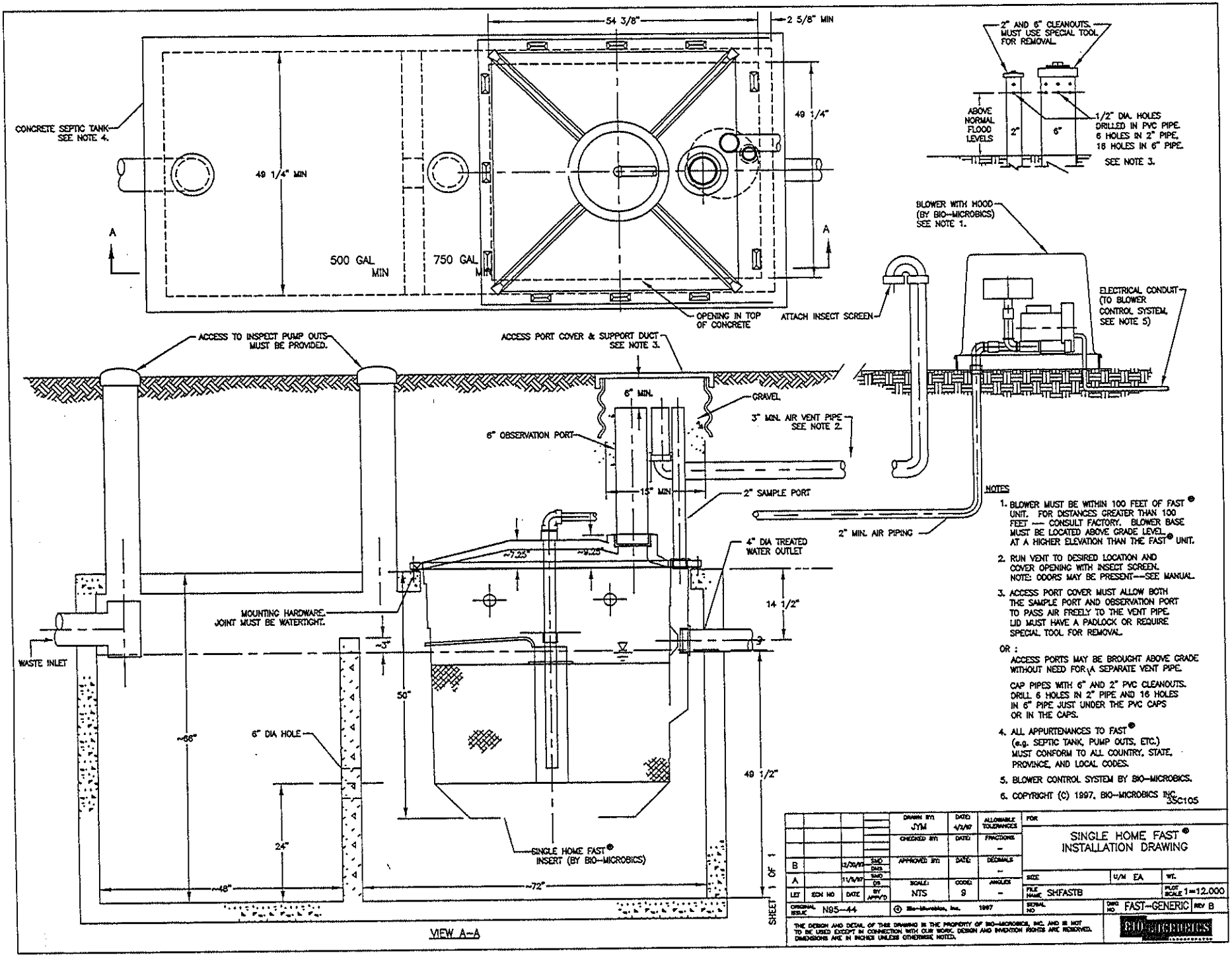

VIEW A-A

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				DRAWN BY: JYM	DATE: 4/2/97	ALLOWABLE TOLERANCES	FOR
				CHECKED BY:	DATE:	FRACTIONS: –	SINGLE HOME FAST® INSTALLATION DRAWING
B		12/30/97	SMD DMS	APPROVED BY:	DATE:	DECIMALS: –	
A		11/6/97	SMD DS	SCALE: NTS	CODE: S	ANGLES: –	SIZE: U/M EA WT.
LET	ECN NO	DATE	BY APPV'D				FILE NAME: SHFASTB PLOT SCALE 1=12.000
ORIGINAL ISSUE	N95-44		© Bio-Microbics, Inc. 1997				SERIAL NO DWG NO FAST-GENERIC REV B

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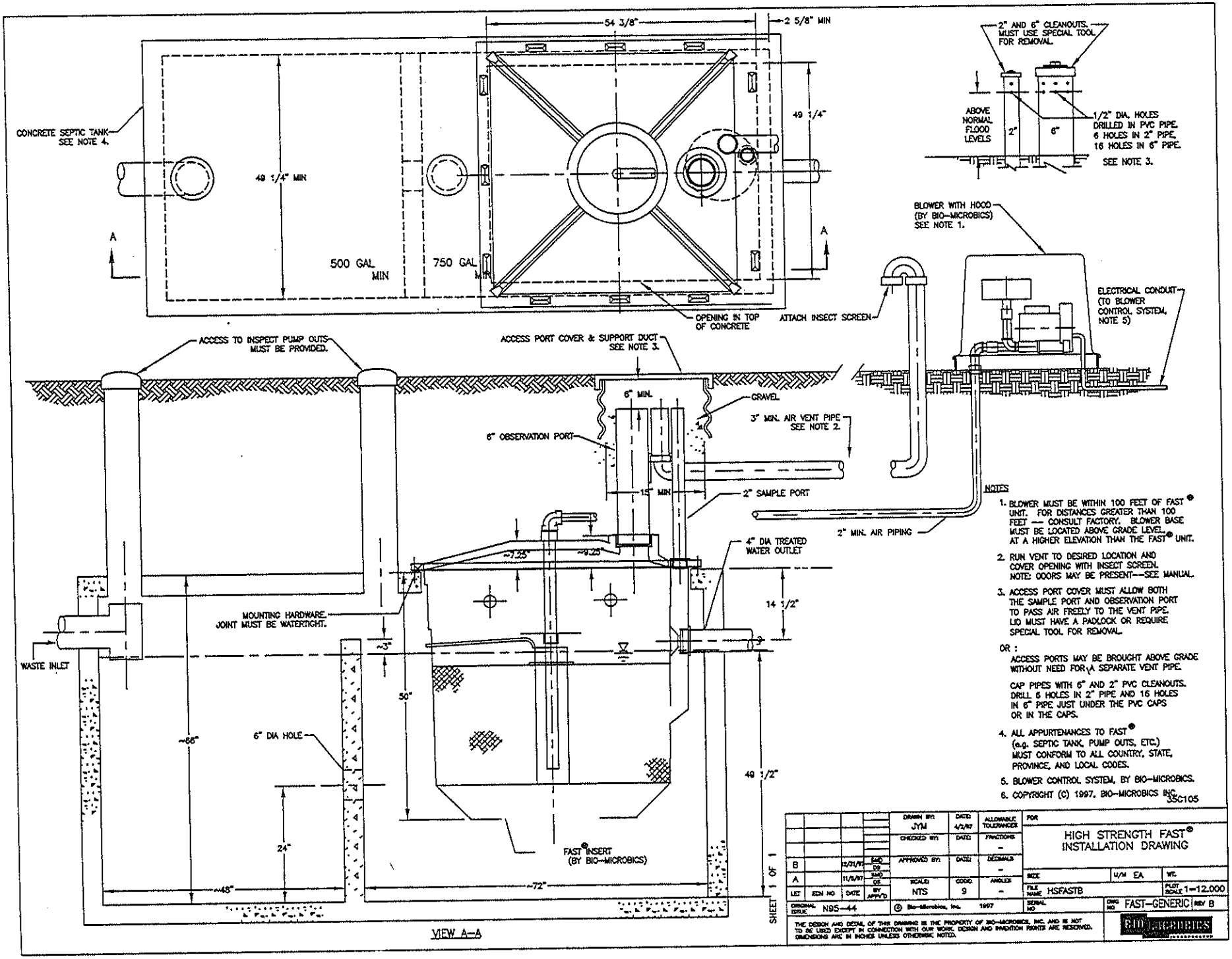
SHEET 1 OF 1



VIEW A–A

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5. BLOWER CONTROL SYSTEM, BY BIO-MICROBICS.
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LET	ECN NO	DATE	BY APP'D
B		2/01/97	DB SMD
A		11/5/97	DB SMD

ORIGINAL ISSUE: N95-44

DRAWN BY: JYM | DATE: 4/2/97 | ALLOWABLE TOLERANCES
CHECKED BY: | DATE: | FRACTIONS –
APPROVED BY: | DATE: | DECIMALS –
SCALED: NTS | CODE: 9 | ANGLES –

FOR

HIGH STRENGTH FAST® INSTALLATION DRAWING

SIZE: A/M EA | WT:
FILE NAME: HSFASTB | PLOT SCALE: 1=12.000
SERIAL NO
DWG NO: FAST-GENERIC | REV: B

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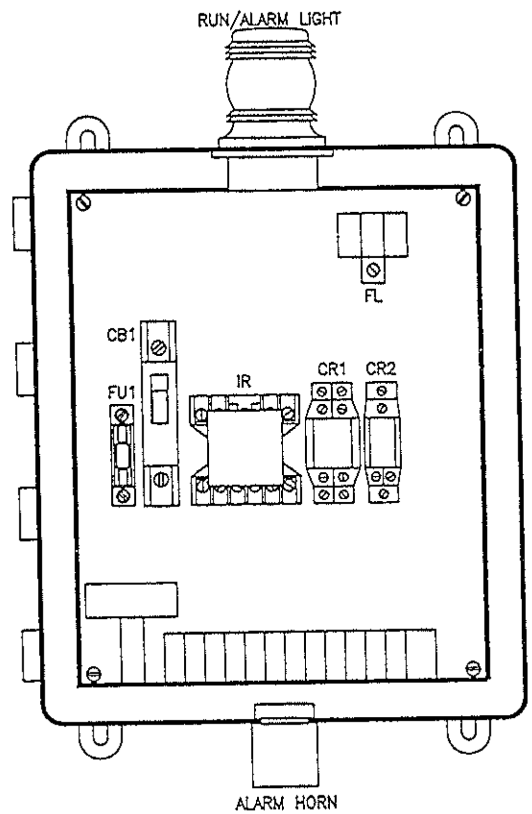
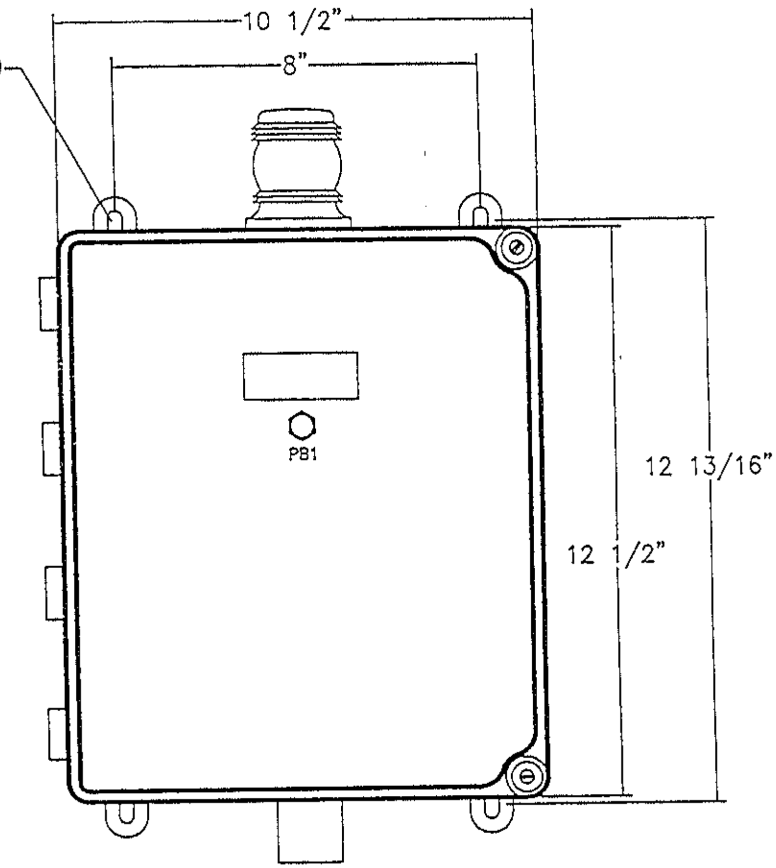
SHEET 1 OF 1



INTERIOR VIEW
DOOR REMOVED FOR CLARITY



EXTERIOR VIEW

NEMA 4X POLYCARBONATE ENCLOSURE – 6" DEEP

NOTES:

				DRAWN BY AL	DATE 11/20/94	ALLOWABLE TOLERANCES	FOR
				CHECKED BY TF	DATE 11/94	FRACTIONS ±1/16"	SINGLE HOME FAST® CONTROL PANEL LAYOUT SALES
B		12/4/96	ALK TF	APPROVED BY BMN	DATE 11/94	DECIMALS –	
A		12/4/96	ALK TF	SCALE NTS	CODE 1	ANGLES –	SIZE / U/M EA / WT.
LET	ECN NO	DATE	BY APPR'D				FILE NAME HFZZ35B / PLOT SCALE 1=2.000
ORIGINAL ISSUE				© Bio-Microbics, Inc. 1996			SERIAL NO / DWG NO HFZZ35 / REV B

SHEET 1 OF 1

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e-mail: onsite@biomicrobics.com • www.biomicrobics.com • 800-753-FAST(3278)

PROGRESSION OF NITROGEN CYCLE

Nitrogen exists in many forms in the environment. The movement and transformation of these nitrogen compounds through the biosphere is characterized by the nitrogen cycle.

In wastewater treatment, organic nitrogen comes from urine, fecal matter, garbage disposal waste and ammonia based household cleaners. For the Single Home Treatment Systems a majority of the organic nitrogen comes from urine.

Organic nitrogen is converted into ammonia nitrogen (NH_3) by a process referred to as ammonification. When ammonia nitrogen is hydrolyzed in water, it turns into the ammonium ion (NH_4+). Generally speaking, these two forms of nitrogen are both referred to as ammonia nitrogen.

The ammonia nitrogen is converted in the nitrogen cycle by nitrifying bacteria which provide the conversion from ammonia nitrogen to nitrite nitrogen (NO_2). A second biological reaction occurs which transforms nitrite nitrogen to nitrate nitrogen (NO_3). These two biological reactions are coupled and proceed rapidly to the nitrate form. Therefore, nitrite levels at a given time are quite low.

The nitrate form of nitrogen may be used in synthesis to promote plant growth or it may be subsequently reduced by denitrification. Denitrification is the biological reduction of nitrate to nitrogen gas. The denitrification step occurs in an anoxic (without oxygen) reaction in order to remove nitrogen from the wastewater.

There are several laboratory tests used to measure the different forms of nitrogen. In order to determine organic and ammonia nitrogen, the test commonly used is Total Kjeldahl (pronounced "kel-doll") Nitrogen (TKN). This test parameter is commonly used for the influent wastewater to determine the total amount of nitrogen present in the wastewater. Since TKN measures both ammonia nitrogen and organic nitrogen, it is sometimes necessary to also measure the ammonia nitrogen using a different test. This will determine what fraction of the TKN is associated with the organic nitrogen.

The tests commonly run on an effluent are TKN, ammonia nitrogen and nitrate nitrogen. Another test that may be run is that for nitrite nitrogen. The nitrite nitrogen is not generally measured because it is generally assumed to be zero, and the typical measurement should run from 0.1 to 0.2 mg/L. The total nitrogen of an effluent sample is assumed to be the TKN plus the nitrate nitrogen measurement. This would measure the organic nitrogen, ammonia nitrogen and nitrate nitrogen.

The Single Home FAST® treatment system is very effective for nitrate reduction.

NSF International
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NITROGEN SERIES TEST RESULTS

(All results reported as mg/L as N)

Plant:Bio-Microbics, Inc. (formerly Scienco/FAST®) Model 23-001-0750

Sample Date	Ammonia - N		Nitrate - N		Total Kjeldahl - N	
	Influent	Effluent	Influent	Effluent	Influent	Effluent
9/17	22	3.3	<0.5	0.7	32	6.1
9/20	29	2.2	0.8	4.1	36	4.7
9/24	34	4.0	<0.5	4.6	39	6.2
9/27	25	3.5	<0.5	3.9	33	5.4
10/1	28	4.7	<0.5	1.5	35	8.0
10/4	21	6.0	<0.5	1.4	31	9.4

Prepared 8/26/96

P.O. Box 130140 Ann Arbor, Michigan 48113-0140 USA
313-769-8010 1-800-NSF-MARK Fax 313-769-0109
E-Mail: info@nsf.org Web:http://www.nsf.org

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The History of FAST®

In the early 1970s, the U.S. Coast Guard had a problem. Ships cruising in coastal waters were dumping wastewater overboard, causing excessive pollution. The Coast Guard decided to call in Smith & Loveless, Inc., a leader in the wastewater industry since 1946.

Smith & Loveless collaborated with a major ship builder and the University of Kansas in Lawrence, Kansas to come up with a solution. There were three criteria for the product to be designed: 1) It had to be fairly small in size; 2) It had to have low maintenance requirements, since the ships' mechanics who would be maintaining the system had to be available for the much more critically necessary ships' engines at any given time; and 3) It had to effectively treat wastewater with varying hydraulic flows.

After much research and testing, the marine form of FAST (Fixed Activated Sludge Treatment) was born. It utilized a fixed film media combined with activated sludge treatment technology so that bacteria clinging to the media would digest wastewater, producing a remarkably clear effluent that was a major improvement over the raw wastewater that had previously been going overboard. In fact, the system worked so well that Smith & Loveless engineers saw possibilities for many additional uses for the technology. As a result, there is now an entire family of FAST® products including:

Marine FAST®—Used on many well-known cruise ship lines and in other places, Marine FAST is certified by the U.S. Coast Guard, the Canadian Great Lakes (the strictest marine standard in the world) and the U.K. based International Maritime Organization (I.M.O.) Marine FAST has been and remains the virtually undisputed worldwide leader in marine wastewater treatment systems.

Modular FAST®—Larger FAST systems are designed for use in municipal and industrial wastewater treatment. The modular configuration allows multiple modules to work together to produce just the right size system for the application. Another advantage of Modular FAST is that each segment is of a moderate size, allowing pieces to be placed through small openings such as ships' doorways before assembly into the final system.

Mobile FAST®—Sometimes called Container FAST, this system fits inside a standard shipping container for transport via truck, rail or ship to remote locations. A popular application for Mobile FAST is resorts, where the system can be moved from season to season depending on where there are the most people in summer or winter months.

Single Home FAST®—Introduced to the market only in the past few years, Single Home FAST was actually developed in the 1970s, before onsite wastewater treatment became such a major concern for environmental protection. Utilizing the same tried-and-true technology as the other FAST systems, Single Home FAST treats wastewater in a fiberglass or concrete septic tank to provide highly treated effluent that won't clog lateral fields or pollute groundwater supplies. Tested and certified by NSF *International*, FAST provides BOD and TSS levels of 10 mg/L for up to twelve people. It can also reduce Total Nitrogen levels, including nitrates, to 10 mg/L for up to ten people or approximately 1,000 gallons per day. Single Home FAST is marketed by Bio-Microbics, an affiliate of Smith & Loveless.

Micro FAST®—The newest member of the FAST family, Micro FAST works like Single Home FAST in a smaller size designed to treat wastewater produced by six to eight people or approximately 600 gallons per day. It produces the same excellent results on a smaller scale and provides an economical method of wastewater treatment where standard septic systems are inadequate. Micro FAST provides a popular alternative to sand filters and mound systems with minimal maintenance requirements.

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ANTI-TRUST POLICY

Bio-Microbics, Inc. does not intend to be involved, and it will not become involved, in the competitive decisions of its distributors, nor will it take action which would tend to restrain competition among its distributors or other outside interests in the home wastewater equipment industry.

Nevertheless, it is recognized by Bio-Microbics, Inc. that during occasions when Bio-Microbics and its distributors meet, this could be regarded by some as a forum or opportunity to promote anti-competitive conduct. For this reason, Bio-Microbics has taken this occasion, through this statement of Anti-Trust Policy, to make clear its unequivocal support for the policy of competition served by the anti-trust laws, as well as its intent to comply in all aspects with those laws.

Compliance with this policy involves not only avoidance of anti-trust violations, but avoidance of any behavior which might be considered improper. Anti-trust laws are complex and far-reaching. This statement is not a complete summary of applicable laws. It is intended to highlight and emphasis certain basic precautions designed to avoid anti-trust problems. In case of doubt, seek the guidance of your own corporate counsel if anti-trust questions arise.

BIO-MICROBICS® INCORPORATED

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e-mail: onsite@biomicrobics.com • www.biomicrobics.com • 800-753-FAST(3278)

SALES AGREEMENT

Purchaser Name: _____

Address: _____ Phone: _____

Bio-Microbics, Inc. having an office at 8271 Melrose Drive, Lenexa, Kansas 66214 (referred to as "Seller"), hereby agrees to sell to the buyer designated below (referred to as "Buyer"), subject to all of the terms and conditions on the face and reverse sides hereof, the following equipment:

(____) Bio-Microbics, Inc. Single Home FAST® Wastewater Treatment Module(s).

(____) Bio-Microbics, Inc. Micro FAST® Wastewater Treatment Module(s).

One remote mounted regenerative blower on support base with weatherproof enclosure and an electrical control panel is included with each unit.

Specifically Excluded Items: (1) installation, unloading, hauling from nearest unloading area and storage; (2) excavation, backfilling, grading and all field labor; (3) concrete foundations and tankage, pads, influent and effluent piping, electrical wiring and conduit, main electrical disconnect and installation of all unmounted equipment such as blower assemblies, drop pipes, etc.

Field Service: An inspection and start-up service visit will be provided by a Bio-Microbics, Inc. authorized technician.

TERMS: The prices contained herein are firm for thirty (30) days after the date of this proposal provided a firm order is received at the factory within that time period. All equipment is scheduled to be shipped within the time period indicated below. In the event we are unable to ship within that period for reasons beyond our control, including a request by the Buyer to defer shipment, the prices are subject to those prevailing at the time of shipment. The increase will not exceed 1-1/2% per month.

SHIPMENT TERMS:

_____.

PRICE: $ _____ F.O.B. factory. Price does not include taxes. Total amount due to Bio-Microbics, Inc. is $ _____. Truck freight is included to a single location (unloading to be by Buyer) except all destinations outside the United States and the states of Alaska and Hawaii.

With approved credit by the Bio-Microbics, Inc. Credit Department, payment terms are:

_____.

THE SALE OF THE EQUIPMENT DESCRIBED ABOVE IS MADE SOLELY ON AND EXPRESSLY SUBJECT TO ALL OF THE TERMS AND CONDITIONS ON THE FACE AND REVERSE SIDES HEREOF.

Agreed to this _____ day of _____, 19_____

_____
Buyer

By _____
Authorized Signature

_____
Address

Is this purchase tax exempt? YES ☐ NO ☐
If YES, attach Sales Tax Exemption Certificate.

BIO-MICROBICS, INC.

By _____
Authorized Signature

Prepared by _____
Sales Representative

The Sales Representative is not an agent or employee of Seller and is not authorized to enter into any agreement on Seller's behalf or to bind Seller in any way.

BIO-MICROBICS® INCORPORATED

8271 Melrose Drive • Lenexa, KS 66214 • Phone: 913-492-0707 • Fax: 913-492-0808
e-mail: onsite@biomicrobics.com • www.biomicrobics.com • 800-753-FAST(3278)

CREDIT APPLICATION

Firm Name _____ Phone (____) _____

Fax (____) _____ email _____

Street Address _____

City _____ State _____ Zip _____

Mailing Address _____

No. of Years in Business _____ Estimated Annual Sales _____

Proprietorship ❑ Partnership ❑ Corporation ❑ Federal ID # _____

Principal or Officer's Name _____ Title _____

Contacts: Purchasing _____ Accounts Payable _____

Credit Limit you feel is necessary to meet your needs $ _____

Principal Suppliers

Name	Street	City	State	Zip
Phone	Fax	email		
Name	Street	City	State	Zip
Phone	Fax	email		
Name	Street	City	State	Zip
Phone	Fax	email		

Bank Reference(s)

Name _____ Address _____

Officer _____ Phone # (____) _____ Account # _____

Name _____ Address _____

Officer _____ Phone # (____) _____ Account # _____

Signed _____ Title _____ Date _____

CORPORATE USE ONLY

Performed by _____

Approved by _____ Limit _____

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FIELD INSPECTION & SERVICE REPORT

For Bio-Microbics Single Home FAST® System

INSTALLATION	AUTHORIZED SERVICE PROVIDER
Installation Address	Name
Owner Name	Street
Mail Address	Mail Address
City State Zip	City State Zip
Phone Fax e-mail	Phone Fax e-mail

INSTALLATION INFORMATION			
Model No.	Serial No.	Date of Installation	Date of last pumpout

EQUIPMENT	YES	NO	MAINTENANCE PERFORMED AND COMMENTS
Electrical Panel(s)			
Visual Alarm Operating			
Audio Alarm Operating (if present)			
Blower(s)			
Air Inlet Filter Clean			
Blower Hood Vents Clear			
Excessive Noise			
Excessive Vibration			
Treatment unit(s)			
Unusual Odor			
Pumpout Required:			
Primary Settling Zone			
Aerobic Treatment Zone			
EFFLUENT (optional)	**LIMIT**	**RESULT**	
Estimated Daily Flow			
pH (Standard Units)	6-9 S.U.		
Color	Clear		
Temperature			
Odor	Slightly musty odor (not septic)		

OWNER SIGNATURE	TECHNICIAN SIGNATURE	SERVICE DATE

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MAINTENANCE INSPECTION AGREEMENT

For Bio-Microbics, Inc. Authorized Technician

It is hereby agreed this _____ day of _____, 19 ___ by and between _____ and _____ of _____ that in consideration of the payments provided for herein, _____ will provide the services of a factory-trained representative to perform a Preventative Maintenance Inspection of the equipment described herein on the frequency shown below.

Each inspection to include an inspection of the equipment followed by a written report to the individual designated by the purchaser of the service. This inspection report will contain recommendation or operation and maintenance, including recommendations for maintenance for failure preventative measures if any are deemed appropriate by the inspector, and a list of recommended replacement parts.

This agreement does not assume any responsibilities or obligations which are normally the responsibilities of Purchaser's maintenance department (if applicable) as related to parts or labor and does not extend to cover any costs that may be associated with any recommendations made under this agreement. _____ can only supply parts or labor after receipt of Purchaser's purchase order. Billings for inspection trips shall be made on a _____ basis.

In no event shall Bio-Microbics, Inc. or _____ be responsible for special or consequential damages, including but not limited to, loss of time, injury to person or property or any other consequential damages or incidental or economic loss due to equipment failure or for any other reason whatsoever.

This agreement shall remain in force for a period of _____ years, beginning _____, 199___ and ending _____, 19__.

Equipment Covered Under This Agreement

Nomenclature	Serial Number	Location	Min No. of Annual Trips	Annual Rate

Purchaser:

Sign: _____

Print: _____

Date: _____

Address: _____

Address: _____

Phone: _____

Fax: _____

E-Mail: _____

Service Provider:

Sign: _____

Print: _____

Date: _____

Address: _____

Address: _____

Phone: _____

Fax: _____

E-Mail: _____

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PRODUCT REGISTRATION REPORT

Product Registration Report must be completed and returned to Bio-Microbics, Inc. in order to effect warranty.

Date of Installation _____ Date Shipped to End User _____ Serial No. _____

OWNER	
NAME	
ADDRESS	
CITY/STATE/ZIP	
PHONE/FAX	

BIO-MICROBICS DISTRIBUTOR	
NAME	
ADDRESS	
CITY/STATE/ZIP	
PHONE/FAX	

INSTALLER	
NAME	
ADDRESS	
CITY/STATE/ZIP	
PHONE/FAX	

CONSULTING ENGINEER (if applicable)	
NAME	
ADDRESS	
CITY/STATE/ZIP	
PHONE/FAX	

	Good	Bad	NA
ELECTRICAL PANEL(S)			
Visual Alarm Operating	☐	☐	☐
Audio Alarm Operating	☐	☐	☐
BLOWER(S)			
Wired for correct voltage	☐	☐	
Inlet/outlet piped correctly	☐	☐	
Filter element installed	☐	☐	
Blower hood secure	☐	☐	
Blower works correctly	☐	☐	
Blower located within 100' of treatment unit	☐	☐	☐
Air line clear	☐	☐	
Air inlet screen clear	☐	☐	
Blower hood vents clear	☐	☐	

	Good	Bad	NA
TREATMENT UNIT(S)			
Air vent clear	☐	☐	
Septic tank level	☐	☐	
Septic tank meets min. size	☐	☐	
Septic tank filled to operating level	☐	☐	
Air Lift Operation	☐	☐	
Recirculation tube in place	☐	☐	
Fasteners tight	☐	☐	
WATER-TIGHT JOINTS			
Treatment unit to septic tank	☐	☐	
Entrance tube to insert cover	☐	☐	☐
Insert to insert cover	☐	☐	
Discharge line connection	☐	☐	

_____

_____

_____

Factory Authorized Personnel: _____ Title: _____

Firm: _____ Date: _____

High Points of the Bio-Microbics Onsite Symposium

Johnson County Community College
Johnson County, Kansas
December 18, 1996

Presenters:
James A. Bell
Dr. Morgan Powell
Kathryn Scott

Single-home treatment systems are significantly harder to design than large, controlled systems most often found at large municipal and industrial applications. This is because the large municipal and industrial applications have many different pieces of equipment and operators, as well as laboratory services on-site to help them control the wastewater treatment in most cases. In addition, the treatment levels required are usually not as stringent as those that may be necessary at the single-family home level.

As onsite wastewater treatment went from a privy to a septic tank, health problems associated with sewage became apparent. Today, a standard septic system may no longer be adequate, and improperly treated effluent from these systems regularly affects potable water aquifers that communities rely on.

The biological process for wastewater treatment encompasses an entire group of bacteria working in harmony as a large community works in harmony. Different bacteria have different purposes. Carbonaceous bacteria, for the most part, will degrade the BOD waste, and nitrifying bacteria will convert organic nitrogen and ammonia nitrogen to nitrates.

Aerobic biological treatment began with the analysis of the effect of wastewater in a stream. At first, there is a rise in the amount of fish and the bacteria until the dissolved oxygen within the stream is eliminated due to this biological demand. As a result, the fish and the bacteria disappear. Once biological treatment of the wastewater was resumed, the dissolved oxygen in the streams and the environment came back, and so did the fish and life forms desirable in those environments.

BOD is a five-day test, and supposedly, the five days was determined by analyzing how long it took the wastewater to flow down the Thames River to the sea in England. While this is the generally accepted method of testing, it can be deceiving for higher strength wastes because some BOD requires greater than five days for the reduction. If you look at bacteria, it is much like humans whereby it will eat the items that it enjoys eating first. Then, when those items have been eliminated, it will then start to eat the balance of the items that remain in place. This would be true for such items as bones and coffee grounds, which are not as easy to eat as the normal BOD. For that reason, higher strength waste BOD plus garbage disposal waste BOD have to be carefully used in the development of one's aerobic wastewater treatment system.

Basic extended aeration technology is how biological treatment was first introduced. This is really a suspended activated sludge treatment system. The size of the basin is critical to the design of the system due to the flow required, the dissolved oxygen required, and the mixing necessary to accomplish this method of aerobic treatment. The key is to keep the bacteria within this basin so that they can continue to do the work. If there are not enough nutrients, or if there is not enough air, the bacterial will not work and settle out properly because they will develop into a filamentous mode which remains stringy and will float within the system. The settling is important to help keep the bacteria within the basin during high flow periods, and even this will not ensure that an extended air system will operate at its optimum.

The explanation for this is simple. If you have a community that has a certain number of people that consume a certain volume of food, by reducing the community by 50% or more, they will no longer be able to consume the same amount of food that is being delivered to the community. The bacteria in an

extended air system will act in this very same manner. In conclusion, extended air needs a great deal of room for the bugs to work. Extended air is subject to hydraulic washout and low influent organic loads where bacteria would eat each other and cause a condition called Endogenous Respiration. When the load comes back after this condition, the system is shock loaded and is unable to keep up with the consumption of food being delivered to it.

As a result, industry has developed what is called attached growth treatment systems over the years. The first attached growth system was a trickling filter, which was originally designed to simulate a river. Rock and other matter were put in the basin, and the wastewater was continually cycled from the bottom of the basin down to the top of the trickling filter. The drawbacks with the trickling filter are that, although you have the bacteria attached to the rock to remain in the basin, you could have algae build up on the surface, inadequate shearing of the inert bacteria off the rock, filter flies, as well as other problems. The trickling filter relies on the atmosphere to obtain the oxygen used for the bacteria. It also relies on one or two submersible pumps to recycle the effluent, and the possible addition of some fans, to help send more oxygen from the atmosphere to the wastewater that cascades through the rocks within the filter.

Another method of attached growth was developed which is called an RBC or Rotating Biological Contactor. This is basically a horizontal shaft with a series of discs attached to the shaft which spin slowly in and out of the wastewater in a basin. This intermittent submerging and re-emergence into the atmosphere provide some oxygen transfer and some exposure to the wastewater by the bugs attached to the discs. Again, some of the drawbacks to this system are the maintenance associated with the moving parts, the historical problems associated with broken shafts, or the need to constantly maintain the runout and grease requirements of these shafts, and the need to have exposure to atmosphere to have oxygen transfer.

The next category of attached growth is the system known as FAST, which is Fixed Activated Sludge Treatment. The FAST system combines the best features of both the suspended growth and the attached growth treatment systems. The FAST system will handle the shock loads and is also self-adjusting to low flow periods because the aerobic bacteria are on the outside of the surfaces of the fixed film, and the anaerobic bacteria will exist on the inside of the aerobic bacteria, or closest to the surface of the attached growth film. All of this bacteria remains submerged, and during a low flow period, the aerobic bacteria will be able to eat the anaerobic bacteria as food until flow returns.

In regards to nitrification, the Progression of Nitrogen sheet that we hand out is a very good reference chart. It should be noted that it is important that aerobic systems be sized with the additional capacity to provide additional oxygen to grow nitrifying bacteria in addition to the carbonaceous bacteria. It is the nitrifying bacteria that convert ammonia nitrogen and organic nitrogen to nitrate nitrogen. By recirculating a portion of the wastewater from the aerobic zone to the surrounding zone without air, known as the anoxic zone, we denitrify nitrates to nitrogen gas, which goes through the vent into the atmosphere.

The anoxic zone is a zone without air where bacteria get desperate and take oxygen off the nitrates. The bacteria also uses carbon as a food source while in that zone. The carbon will come from the raw wastewater that enters the anoxic zone and the primary settling zone of our septic tank's treatment system.

Phosphorus removal is something that is being considered, and at this time, the most practical method for phosphorus reduction is biological, which can be achieved to acceptable levels for most applications.

Most communities with septic systems were developed with some thought that sewers would eventually come to the homes on those systems. Today, we realize that many if not most of the homes with septic systems will not have sewers brought to them because it is not feasible for several different reasons. As a result, enhanced septic tank treatment is a requirement.

A regular septic tank requires 24 to 48 hours minimum to accomplish some treatment and some grease and solids separation. At that point, the absorption field is expected to accomplish the balance of

the treatment with phosphorus and nitrogen taken up by plants and passive aerobic and anaerobic bacteria degrading most of the balance of the wastewater. Under this scenario, the septic tank would accomplish about 40% of the treatment and the soil 60% of the treatment; however, it is important to note that the wastewater will not be 100% treated in this application. It is also important to note that most areas will not percolate sufficiently to accomplish the level of treatment described above. As a result, it may be necessary to use an enhancement.

There are many enhancements on the markets. Sand filters are very expensive, and on average require 50 tons of sand and 25 tons of gravel. Mound systems are also expensive and unsightly. Both of the above systems are earth-based systems and have been known to fail through some other failures such as breakthrough.

Aerobic systems have been used; however, the extended air systems have not been adequate in most cases, and the fixed film systems such as FAST provide the best alternative. This is especially true when we consider that most soils are poor, and wide trenches for laterals do not allow as much oxygen to circulate around them as narrow trenches do. As a result, it would be better to use the FAST treatment system with a reduced lateral field size and a shallow bury than it would be to use one of the other methods.

It is important to keep in mind that the FAST system was developed in the 1970s and has continued to be refined right up until the mid-1990s. It is the leading edge of wastewater treatment. Most other systems in use today were developed in the last century.

As part of the regulations driving the standards for today's onsite treatment systems, we need to refer to the National Safe Drinking Water Act This act sets up controls to ensure that the nation has safe drinking water supplies. As a result, there will be a need to go to onsite treatment performance standards as opposed to prescriptive standards that are used today.

In regards to disinfection systems, there are three that can be chosen. The first would be chlorine, which is the least expensive to purchase initially and is the most common. The drawback is that a storage and re-supply of chemicals must be done on a regular basis, and chlorine residual is very often a concern.

Ozone is another disinfection system that does not require chemical storage and does not produce a chemical residual, nor is it pH sensitive. Ozone can also eliminate odors; however, it takes more ozone to eliminate odors, therefore more needs to be established onsite. Ozone is expensive to generate and must be kept within its container so that it does not affect surrounding items.

Chlorine, as we discussed earlier, is pH sensitive and reacts with ammonia and other chemicals. This is another reason why chlorine is quickly becoming least desirable.

The third alternative is ultraviolet disinfection. U.V., as it is most commonly called, does not produce a chemical residual, nor does it require chemical storage. The U.V. disinfects very quickly; therefore, it does not require a retention and reaction tank like chlorine or ozone to accomplish the disinfection. U.V. does need a relatively clear effluent such as that provided by the FAST system to continue to be an effective method of disinfection without the need to clean or replace the U.V. lamps too often. The U.V. lamps, however, will need to be cleaned and replaced at least once a year.

In conclusion, it would seem as if the FAST system would be the best choice for onsite treatment needs for many different reasons. A 50% reduction utilizing a shallow bury with the lateral fields would also be feasible. If disinfection is a requirement, the FAST system would be the best product to use with the disinfection systems, especially if the U.V. disinfection system were chosen. The fact that the FAST system produces a clear effluent on a regular basis is important in determining whether one can use a disinfection system with confidence and allow a reduction of the lateral field with confidence as well.

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Sand Filters and Bio-Microbics FAST® System: A Comparison*

Feature	Sand Filter	FAST®
Design considerations	site condition, selection and maintenance of materials, sizing and obtaining uniform media, flow, strength of waste	flow, waste strength
Assembly	onsite construction by licensed contractor with sand filter experience	pre-assembled in factory
Components	septic tank, distribution pipes, special uniform media, sand filter bed, underdrain, pump, floats, timer	septic tank, FAST® system
Screens and filters	sometimes needed to enhance treatment	not needed
Pumps	needed to distribute wastewater; floats and timer also needed	not needed
Media	special uniform media must be sized, located, and purchased; may be very expensive	included in pre-assembled FAST
BOD reduction	10 mg/L or less	10 mg/L or less
TSS reduction	10 mg/L or less	10 mg/L or less
Nitrogen reduction	0 - 50%	more than 70%
Hydraulic loads	sensitive to varying flows; less effective at high rate; needs pumps, floats and timers to regulate flow	effectively handles high, low or varying flows
Dosing	intermittent, using complex series of floats, pumps and timers	not needed
Clogging	occurs periodically and may require replacement of media	self cleaning
Maintenance	rake filter surface top 3 in. every 3 mos. (or annually depending on filter type and construction); remove weeds and algae mats; inspect and pump septic tank regularly; check and service pumps, floats and timers every 3 mos.; check pipes, valves, etc.; clean screens and filters regularly; check septic tank annually for pumpout	check blower air filter annually; check septic tank annually for pumpout
Natural biological process	yes	yes
Use on small lots	possibly	yes
Renovates failing systems	possibly	yes
Good for nitrogen sensitive areas	possibly	yes
Tested and certified by NSF *International*	no	yes, Standard 40, Class 1

*Sand Filter data from: *Pipeline*, Summer 1997, Vol. 8 No. 3

Pipeline

Summer 1997
Vol. 8, No. 3

NATIONAL SMALL FLOWS CLEARINGHOUSE

Small Community Wastewater Issues Explained to the Public

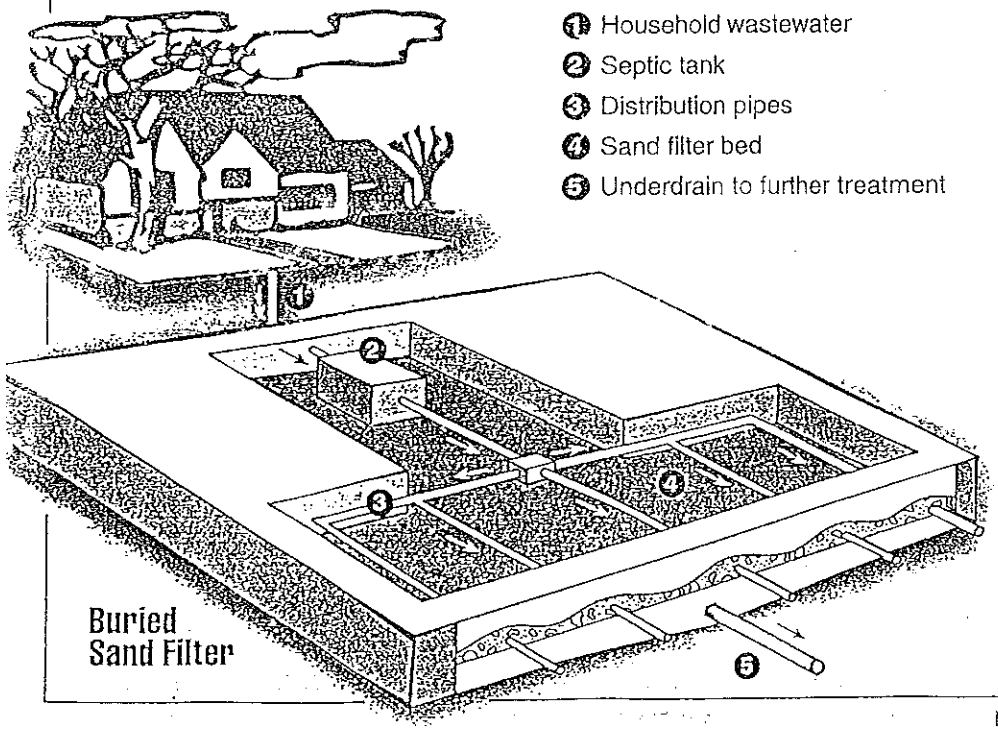
Sand Filters Provide Quality, Low-Maintenance Treatment

Thanks to a technology that was developed more than 100 years ago, countless homes, schools, businesses, and small communities in rural areas have an alternative to centralized wastewater treatment.

Sand filters treat wastewater using naturally occurring physical, biological, and chemical processes. They are one of the best options for additional onsite treatment where septic tank/soil absorption systems have failed or are restricted due to high groundwater, shallow bedrock, poor soils, or other site conditions. They also can be a good choice for homes, businesses, institutions, and small residential developments and communities in areas where centralized treatment is unavailable or too expensive.

Sand filters usually are used as the second step in wastewater treatment after solids in raw wastewater have been separated out in a septic tank, aerobic unit, or other sedimentation tank. Wastewater treated by sand filtration is usually colorless and odorless and, depending on local environmental conditions and regulations, sometimes can be disinfected and discharged directly to surface water. When discharged to soil, sand filter effluent can receive further treatment in a soil absorption field, even at some sites where conventional septic tank/soil absorption systems cannot be used.

Over the years, sand filters have proven to be a reliable technology when they are properly designed, constructed, and maintained. Their performance is consistent and they have low operation and maintenance requirements. In addition, overall treatment costs often compare favorably with other alternative systems.



Buried Sand Filter

Why Consider Sand Filters?

Small Community Officials:

- Sand filters cost less to construct than centralized treatment systems.
- They are energy-efficient.
- They have low maintenance requirements and often can be operated by part-time staff or volunteers.
- They can provide higher quality treatment than other systems.

Homeowners:

- Sand filters may enable development or use of difficult sites.
- They can remedy an existing malfunctioning system.
- They can be a good option for homes in environmentally sensitive areas.

This issue of *Pipeline* provides an overview of three types of sand filters, their design, how they work, and their advantages and disadvantages for homes and small communities. Operation and maintenance issues also are discussed.

Readers are encouraged to reprint *Pipeline* articles in local newspapers or include them in flyers, newsletters, or educational presentations. Please include the name and phone number of the National Small Flows Clearinghouse (NSFC) on the reprinted information and send us a copy for our files.

If you have any questions about reprinting articles or about any of the topics discussed in this newsletter, please contact the NSFC at (800) 624-8301 or (304) 293-4191.

How Do Sand Filters Work?

More goes on inside a sand filter than
eets the eye. On one hand, sand filters
e simple in design and easy to operate
d maintain. What is surprising about
em are the complex processes that take
ace in them naturally, which, together,
sult in wastewater treatment.

Vhat Are Sand Filters?

Sand filters are constructed beds of sand
other suitable granular material usually
o to three feet deep. The filter materials
alled media) are sometimes contained in
iner made of concrete, plastic, or other
permeable material. Depending on the
sign, the filter may be situated above
ound, partially above ground, or below
ound, and the filter surface may be open
covered.

artially treated wastewater is applied to
filter surface in intermittent doses and
eives treatment as it slowly trickles
ough the media. In most sand filters, the
stewater then collects in an underdrain
flows to further treatment and/or
posal.

and filter units are constructed or
embled onsite by a licensed contrac-
—preferably one who has specific sand
er experience. Most materials are
ilable locally, sometimes with the
eption of filter media. If the appropriate
dia cannot be obtained nearby, it must
shipped in, which can greatly increase
filter's cost.

uitable filter media can be purchased
n aggregate companies or other
pliers. The media must be as clean and
orm in size as possible to allow the
ewater to flow correctly through it.
ot, smaller grains will settle in the
es between the larger grains, leaving
lace for the wastewater to flow. (*A
cal flow pattern is shown in the graphic
his page.*)

ere are different sand filter types and
gns. Some are better suited for small
munities, clusters of homes, large
esses, or institutions, while others are
appropriate for individual homes and
businesses. (*A few common sand
types are described in this issue
ning with the articles on page 3.*)

Sand Filter Basics

There are a few basic operating and design principles common to every type of sand filter system.

First, to prevent the filter from clogging, the wastewater must be pretreated to remove solids and scum. Pretreatment usually takes place in a septic tank, Imhoff tank, or aerobic unit. Screens or filters are sometimes used in the pretreatment tank as an additional step to ensure that no solids carry over to the filter in times of heavy water use.

After the solids have been removed, a pump equipped with an adjustable timing mechanism or a siphon doses the wastewater to the filter in timed intervals or when the tank becomes full. Applications are spaced intermittently to allow the filter media to drain between doses. This ensures that oxygen is introduced in the filter with every dose of wastewater. Oxygen is critical to the biological and chemical treatment processes that take place inside the filter.

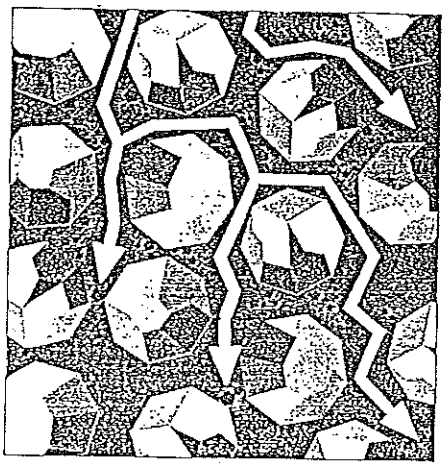
It also is important that the wastewater be applied evenly across the filter surface. This is accomplished either by flooding the surface completely with a thin layer of wastewater, or spraying or applying the wastewater evenly through a network of distribution pipes.

How Treatment Occurs

As the wastewater percolates slowly through the filter media, natural physical, biological, and chemical processes combine to provide treatment. Most treatment occurs in the first 6 to 12 inches of the filter surface.

Some of the organic matter breaks down in the filter. Particles stick to grain surfaces or get caught in crevices or voids on grains or in spaces between grains. In addition, negatively charged grain surfaces can attract positively charged waste particles and bond with them through a process called adsorption. Chemical bonding also takes place as certain particles in the wastewater come in contact with and react with the media.

Probably the most interesting thing about sand filters is that they accomplish much of the treatment through biological processes. Like the soil in every backyard, sand filters are home to a variety of organisms, many of which contribute to treatment by consuming organic matter in the wastewater. Bacteria are the most abundant organisms in the filters, and they do most of the work. There are other beneficial life forms found



Typical Flow Pattern Through Filter Media

in the filters, such as protozoa and worms, which also contribute to treatment.

After the filter has had a chance to mature—usually after a period of approximately two weeks—a miniature ecological system develops as the organisms multiply and rely on each other to survive.

The most significant part of the filter ecosystem is a thick layer called the biomat, which eventually forms near the surface of the filter. This layer contains bacteria which consume particles in the wastewater. In turn, protozoa feed on the bacteria and help prevent the biomat from becoming so dense that it clogs the filter. This balance between the various life forms and the physical and chemical processes that take place in the sand filter results in extremely efficient wastewater treatment requiring minimal operation and maintenance.

Eventually, the biomat in some filters does become clogged, and the top layer of sand needs to be raked or removed as part of regular filter maintenance.

Common Sand Filter Designs

Sand filters are a versatile technology and there are many possible sand filter system designs. Intermittent sand filters receive and treat wastewater in doses. Three of the most common types of sand filters—buried, open, and recirculating—are intermittent designs. (*See page 5 for a discussion of recirculating sand filters.*)

Buried Sand Filters

The most common sand filters used for homes, small businesses, and other small flows require little maintenance and work completely underground.

Buried sand filters are constructed onsite and usually require an excavation of four to five feet. Before construction, a thorough site evaluation is needed to ensure the filter bed will be level. The filter also must be sited to avoid contact with groundwater and excess surface water runoff. (*Refer to the graphic on page 1 for an example of a buried sand filter.*)

Depending on local regulations and site conditions, the entire buried filter unit may be contained in an impermeable membrane liner. Underdrain pipes and a graded layer of washed gravel or crushed rock are placed at the bottom of the filter bed—with the finer gravel on top of the coarser gravel to keep the media grains from washing into the underdrains.

The filter media is then placed on top of the layer of fine gravel. As with all sand filters, the depth of the media depends on the size of the grains and other factors, but normally ranges from 24 to 36 inches.

Another graded layer of gravel is placed on top of the media bed and surrounds a network of distribution pipes. However, the order is reversed this time and the finer gravel is placed under the coarser gravel closest to the media bed. A geotextile fabric is placed on top of the entire filter bed and then is covered with backfill material.

Most buried sand filters are dosed twice a day or as often as is naturally dictated by

Continued on page 4

Many Factors Affect Sand Filter Performance

Pretreatment

Pretreatment is very important to sand filter performance. Solids in the wastewater must be removed by some method of pretreatment or primary treatment or else they will clog the filter. Septic tanks, aerobic units, screens, and other pretreatment methods should operate properly and receive regular maintenance.

Septic tanks are the most common and usually the least expensive pretreatment method for sand filters.

Media

The composition, size, uniformity, and depth of the media all affect sand filter performance.

In some areas where sand is not available locally, other materials, such as crushed glass, anthracite, garnet, mineral tailings, or bottom ash, have been used for filter media. Characteristics of the media's composition, such as its solubility, acidity, and hardness, must be considered in the filter design. It also is extremely important that the media be washed. It should be inspected for cleanliness by an engineer or other qualified individual before it is used in the filter.

The size and uniformity of the grains also affect performance, filter depth, and the amount of wastewater that can be treated at one time.

The media grains are sorted and measured through a series of mechanical sieves. The grains should be relatively uniform in size to prevent clogging. "Effective size" and "uniformity coefficient" are measurements used to express these characteristics. Effective sizes for sand filter media range from 0.3 mm to 3 mm in diameter. Each sand filter type has its own media size range requirements. (*Refer to the table on page 4 for more information.*) A uniformity coefficient of four or less is recommended for all filter media.

In addition, the media should be neither too coarse nor too fine. Coarse media may allow wastewater to pass too quickly through the filter without receiving adequate treatment, while very fine media can slow down treatment too much, is prone to clogging, and can keep oxygen from reaching certain parts of the filter.

Filter depth depends on the type of filter and media size, but normally ranges from 24 to 36 inches. Most treatment occurs in the first 6 to 12 inches, but a few additional inches improves overall performance, pathogen removal, and allows for maintenance.

Organic Loading Rate

Organic loading rate depends on the strength of the wastewater. Depending on its source, wastewater may contain more or less organic material requiring treatment. Strong wastewater containing high levels of organic material can reduce the filter's performance over time and increase the need for maintenance.

Hydraulic Loading Rate

Hydraulic loading rate is the amount of wastewater applied to the filter in one day. Sand filters are less effective at removing certain pathogens and other wastes from wastewater at high hydraulic loading rates. The appropriate rate is determined based on the dosing pattern, the size of the media, and the organic loading rate.

Dosing Method and Frequency

Careful dosing and even distribution of the wastewater across the filter surface are needed to ensure consistent treatment. Uneven distribution may cause one part of the filter to become overloaded, and wastewater can be flushed through the filter before receiving adequate treatment. Too frequent dosing causes similar problems. Doses should be spaced to allow the filter adequate time to drain and reaerate.

Climate and Temperature

All wastewater treatment methods that rely on natural processes are affected by temperature. Treatment slows down in cold temperatures, so organic loading rates must be lower to maintain treatment. Freezing also can be a problem with certain filter designs, such as recirculating filters and open filters, and some designs may be inappropriate for cold climates. Sometimes adjusting hydraulic loading rates and dosing frequencies can help filter performance in low temperatures.

ommon Sand Filter Designs

tinued from page 3

usehold water use. After the wastewater eives treatment, it collects in the derdrains and then usually either flows to nfection in a chlorination unit and to face discharge or directly to a soil sorption field for further treatment and surface discharge.

he underdrains are sloped toward the let and vented at the surface at the stream end. If possible, the surface vent uld be located away from residences to imize possible odor problems.

uried sand filters are designed to receive hydraulic loads of approximately 1.2 to 1.5 gallons per square foot per day. This is a relatively low rate compared with other sand filters, which helps to ensure that the filter does not become overloaded or clogged and that it can work up to 20 years without maintenance.

Due to this low hydraulic loading rate, buried filters usually require more surface area to treat the same amount of wastewater as other sand filters. However, with good landscaping techniques, the land used for buried sand filters can be available for other aesthetic uses.

And, although the filter itself does not require maintenance, regular maintenance is essential for the septic tank or other pretreatment tank to prevent solids from clogging the filter. (*Refer to the sidebar on page 6.*) Maintenance is also important for screens, pumps, siphons, timers, disinfection units, and components of soil absorption fields.

How Well Do Sand Filters Perform?

epending on the system design, sand rs are capable of reducing five-day chemical oxygen demand (BOD_5) and l suspended solids (TSS) in wastewato 10 milligrams per liter or less. oth BOD_5 and TSS are indicators d by regulatory agencies to assess tment and its potential impact on the ironment. BOD_5 is a measure of the ount of oxygen microorganisms need consume and break down organic ter. TSS is a measure of the amount waste particles suspended in the stewater.

and filters also remove many patho-s, such as viruses and harmful teria. However, disinfection or further tment may be necessary before the ent can be returned safely to the ironment.

ne disadvantage of sand filters is that are not very effective at removing sphorus from wastewater. Therefore, itional treatment may be required in e phosphorus sensitive areas.

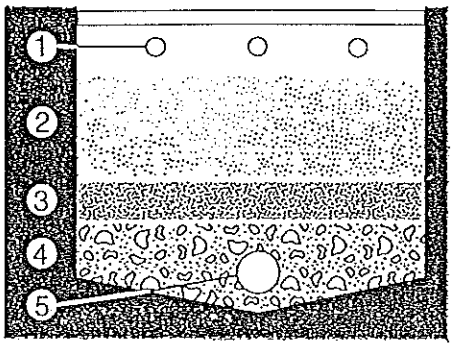
and filters are not permitted in all s. Regulations concerning their use final treatment and disposal of their ent vary widely. Check with your local lth department or state regulatory ncy for permit requirements in your . (*Refer to page 7 for contact rmation.*)

Open Sand Filters

Open sand filters—which are often simply called intermittent sand filters—are a practical option for treating wastewater from small communities, residential developments, recreational areas, shopping centers, and institutions. They are used most often for sources generating up to 120,000 gallons of wastewater per day.

Open sand filters are similar in design to buried sand filters, except they always are at least partially above ground. Depending on local regulations, site conditions, and the size of the filter, they may be contained in an impermeable synthetic liner or concrete. (*Refer to the graphic above for an example of an open sand filter design.*)

Open Sand Filter



① Distribution pipes
② Filter media
③ Fine gravel
④ Coarse gravel
⑤ Underdrain

Because the filter surface is accessible and easy to maintain, open sand filters are more practical than buried filters for treating large volumes of wastewater. Hydraulic loading rates for open filters typically range from two to five gallons per square foot per day and could be higher in some cases.

In addition, open filters usually have two or more beds that can be operated in parallel or in series, which allows parts of the filter to be rested while others are working.

In spite of their name, many open sand filters have removable covers to insulate them from extreme cold weather, minimize maintenance, and reduce odors, which can be a nuisance.

Because odors are generated when septic tank effluent is dosed to the filter surface, open sand filters should be sited downwind from residences and businesses. Where this is impractical, other options should be considered, such as using a recirculating sand filter.

Typical Design Values for Sand Filters*

Design Factor	Buried	Open	Recirculating
Pretreatment	Must include settling/removal of solids		
Media			
Material	Washed, Durable Granular Material		
Effective size	0.3–1 mm	0.3–1 mm	0.8–3 mm
Unif. Coeff.	<4.0	<4.0	<4.0
Depth	24–36 inches	24–36 inches	24–36 inches
Hydraulic Loading	<1.5 gpd/ft^2	2–5 gpd/ft^2	3–5 gpd/ft^2 (based on forward flow only)
Organic Loading	<5 x 10^{-3} lbs. BOD_5/day/ft^2		
	<2.4 x 10^{-2} kg. BOD_5/day/m^2		
Media Temperature	>5° C	>5° C	>5° C
Dosing Frequency	<2 per day	>2 per day	5–10 min./30 min.
Recirculation Ratio	NA	NA	3:1 to 5:1

*The values above only show typical design criteria for sand filters and do not represent all possibilities.
Adapted from: Anderson et al. 1985. "Technology Assessment of Intermittent Sand Filters." U.S. Environmental Protection Agency.

Recirculating Sand Filters: An Innovative Solution

In the late 1960s, two engineers with the Illinois Department of Health, Michael Hines and R. E. (Tony) Favreau, set out to solve a common problem facing their area. Although sand filters were the best treatment option for many local sites with poor soils or other limiting conditions, the odors associated with them made them unsuitable for more developed areas.

In response to this challenge, the two developed an innovative sand filter design—the recirculating sand filter—which has been widely adapted and used ever since for schools, homes, businesses, recreational areas, and small communities.

Recirculating sand filters eliminate odors by ensuring an adequate supply of oxygen to the wastewater. (*Refer to the graphic below for an example of a recirculating sand filter design.*)

The ratio of sand filter effluent that is recirculated ranges from 3:1 to 5:1. How this amount is controlled varies with individual system designs. Weirs, moveable gates, and other devices can be used to direct part of the flow from the sand filter underdrains to the recirculation tank.

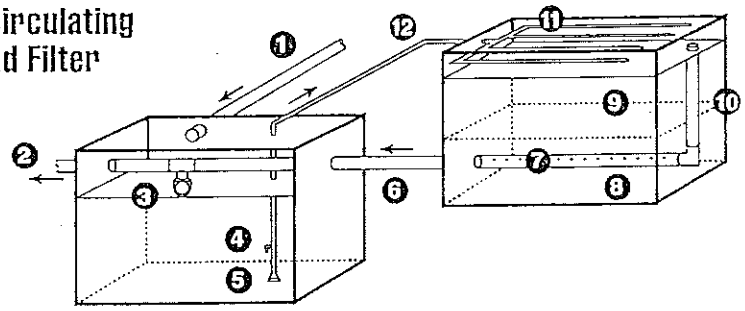
In the example shown in the graphic below, an upside-down tee pipe in the recirculation tank connects to the sand filter underdrains. A rubber ball in a screened cage rises with the water in the tank and plugs the tee when the tank reaches a certain level. When this happens, the remaining sand filter effluent bypasses the recirculation tank and flows directly to disinfection or further treatment and/or disposal.

However recirculation is achieved, the result is that the wastewater applied to the sand filter is weaker and contains more oxygen than straight septic tank effluent, which eliminates odors. The final sand filter effluent also is of higher quality and ranges from 2 to 5 milligrams per liter BOD, and from 3 to 5 milligrams per liter TSS.

Recirculating sand filter media ranges from an effective size of 0.8 mm to 3 mm, which is somewhat coarser than other sand filter media and, therefore, less prone to clogging. Hydraulic loading rates typically range from three to five gallons per square foot per day, meaning that less land area is generally needed to treat the same amount of wastewater than with other sand filter designs. Energy and routine maintenance requirements are more than for other sand filters but are still minimal and much less than is required for extended aeration package plants.

One drawback to recirculating sand filters is they are more sensitive to cold temperatures and prone to freezing than systems that are regularly dosed with warm septic tank effluent. This problem sometimes can be offset by adjusting the dosing frequency and the recirculation ratio or by covering the sand filter bed.

Recirculating Sand Filter



1. From pretreatment
2. To disinfection/discharge
3. Float valve
4. Bleed line
5. Submersible pump
6. Filter effluent line
7. Perforated underdrain piping
8. Layered support gravel
9. Filter media
10. Riser pipe
11. Distribution piping
12. Recirculation pump discharge

In a recirculating sand filter, wastewater flows by gravity from a septic tank to a recirculation tank, which is equipped with a pump, a timing mechanism, and float valves. The wastewater is pumped to the filter when it reaches a certain level in the tank or in timed doses.

After receiving treatment in the sand filter, the wastewater collects in underdrains and a portion of it is directed back to the recirculation tank, where it mixes with the septic tank effluent and is recirculated to the sand filter. The remaining sand filter effluent bypasses the recirculation tank and goes directly to disinfection or further treatment.

How Much Do Sand Filters Cost?

Exact costs for sand filter construction, operation, and maintenance depend on the filter design and local costs for labor and materials. Costs for pretreatment and additional treatment and disposal also need to be factored in when evaluating the overall system costs.

Construction of the sand filter units usually is economical because the filters can be constructed or assembled onsite using local labor and materials. Another advantage is their low operation and maintenance requirements. Operating costs are limited to the small amount of electricity used by the pump (usually around 0.28 horsepower per hour per 1,000 gallons), and most maintenance can be performed by homeowners or unskilled staff.

The two most significant factors that affect the cost of sand filter treatment are land and media costs. In areas where media is expensive or needs to be hauled a long distance, costs are much higher.

Initial costs for sand filters are sometimes higher than those for extended aeration package plants and other treatment options. However, in the long run, sand filters' low energy costs, low operating costs, and high performance often make them the most cost-effective choice.

Sand Filters Are Simple To Operate, Maintain

Most operation and maintenance requirements for open and recirculating sand filter beds are simple and can be performed by homeowners, unskilled staff, or volunteers. Exactly how much maintenance is needed varies by system design and can be best determined after working with the filter over a period of a year or more. Buried sand filter beds are the exception and can work up to 20 years without maintenance.

Routine maintenance of open and recirculating sand filter beds includes periodic leveling and raking the surface and raking or removing the surface layer when it begins to clog. How often clogging occurs will depend on organic loading rates and the filter media size.

For example, sand filters receiving septic tank effluent may need more frequent attention than those receiving aerobic unit effluent, because the organic strength of the septic tank effluent is higher. In addition, because recirculating sand filters use coarser media and receive lower organic loading rates, they tend to clog less frequently.

Sometimes simply raking the filter surface will not suffice and the top half-inch to one-inch layer of media must be removed. Most sand filters are designed to be deep enough to allow several layers to be removed before the media needs to be replenished or replaced.

Filter beds that are exposed to sunlight should be weeded regularly and may develop algal mats that need to be removed.

Maintenance for other parts of the system may include periodic inspection and service by a qualified professional. For example, pretreatment tanks and disinfection units need to be inspected and pumped, and electrical components, such as pumps and timers, need to be checked and serviced according to manufacturer recommendations.

Pumps often are designed to last from 10 to 25 years, but eventually need to be replaced. Pipes, valves, and other system components need to be checked regularly, and screens and filters need to be cleaned. (*Refer to the sidebar at left and the table below for more information.*)

Many larger sand filters are operated in sections to allow portions of the filter bed to rest by switching the sections to be dosed. It also is sometimes necessary to regulate hydraulic loading rates to prevent the filter from being overloaded or to prevent the filter surface from freezing.

Another cold-weather operating strategy entails raking the filter bed in a pattern of ridges and furrows and flooding the surface until an ice sheet forms. The filter can then be loaded below the insulating sheet of ice.

General maintenance requirements for both open and recirculating sand filters are summarized in the table below.

Sand Filter Maintenance

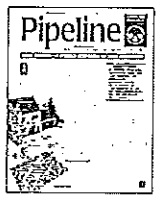
Item	Requirement
Pretreatment	Depends on process (septic tank, aerobic unit, etc.)
Dosing chamber	
Pumps and controls	Check every 3 months.
Timer sequence	Check and adjust every 3 months.
Appurtenances	Check every 3 months.
Filter media	
Raking	Check every 3 months. If drainage time between doses has increased significantly, rake top 3 in. (for surface filters only).
Replacement	Skim media when heavy incrustations occur. Add new media when depth falls below 24 in. Rest when ponded continuously. Replace top 2–3 in. media when surface ponds more than 12 in. deep. Rest while alternate unit in operation (60 days).
Other	Weed as required.
	Maintain distribution device as required.
	Protect against ice sheeting.
	Check high water alarm (for open sand filters only).

Adopted from: U.S. Environmental Protection Agency. 1980. Design Manual: *Onsite Wastewater Treatment and Disposal Systems.*

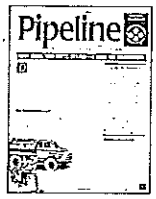
Pretreatment Tanks Need Maintenance Too

Sand filters performance depends on pretreatment tanks working properly. The following *Pipeline* issues contain useful information about the siting, design, construction, installation, operation, and maintenance of septic tanks and aerobic units—two common pretreatment methods for sand filter systems.

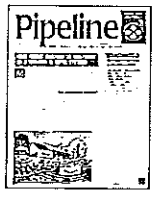
- Summer 1995 *Pipeline*: "Septic Systems: A Practical Alternative for Small Communities." Item #SFPLNL02.



- Fall 1995 *Pipeline*: "Maintaining Your Septic System: A Guide for Homeowners." Item #SFPLNL03.



- Winter 1996 *Pipeline*: "Home Aerobic Wastewater Treatment: An Alternative To Septic Systems." Item #SFPLNL04.



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MORBIDITY AND MORTALITY WEEKLY REPORT

Spontaneous Abortions Possibly Related to Ingestion of Nitrate-Contaminated Well Water — LaGrange County, Indiana, 1991–1994

Health effects associated with ingestion of nitrate-contaminated water have included methemoglobinemia (i.e., blue baby syndrome) in infants (*1*) and spontaneous abortions in laboratory animals and livestock (*2,3*); however, only one study in humans has reported an association between increased methemoglobin levels and spontaneous abortion (*4*). During March 1993, the LaGrange County (Indiana) Health Department (LCHD) identified three women who reported a total of six spontaneous abortions during 1991–1993 and who resided in proximity to each other; each had obtained drinking water from nitrate-contaminated private wells in LaGrange County (1995 population: 29,350). LCHD was subsequently notified about a fourth woman from another part of the county who had had two spontaneous abortions after she had moved into a new home with a nitrate-contaminated private well. This report summarizes the investigations of these reports by LCHD, which indicate the need for further assessment of a possible relation between ingesting nitrate-contaminated water and spontaneous abortion.

Investigation 1

Patient 1. During May 1991–December 1992, a 35-year-old woman had four consecutive spontaneous abortions: the first three at 8 weeks' gestation, and the fourth at 11 weeks. Karyotyping of one fetus did not identify a genetic explanation for the spontaneous abortion. During the investigation of this case, a neighbor was identified who also had reported a spontaneous abortion (patient 2).

Patient 2. During March 1993, a 37-year-old woman who resided one half mile from patient 1 had spontaneous abortion of her second pregnancy at 8 weeks' gestation. Her first pregnancy (which occurred at age 34, before moving to the current home) had resulted in the birth of a full-term, live-born infant. During the investigation of patients 1 and 2, another neighbor reported to LCHD a history of a recent spontaneous abortion (patient 3).

Patient 3. During July 1993, a 20-year-old woman who resided approximately 1 mile from patient 1 had spontaneous abortion of her first pregnancy during the 8th week of gestation.

Environmental Investigation

To determine possible causes of this cluster of spontaneous abortions in the three women, LCHD conducted an environmental investigation during June–September 1993. A well located on a hog farm in the vicinity of the residences of patients 1–3 had been documented to be nitrate contaminated (>50 mg/L) in 1989; LCHD had been notified about this contamination in 1990. Because of the proximity of the residences of patients 1–3 and the hog-confinement facility, persons in all 19 residences within 3 miles down gradient (i.e., the direction the groundwater was moving) of the hog-confinement facility were interviewed regarding illness and reproductive histories. Nine women of childbearing age lived in these residences, including the three patients whose spontaneous abortions had been investigated by LCHD. Five other women each reported having a full-term birth during the preceding 2 years. Water samples from the 19 wells serving the residences were tested for bacteria and nitrates. For

Spontaneous Abortions — Continued

patients 2 and 3, water samples also were analyzed for volatile and semivolatile compounds, pesticides, metals, inorganic compounds, and coliform bacteria.

Nitrate was the only contaminant in well water present at elevated levels. In the wells serving the households of patients 1–3, nitrate levels were 19.0 mg/L, 26.0 mg/L, and 19.2 mg/L, respectively (Environmental Protection Agency [EPA] maximum contaminant level [MCL] for nitrate: 10.0 mg/L). In comparison, for the five households in which women reported giving birth to full-term, live-born infants, drinking water nitrate levels ranged from 1.6 mg/L to 8.4 mg/L (mean: 3.1 mg/L).

An LCHD investigation of potential sources of nitrate contamination of the household wells indicated that the probable source of groundwater contamination was animal waste from the hog-confinement facility. This facility was located approximately one half mile from the residence of patient 1, 1 mile from patient 2, three fourths mile from patient 3, and approximately 2 miles from the residences of women reporting full-term births.

Investigation 2

After completing the investigations of patients 1–3, LCHD investigated a fourth case of spontaneous abortion in a 35-year-old woman who lived approximately 10 miles from the other three women. She had had five live births during 1984–1992. The woman's doctor reported to LCHD that she had had two spontaneous abortions during April and August 1994, both at 8 weeks' gestation: the first occurred 24 months after the birth of her fifth child and 44 months after beginning use of a new well. A mean nitrate-N level of 28.7 mg/L was detected in water samples collected during August 1994 from the household's well, which had been used since 1990. A nitrate-N level of 1.2 mg/L was detected in a second well on the property, approximately 100 feet from the first well; this well had been the source of the woman's drinking water during her first four pregnancies. Nitrate-N levels of <1.5 mg/L were present in water samples in six other wells located up gradient from the family's well and within 1 mile of the household. The only nitrate source identified near the contaminated well was the family's septic system, which was installed in sandy soil approximately 70 feet up gradient from the contaminated well. Although the well probably became contaminated by effluent from the septic tank, it is unknown when contamination occurred.

Following these investigations, all four women changed to nitrate-free sources of drinking water (i.e., bottled or reverse-osmosis treated). Subsequently, each delivered one or more full-term, live-born infants.

Reported by: W Grant, LaGrange County Health Dept, LaGrange; G Steele, DrPH, State Epidemiologist, Indiana State Dept of Health; SA Isiorho, PhD, Dept of Geosciences, Indiana-Purdue Univ, Ft. Wayne, Indiana. Div of Parasitic Diseases, National Center for Infectious Diseases; Div of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion; Div of Birth Defects and Developmental Disabilities and Div of Environmental Hazards and Health Effects, National Center for Environmental Health, CDC.

Editorial Note: The most widely recognized health problem associated with ingestion of nitrate-contaminated water is infant methemoglobinemia, and the EPA standard for nitrate in drinking water of 10 mg/L was established in 1977 to prevent this condition. Although the findings from studies of the influence of nitrate on the reproductive outcomes of laboratory animals and livestock have not been consistent, some studies have suggested a relation between nitrate consumption and spontaneous abortions (*2,3*). Epidemiologic studies of humans have suggested a possible relation between

ingestion of drinking water containing elevated nitrate levels and an increased risk for neural tube defects (*5,6*) and, based on the findings of one study, a possible relation between methemoglobin levels in women during early pregnancy and subsequent spontaneous abortions (*7*).

An estimated 13.8 million households in the United States obtain drinking water from private wells (*8*). Based on recent studies, the EPA MCL for nitrates was exceeded by 13.4% of household wells in nine states in the Midwest (*9*) and 9% of household wells nationally (*10*). Because of the risks for potential adverse health effects, persons who use drinking water that contains nitrate levels >10 mg/L or other contaminants exceeding the EPA MCL should have alternative sources of water or appropriate treatment of existing supplies. Information regarding testing of well water may be obtained from city or county health departments.

Spontaneous abortions occur commonly, are directly associated with increasing maternal age, and may cluster by chance. Possible explanations for the cases of spontaneous abortion investigated by LCHD are that they may represent an otherwise unrelated cluster or that they may have been related to ingestion of nitrate-contaminated drinking water. Term births occurred before or after the period when each of the four women consumed contaminated water, and spontaneous abortions occurred coincident with the period of nitrate exposure. However, spontaneous abortions frequently are preceded or followed by live births, and this investigation did not compare the rate of spontaneous abortions in other residents of the community who either were or were not exposed to nitrate-contaminated water. Although this investigation did not establish a causal link between spontaneous abortion and nitrate exposure, the findings indicate the need for further assessment of the possible effects of this common groundwater contaminant on human reproduction.

Since 1971, EPA and CDC have maintained a surveillance system to monitor the occurrence of waterborne disease outbreaks. Illnesses related to exposures to pathogens and chemicals associated with recreational water use or ingestion of drinking water should be reported to the Epidemiology Branch, Division of Parasitic Diseases, National Center for Infectious Diseases, CDC, telephone (770) 488-7760.

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RENOVATING FAILING SEPTIC TANK-SOIL ABSORPTION SYSTEMS USING AERATED PRETREATED EFFLUENT

J.C. Converse, E.J. Tyler*

ABSTRACT

Failing septic tank soil absorption systems were renovated by installing aerobic treatment units after the septic tank to produce a highly pretreated effluent with low BOD and suspended solids. Fifteen systems were identified and evaluated for hydraulic performance. Twelve of the 15 soil absorption units successfully accepted all of the treated wastewater after installation of the aerobic unit. One system was vastly overloaded; another system needed some pumping during the first six months and the third system continues to need some pumping 9 mo. after the aerobic unit was installed. It also has experienced some aerobic unit start up problems. As a result of this study, the State allows the installation of aerobic units or sand filters for the purpose of renovating failing soil absorption systems provided the sites meet soil and site separation distances required.
Keywords: Renovation, Pretreated effluent, On-site systems.

INTRODUCTION

Septic tank-soil absorption systems will form a biological mat at the soil infiltrative surface which reduces the wastewater infiltration rate. There are many biological factors that affect mat development such as hydraulic and organic loading rates, temperatures and age. Much research has been done to identify the components. Siegrist et al., 1991 discuss the humic substance formation during wastewater infiltration in soil absorption systems. Wong (1994) is attempting to identify the various bacteria involved in mat formation.

When the hydraulic loading rate exceeds the wastewater infiltration rate, septic tank effluent begins to pond in the system. If this process continues, the net result is septic tank effluent backing up into the home or breaking out on the ground surface. Resting for long periods of time will renovate the system but during that time alternative effluent handling methods are required. Some researchers have used hydrogen peroxide or other oxidizing agents to break up the mat but it may decrease the wastewater infiltration rates significantly (Hargett, et al., 1984. Mickelson, et al., (1989) showed that hydrogen peroxide is effective in reducing the clogging mat in clean sands for 1 or 2 times after which it is no longer effective. Lower organic loading rates will retard the development of the biomat (Siegrist, 1987).

If the organic loading rates could be reduced by effluent pretreatment through a sand filter or aerobic unit prior to entering a failing soil absorption system, it may be possible to continue to use the system at the same hydraulic loading rate while the system is undergoing renovation through biological decomposition.

The objective of this study was to determine how effectively aerobically treated effluent renovated soil absorption systems which had failed due to biological mat formation. Aerobically pretreated effluent is defined as effluent exiting a normally operating aerobic unit or sand filter with typical BOD and SS values less than 10-15 mg/L.

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*J. C. Converse, Professor and Chair, Agricultural Engineering Department and E.J. Tyler, Professor, Soil Science Department, UW-Madison. Research supported by the College of Agriculture and Life Sciences and the Small Scale Waste Management Project.

MATERIALS AND METHODS

In 1987 an aerobic unit was installed with the effluent entering a failing soil absorption unit. Two other units were installed in 1990. Based on preliminary results of these three sites, the State of Wisconsin in 1991 allowed homeowners to install pretreatment units, capable of producing highly pretreated effluent, for the purpose of renovating failing soil absorption units. However, the soil absorption unit must meet the separation distance required of all soil absorption units which is 3 ft of separation between the aggregate/soil interface and the high water table or bedrock (Burks, 1991).

In February 1994, the authors contacted county sanitarians for a list of sites using highly pretreated effluent to renovate failing systems with 17 sites identified. A telephone and written survey instrument were developed for the homeowner and installer, respectively. There was 100% response to the surveys.

RESULTS AND DISCUSSION

System Characteristics

Table 1 gives the site characteristics for 15 units of the 17 systems identified. Two systems were not included in the study as the systems were not failing prior to installation of the aerobic units and one of the two systems was serving a summer home. Fourteen of the systems served homes and one served a town hall. The ownership and number of people served remained the same prior to and after installation of the aerobic unit except at Site 2 where the number of people served remained the same. The owner survey also indicated that the water use prior to and after installation was essentially the same. At Site 2 the owner indicated more water was used after installation and at Site 14 less water was used. In the latter case, the system is one of the two systems that does not appear to be working correctly. At Site 1 the water softener discharge was diverted elsewhere, and at Site 9 the basement sump was disconnected from the system.

The symptoms varied from backup in the basement, to severe ponding with no breakout to breakout on the ground surface. In all but one case (Site 14) the symptom disappeared after installation of the aerobic unit with reappearance of symptoms in 5 cases. In all but two cases (Sites 14 and 15) the homeowners were satisfied with the performance.

Table 2 summarizes the symptoms before and after the installation of the aerobic unit. In two of the cases the symptoms reappear during spring wet weather and three of the systems needed occasional pumping. Systems 9 and 10 are in high ground water sites. System 9 ponded during Spring 1993 but did not during Spring 94. System 10 exhibited a small spongy spot during Spring. Each system accepted all of the wastewater without requiring pumping. Within a few weeks ponding disappeared. Samples of ground water taken twice in Spring 1994 (Site 9) from the 4 observation wells surrounding the soil absorption unit showed fecal coliform counts below detectable levels. The drywell on Site 6 needed periodic pumping for 6 months then accepted all of the waste water. At Site 14 the system is still experiencing problems 9 months after installation of the aerobic unit. The aerobic unit has experienced start up problems and the system continues to need periodic pumping but probably on a less frequent basis. At Site 15, less frequent pumping occurred after installation of the aerobic unit, but the drywell was vastly undersized for the amount of effluent entering it. It should be noted that the vent tube extends only to the distribution pipe which is typically 6 - 12 in. above the aggregate/soil interface while the observation tube monitors ponding to the aggregate/soil interface. Thus if ponding disappeared in the vent tube, there could still be ponding below the distribution pipe.

Table 1. Home and System Characteristics and Performance

Site	No. Bedrm	House Size (ft^2)	Population	Water Appliance	System Type-Date (ft)	System Size	Water Use	Symp tons	Symp Disappear	Symp Reappear	Owner Satisfied
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
1	3	2-3000	2(3)	D,W,G	M-78(2-93)	5X94	S/L	P	Y	N	Y
2	3	2-3000	2(2)*	D,W,G	M-86(4-92)	8X47	M	P	Y	N	Y
3	2	2000	2(1)	D,W,G	B-78(5-90)	24X34	S	B	Y	N	Y
4	3	2-3000	2(0)	D,W,S	B-75(6-90)	6X58	S	B	Y	N	Y
5	3	2-3000	2(0)	D,W,G,S	B-85(4-91)	12X52	S	B	Y	N	Y
6	3	1-2000	2(1)	W	D- -(4-91)	-	S	L	Y	P	Y
7	3	1-2000	2(1)	D,W,G,S	T-77(10-93)	5X110	S	B	Y	N	Y
8	3	1-2000	2(2)	D,W,S	T- -(2-92)	5X62	S	L	Y	N	Y
9	4	1-2000	2(1)	W,S	B-72(7-92)	18X62	S/L	P	Y	S	Y
10	4	>3000	2(3)	W	B-75(10-91)	14X47	S	L	Y	S	Y
11	3	1-2000	2(2)	W,S	T-60(8-87)	-	S	L	Y	N	Y
12	3	2000	2(2)	D,W	B-73(5-92)	20X38	S	L	Y	N	Y
13	T.H.	-	Same	-	B-74(5-92)	20X35	S	L	Y	N	Y
14	4	2-3000	2(4)	D,W	B-74(10-93)	18X30	L	L	N	P	S
15	5	2-3000	2(5)	-	D- -(8-90)	-	S	L	Y	P	S

Notes:

Col. b-T.H.-Town Hall with offices with 4 employees and meeting rooms.

Col. c-2-3000 means house size between 2000 and 3000 sq. ft.

Col. d-Number of adults (number of children), *ownership change at time of aerobic installation.

Col. e-Appliances: D (dishwasher), W (Washer), G (Garbage Grinder), S (Softner discharge to unit).

Col. f-B-Bed, M-Mound, T-Trench, D-Drywell, year original system installed (date aerobic unit installed).

Col. g-System size was taken from plans on file in county offices. Drywell units are single units with unknown dimensions, typically 6-10 in diameter 8-9 ft from ground surface.

Col. h-Water usage before and after based on homeowner opinion. S(Same), M (More), L(Less), S/L(Same use in house, less to system).

Col. i-P-Ponding, B-Backup, L-Breakout on Lawn.

Col. j-Symptoms disappear; Y(Yes), N(No)

Col. k-Symptoms reappear; Y(Yes), N(No), S(Seasonal), P(Occasional pumping) after aerobic unit installation.

Col. l-Owner satisfied; Y(Yes), S(Somewhat)

Table 2. Description of Symptoms before and after Installation of Aerobic Unit

Site	System Type	Infiltration Area Condition Prior to Aeration	After Aeration	Comments
1	Mound	At least 6-8 months severe ponding.	No ponding after 6 months, dry in July, 94.[a]	Diverted softener discharge elsewhere after aerobic unit installed.
2	Mound	Mound ponded.	No ponding after 6 months, dry in July, 94.	New owners indicated previous owners practiced water conservation for extended period, uncomfirmed.
3	Bed	Ponding for some time,backed up in house.	In-ground bed dry.	Aerobic unit installed within 90 days of backup.
4	Bed	Ponding for some time, backed up in house	Ponding continues for several years (Fig. 1)	Septic tank pumped for a month before aerobic unit installed.
5	Bed	Ponding with intermittent back up in house for 3 years.	Bed dry in July, 94.	Septic tank pumped frequently for 3 years before aerobic unit installed.
6	Drywell	Ponding with breakout on lawn in winter at end of trench connected to drywell.	Drywell needed periodic pumping for 6 months, about 5 1/2 in. of effluent in drywell in July 94.	Aerobic unit installed within 6 mo. after detecting problem. Trench disconnected at time of aerobic installation.
7	Trench	Ponding with intermittent back up in house for 6 years.	Noticeable drop in ponding within 2 weeks. There was about 2" of ponding 6 mo. later. Dry in July, 94.	No further backup into home.
8	Trench	Ponding with breakout on lawn for about 6-8 months.	Symptoms disappear with ponding in vent tube disappearing in 3 mo. No effluent in vent in July, 94.	There could be ponding in trench as vent tube doesn't extend to base.

Table 2. Continued

9	Bed	Ponding in vent tube to about 6" of ground surface.	No ponding shortly after installation but ponded during Spring 93 due to high water table, basement sump and wet spring. No ponding in Spring 94. Dry in July, 94 but some ground water in 3 of 4 wells.	Installed observation tubes to bottom of system. Basement sump pumped into system until Summer 93. Spring 94 drier but water table did rise into wells which were installed around system. Water table recedes in summer.
10	Bed	Ponding with effluent surfacing on lawn.	No surfacing but ponded in Spring due to high water table. Vent tube dry in July, 94.	Spot, where previously surfaced, spongy in Spring but dry rest of year.
11	Trench	Ponding with breakout through distribution box for one year.	Ponding continued in trenches for several years. (Fig. 2).	Trenches are probably undersized for home.
12	Bed	Ponding with breakout for 3 years. with septic tank pumping quarterly.	Observation tubes indicate 6-8 in. ponding from Dec.-April and 2-4 in. for May-Nov. There was 4-6 in. of ponding in July, 94.	Soil added to breakout point as low. No more break out.
13	Bed	Ponding with septic tank pumped frequently. Effluent standing in distribution box which sits in aggregate of bed.	No ponding in distribution box as of Spring 94. In July 94, effluent just below aggregate surface.	System accepting all effluent with no septic tank pumping.
14	Bed	Ponding with periodic bleeding through retaining wall at end of system.	System continues to need periodic pumping with 15 in. of pond and no bleeding to surface as of July, 1994.	Problems in getting aerobic unit started.
15	Drywell	Ponding with periodic breakout to lawn for several years.	Ponding continued with occasional pumping until large family moved. No further pumping required with only one person.	Drywell vastly undersized for amount of effluent added.

*Authors visited all but Site 3 in June and July 1994 to verify performance. Other data is result of interviews of owners and contractors.

Construction Details

All soil absorption units except two (Site 2 and 3 in Table 3) were pumped prior to the system coming on line after the new pretreatment unit was installed. This allowed the system to start its renovation process and provided some storage capacity in the aggregate. Table 3 gives a summary on how effluent was removed from the soil absorption unit. Effluent was drained from about half of the systems by cutting into the side of the systems, allowing the effluent to flow into the cut and then pumped. The rest were pumped from the distribution box or observation tubes.

Table 3. Effluent removal from the soil absorption unit.

Site	Pumped	Description
1	Yes	Mound with 2 observation tubes, pumped through tubes.
2	No	Mound
3	No	In-ground bed
4	Yes	In-ground bed, cut into side
5	Yes	In-ground bed, pumped through observation tubes
6	Yes	Drywell, pumped it
7	Yes	In-ground trench, cut into side
8	Yes	In-ground trench, cut into side
9	Yes	In-ground trench, cut into side
10	Yes	In-ground bed, pump from distribution box, accidently cut into side of bed during installation of aerobic unit.
11	Yes	In-ground trench, pump from distribution box
12	Yes	In-ground bed, cut into side
13	Yes	In-ground bed, pumped from the distribution box
14	Yes	In-ground bed, cut into header pipe
15	Yes	Pumped dry well

Long Term Monitoring

Two systems were monitored for several years to evaluate how the systems responded to aerobically treated effluent. Site 4 has two vent tubes with the effluent entering the center of the bed. Both vent tubes, which extended to the distribution pipe and not the bottom of the bed, exhibited ponding prior to the installation of the aerobic unit. The bottom of the vent tubes are not at the same elevation thus inferring that the bottom of the bed is not level. After the system was pumped and the aerobic unit installed (Day Zero) only one of the vent tubes has exhibited ponding with the liquid levels shown in Fig. 1 for several years. The liquid level fluctuated between 20 and 38 cm (8 - 15 in.) for about 1000 days and then started to drop. The times that the vent pipe was dry coincided with the owners on vacation. The system has accepted all of the wastewater after installation of the aerobic unit.

Figure 2 shows the ponding depth with time for Site 11. Effluent was flowing out of the distribution box for about a year before the aerobic unit was installed at Day Zero. However, for a few months prior to Day Zero, the septic tank was pumped for several weeks to measure ponding response through the observation tubes located at the aggregate/soil interface. There was a decrease in ponding level prior to Day Zero when no effluent was entering the system. Immediately after the aerobic unit was installed the ponding level rose with a gradual decrease over 2000 days, around which time one or more of the observation tubes were reported dry. These measurements are the average of 2 observation tubes, in each of two trenches served by a common distribution box. Although the size of this system is not known, it is believed to be undersized for the home size and the soil conditions. Had the proper size soil absorption been

installed according to current standards, it is believed that the liquid level would have dropped much faster as observed in other systems (Table 2). The system accepted all of the wastewater after the aerobic unit was installed.

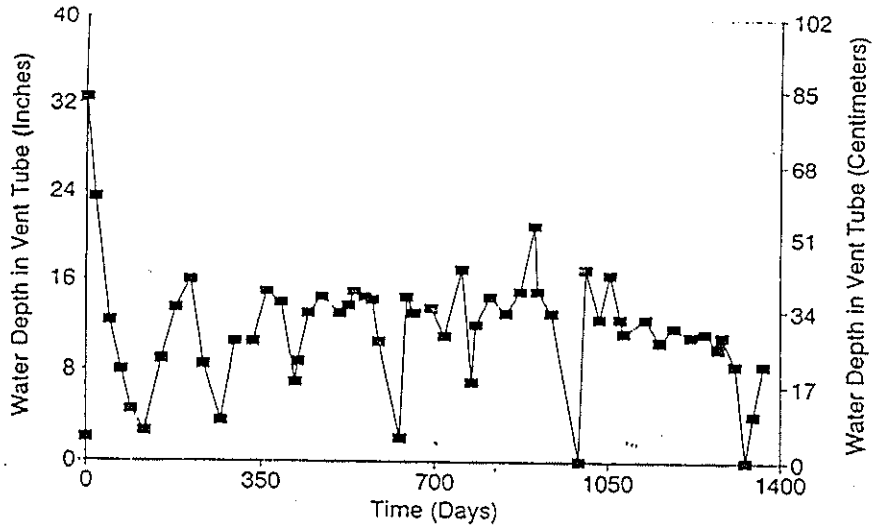

Figure 1. Ponding Depths in Soil Absorption Bed With Time for Site 4. Depth Zero Represents the Invert of the Distribution Pipe, not the Bottom of the System.

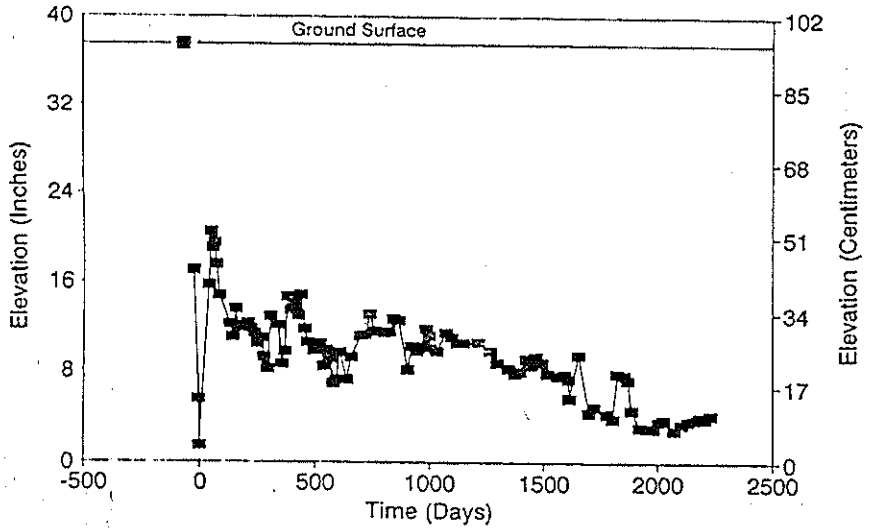

Figure 2. Ponding Depths in Soil Absorption Bed with Time for Site 11 to Bottom of System.

SUMMARY AND CONCLUSIONS

This study evaluates the concept of adding aerobically treated effluent with low BOD and suspended solids from aerobic units in an attempt to renovate the soil absorption unit. Aerobic units were installed behind the septic tank in fifteen units in which the effluent was backing up into the house, ponding in the absorption unit or breaking out on the ground surface. In most cases the only alteration was the installation of the aerobic unit and pumping of the soil absorption unit. Thirteen of the 15 units have accepted all of the wastewater added after installation of the aerobic unit. The dry well on one system was vastly undersized for the amount of effluent added and needed occasional pumping. Another system needed occasional pumping for only 6 months at which time it started to accept all of the waste water. The soil absorption unit at another site needs occasional pumping 9 mo. after the installation of the aerobic unit. The aerobic unit has experienced some start up problems. Taking into account these limitations, it appears that failing soil absorption systems can be successfully renovated by adding aerobically pretreated effluent.

As a result of this study, the State of Wisconsin is allowing systems that are failing due to clogging mat development to be renovated using aerobically treated effluent from aerobic units or sandfilters provided the site meets separation requirements between the aggregate/soil interface and limiting conditions of highwater table or bedrock.

REFERENCES

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FAST wastewater treatment system

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FAST Installation Manual

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BIO-MICROBICS INCORPORATED

INSTALLATION MANUAL

SINGLE HOME FAST® OR MICRO FAST® WASTEWATER TREATMENT SYSTEM

IMPORTANT: ALL WORK MUST CONFORM TO LOCAL ELECTRICAL, PLUMBING, AND BUILDING CODES.

Revised May, 1997

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Materials Required for Installation

- Septic tank with minimum dimension requirements shown on installation drawing and fabricated according to IATMO, ANSI or appropriate standards.
- Recognized, safe lifting mechanism for module.
- 18-22 linear feet of concrete joint sealant compound. (14-18 linear feet for Micro FAST®.)
- Anchor bolts or other commercially available anchoring system to secure module to septic tank.
- 2", 4" and 6" PVC Schedule 40 pipe and fittings. Optional: 3" PVC Schedule 40 pipe and fitting: see Recommended Installation Procedure.
- Pipe joint lubricant
- PVC primer and glue
- Optional: small riser section with cover, minimum 15" inner diameter. See Recommended Installation Procedure.
- Base (concrete preferred) for blower assembly. See Recommended Installation Procedure.
- Mounting hardware for control panel.
- Electrical underground conduit or wiring for connecting control panel to blower assembly.

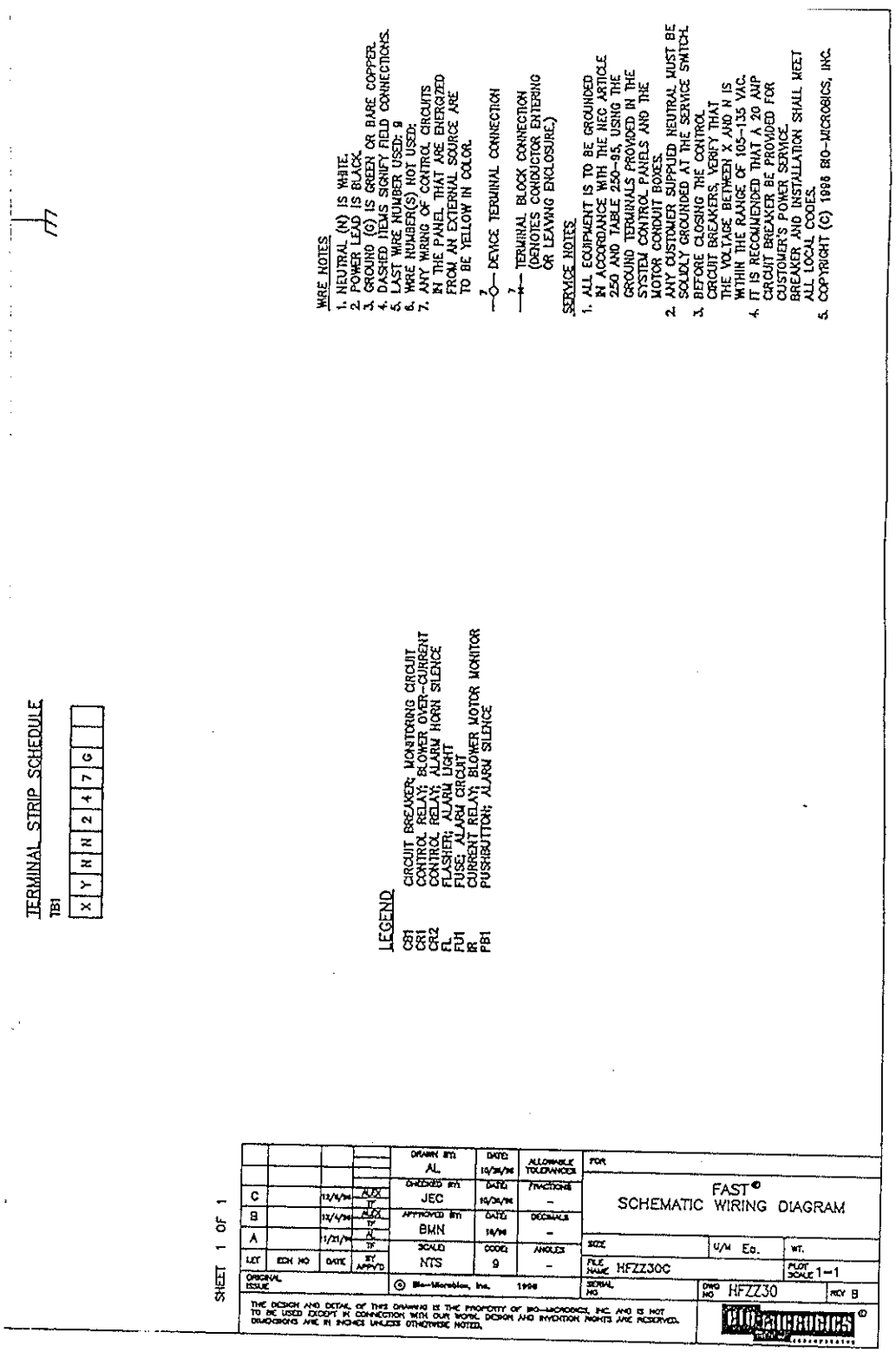
IMPORTANT INFORMATION

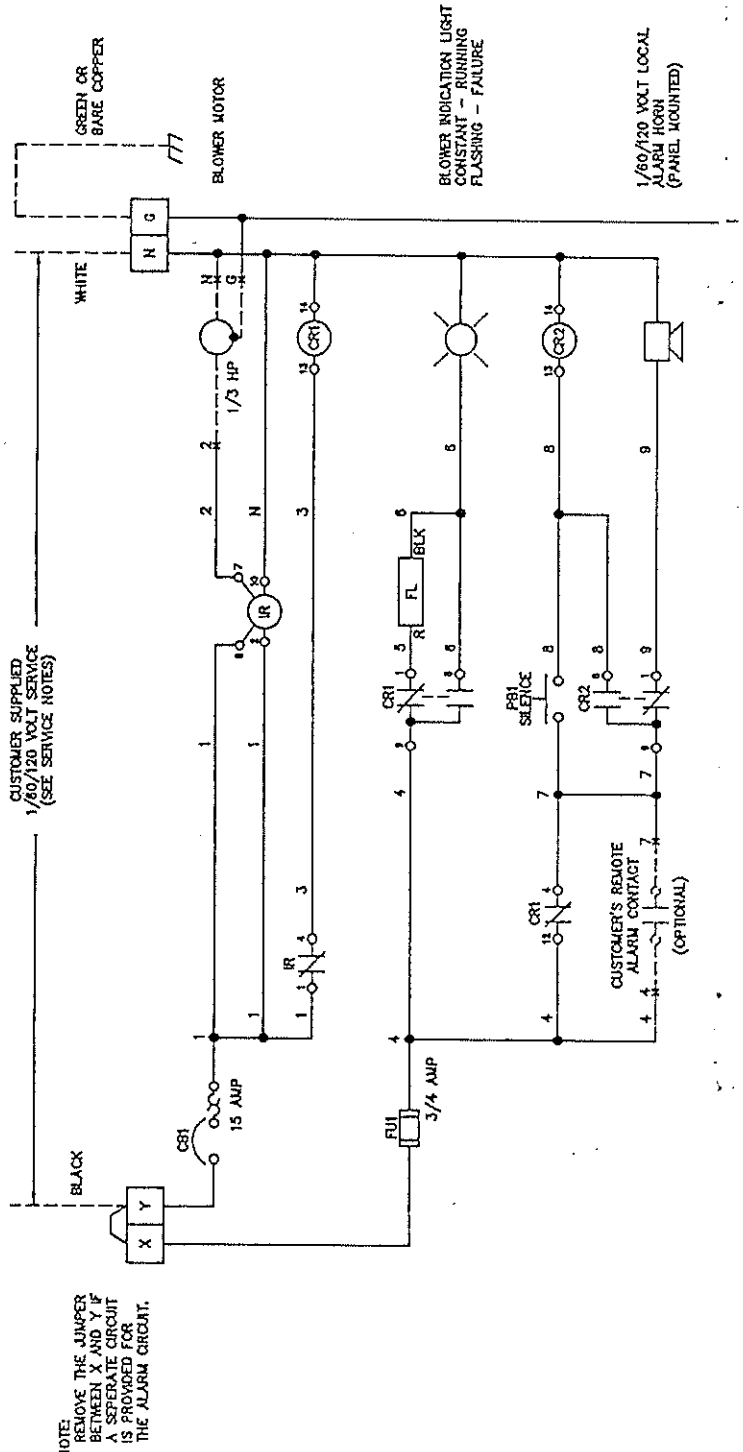
Please read and follow the cautionary notes given below and those found elsewhere in this manual. If you have questions regarding the safety or operation of your Single Home FAST® or Micro FAST®, contact Bio-Microbics, Inc. at 1-800-753-3278 (753-FAST).

WARNING: *The installer must assure that the installation site is safe from hazards. These could include excavations left open overnight, debris left lying around, and tanks and equipment not properly blocked. Provisions must be made to eliminate the above potential hazards by roping off and proper shoring around the excavations, cleaning up at the end of each work day and proper storage of equipment. Failure to do so could result in severe bodily injury or death.*

WARNING: *Hazards exist in confined spaces such as a new or used buried septic tank. No one should be allowed to enter the tank under any circumstances. The hazards include presence of dangerous or fatal gases, insufficient oxygen, and the collapse of the tank and entrapment of personnel. Always keep tank openings covered during storage and installation. Failure to do so could result in severe bodily injury or death.*

WARNING: *If any person comes in contact with any of the wastewater (influent or effluent), immediately remove all contaminated clothing and soak in a detergent solution with a disinfectant. The person who has come in contact with the wastewater should then thoroughly wash the exposed area with soap and water and immediately call his or her personal physician. Failure to do so could result in severe bodily injury or death.*





LOCATION

Single Home FAST or Micro FAST may be located in the same position relative to the house and water supply as any conventional septic system; however, some basic guidelines should be followed:

WARNING: *Always check with the local utility companies for the locations of water line, electrical and telephone cables or any additional hazards below grade prior to excavation. Failure to do so could result in severe bodily injury or death.*

1. Single Home FAST or Micro FAST is only designed to withstand the weight of the soil up to a burial depth of 4 feet (1.2 meters). It is not designed to withstand loads from concrete slabs, vehicles, or buildings. Do not place the tank in a location where it could be subjected to additional weight.

CAUTION: *If the burial depth must be more than four feet or if the area is subjected to additional weight, such as from occasional standing water, contact Bio-Microbics at 1-800-753-FAST.*

2. Single Home FAST or Micro FAST must be located so that sufficient slope is provided for the influent and effluent lines. If either of these two lines becomes blocked, there is risk of excess water backing up into the house. A 2% slope is recommended for this. A 2% slope equates to a drop of two feet over a run length of one hundred feet. This also equates to 1/4 inch per foot .
3. Single Home FAST or Micro FAST must be located so that vents and air intakes will be protected from snow drifts.
4. Avoid locating Single Home FAST or Micro FAST® in high groundwater areas where the tank could possibly float up and become dislodged.
5. The blower housing should be no more than 100 feet from the Single Home FAST or Micro FAST.

   NOTICE: *The blower must be placed at an elevation higher than the water level in the treatment unit.*

NOTICE: *Never place the Single Home FAST or Micro FAST in a location where the plant effluent has any opportunity to enter the ground water supply. If there are any questions, contact the local health*

department and local environmental department.

7. When installing a new septic tank, make sure the inlet is a minimum of 3 inches (8 cm) above the outlet. If the tank is installed with the inlet below normal operating water level, Bio-Microbics, Inc. will not accept responsibility for operation of the unit.

Documentation must be maintained by installers verifying the minimum dimensions of the tank as well as its structural integrity.

If the tank is out of the minimum dimensional range specified, Single Home FAST or Micro FAST will not operate properly. The effluent quality will suffer and may not meet the standards. If the treatment plant is installed in a manner that violates the above guidelines or dimensional ranges, Bio-Microbics, Inc. will not accept any responsibility for its process or mechanical performance.

INSPECTION

Your Single Home FAST or Micro FAST has been carefully manufactured, checked and tested at the factory before shipment. Upon receiving the unit, please do the following:

1. Before uncrating, check the packaging for signs of shipping damage. If there is evidence of damage or abuse, notify Bio-Microbics, Inc. at (913) 492-0707.

2. After uncrating, inspect the unit to ensure no components are missing. Also inspect for damage to the unit. If any discrepancies are found, notify Bio-Microbics, Inc. at (913) 492-0707.

If the unit is free of damage, uncrate completely and proceed with the installation.

LIMITED 24-MONTH WARRANTY

Bio-Microbics, Inc. warrants every new Single Home FAST or Micro FAST against defects in materials and workmanship for a period of two years after installation or three years from date of shipment, whichever occurs first, subject to the following terms and conditions:

During the warranty period, if any part is defective or fails to perform as specified when operating at design conditions and if the equipment has been installed and is being operated and maintained in accordance with the written instructions provided by Bio-Microbics, Inc., Bio-Microbics, Inc. will repair or replace at its discretion such defective parts free of charge. Defective parts must be returned by owner to Bio-Microbics, Inc.'s factory postage paid, if so requested. The cost of labor and all other expenses resulting from replacement of the defective parts and from installation of parts furnished under this warranty and regular maintenance items such as filters or bulbs shall be borne by the owner. This warranty does not cover aerator components which have been damaged by flooding or improper storage or any components that have been disassembled by unauthorized persons, improperly installed or damaged due to altered or improper wiring or overload protection. This warranty applies only to the treatment plant, and does not include any of the house wiring, plumbing, drainage, septic tank or disposal system. Bio-Microbics, Inc. reserves the right to revise, change, or modify the construction and/or design of the Single Home FAST or Micro FAST , or any component part or parts thereof, without incurring any obligation to make such changes or modifications in present equipment. Bio-Microbics, Inc. is not responsible for consequential or incidental damages of any nature resulting from such things as, but not limited to, defects in design, material, workmanship, or delays in delivery, replacements, or repairs.

THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. ANY WARRANTY IMPLIED BY LAW, INCLUDING WARRANTIES OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE, IS IN EFFECT ONLY FOR THE WARRANTY PERIOD SPECIFIED ABOVE. NO REPRESENTATIVE OR PERSON IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR TO ASSUME FOR BIO-MICROBICS, INC., ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF ITS PRODUCTS.

CONTACT YOUR LOCAL DISTRIBUTOR FOR PARTS AND SERVICE.

Referring to the electrical drawing in this manual, connect the electrical cable to the blower and control cabinet per the wiring diagram and all applicable codes. The control cabinet meets NEMA standards for indoor and outdoor use. It is rated for watertight and dust-tight integrity and is constructed of corrosion-resistant materials. The location of the panel must be in compliance with all local codes.

Step 7: Final Installation Inspection

It is the responsibility of the installer to fill the tank to the operating water line prior to backfilling the excavation. If the tank is not filled, heavy rains after backfilling could cause the tank to float and damage the surrounding grounds.

Before unit is backfilled:

- Fill the tank to the operating water line.
- Check for leaks in all watertight seals. If leaks are found, reseal leaking areas.
- Ensure that the air supply line is properly installed and connected to the tank and blower.
- Turn on the blower and observe the operation of the airlift through the observation port (see Figure 2).

If the unit is level, contains no leaks, and has an even flow dispersion of water, then backfill the excavation.

Step 8: Start-Up Procedures

- Seed the unit with normal household waste.
- Allow system to run for a minimum of 10 days to establish biomass population and attachment of biomass.
  * In colder climates, it may require a longer time to establish the biomass population.
  * Do not introduce limited-use substances during the population establishment period.
- After the ten-day biomass population initiation period, continue normal use of unit as described in the Homeowner's Manual.

THE FAST SYSTEM

FAST stands for Fixed Activated Sludge Treatment. In the Single Home FAST or Micro FAST process, a colony of bacteria called the biomass breaks down biodegradable waste into carbon dioxide and water. The process occurs continuously as long as the biomass is supplied with food (incoming waste) and oxygen (air) in a suitable environment. Solid material that the biomass cannot process and bacteria that die settle in the septic tank for normal pump-out removal.

The FAST process consists of the treatment tank and the blower (air source). The blower provides continuous air to the treatment tank through the air supply pipe. The air supply pipe combines with the draft tube to create an air lift. This air lift is the means by which air and wastewater are mixed within the tank. The air lift lifts the wastewater to the splash plate. The wastewater is cascaded off the splash plate across the surface of the honeycomb media.

The treatment tank is located below ground. Its rugged construction is designed to support the weight of four feet of burial depth. It is designed to resist deterioration and corrosion. The honeycomb media is the heart of the FAST process and is suspended in the septic tank. The media contains the biomass, the colony of bacteria that stabilizes the wastewater. By growing on the honeycomb media and receiving food and air necessary for growth from the airlift, the biomass is allowed to stabilize (eat) the waste before it is discharged to the drain field. In a traditional septic tank and some other aerobic treatment systems, the biomass is allowed to suspend in the wastewater. Therefore, it has a greater opportunity to be discharged into the drain field. The Fixed Activated Sludge Treatment system keeps the active biomass on the media and not in the water. This allows for cleaner water to be discharged to the drain field.

The vent pipe allows for venting of air and non-harmful carbon dioxide created by the process.

Eventually, as the biomass dies, sloughs off the media and collects at the bottom of the tank, the tank will need to be pumped out. The pumpout cover provides a convenient means of access to the the tank with limited disturbance of the surrounding landscape.

RECOMMENDED INSTALLATION PROCEDURE

The performance of this unit depends on the disposal method of the effluent. The method and arrangement for disposal must not cause a backup or any other interference with the treatment plant's operation. The technique and equipment used for the effluent disposal must be approved by the local or state health and environmental agencies.

Before installation of the module may begin, check the tank to ensure it is level within 1 inch from inlet to outlet and 1-1/2 inch from side to side.

Once the tank is in place and level and in compliance with local health, environmental and plumbing regulatory agencies, the installation of the module may begin.

Step 1: Insert Module Into Septic Tank

First, locate the 4" treated water outlet pipe gasket. Make sure it is positioned properly in the effluent channel wall. The flange of the gasket should rest flat against the outside module wall. (See Figure 1.)

It is critical that the mating surfaces of the module flange and tank top be sealed to prevent ground water seepage into the system. (See Figure 2.) A non-hardening sealant must be spread under the module flange or around the perimeter of the septic tank cut-out.

WARNING: *Use recognized, safe lifting techniques to set module in cutout of septic tank. Make sure all lifting equipment is clear of overhead obstructions such as power lines, trees or rooftops when lifting apparatus near the excavation. Always be careful to place the lifting equipment on solid, stable ground to prevent ground giving way beneath the equipment.*

Embedded bolts or another commercially available anchoring system should be used to anchor the module to the septic tank. Drill holes through the module flange and into the tank to insert the anchors.

WARNING: *All electrical work should be performed by a qualified electrician and per all applicable codes. Failure to do so may result in severe bodily injury or death.*

The location of the air supply line and electrical conduit in the concrete slab is shown below.

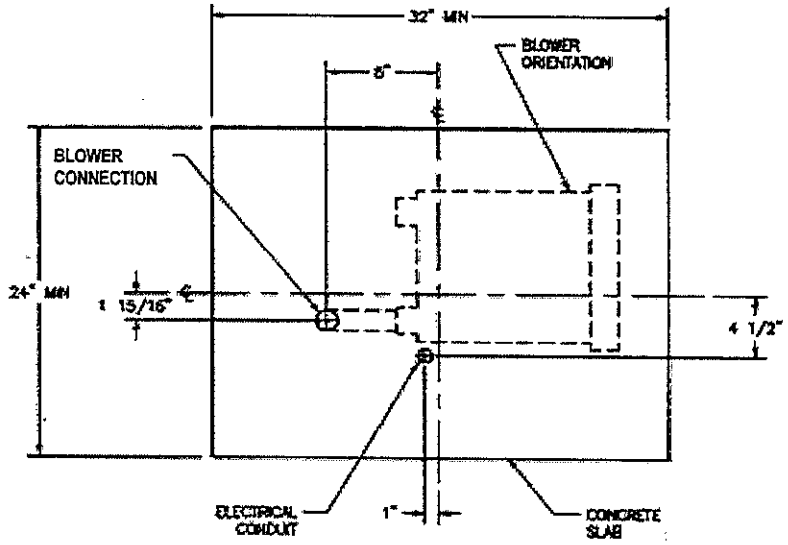


FIGURE 5

Once the air supply pipe and electrical conduit have been run, the concrete slab can be poured. (See Figure 5.) Care should be taken so that no debris enters the air supply pipe during construction of the concrete slab. A precast concrete slab can also be used by drilling the appropriate holes for the air supply pipe and electrical conduit.

The blower housing should be placed on the concrete slab so that the blower discharge is aligned with the air supply pipe. Use the existing holes in the bottom of the housing to match drill holes in the slab for anchors. Place anchors in the newly drilled holes.

Solvent weld the air supply pipe to the blower connection (see Figure 5). It is recommended that a union be placed in this line for ease of disassembly.

Step 5: Install Air Supply Pipe

The 2" PVC Schedule 40 air supply pipe can now be installed. This pipe should be solvent welded to the air supply connection (see Figure 2) and run to the blower housing no more than 100 feet away. Run the air supply line from the Single Home FAST or Micro FAST to the desired blower housing location. Be sure that no debris enters the pipe during installation and that the solvent weld is alalowed sufficient drying time. Be suer all connections are air-tight and permanent. Do not cover the tank with soil until the blower is connected and tested.

WARNING: *Always check with the local utility companies for the locations of water lines, electrical and telephone cables or any additional hazards below grade prior to excavation. Failure to do so could result in severe bodily injury or death.*

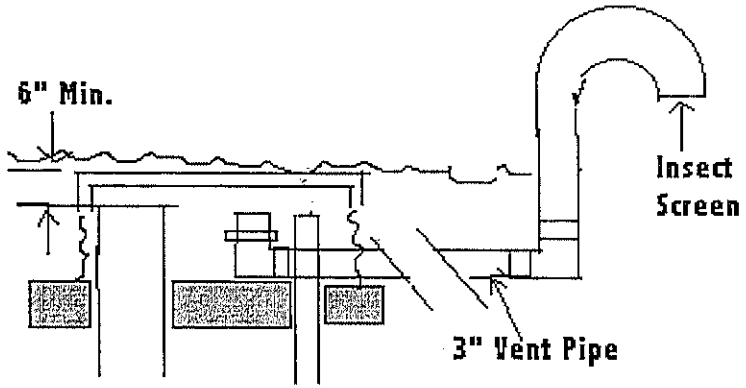


FIGURE 4

Step 6: Install Blower Housing

The blower housing should be placed on a concrete slab at least two feet above the treated water outlet pipe (see Figure 1). Both the electrical conduit and air supply line must pass through the concrete slab from below grade.

The electrical supply conduit should be run from the control panel to the desired blower location.

Step 2: Install Treated Water Outlet Pipe

The four-inch treated water effluent pipe gasket must be in line with the outlet hole of the tank. Four inch, schedule 40 PVC pipe fits through the treated water outlet pipe gasket. Lubricate with pipe joint lubricant 2" of the end of the pipe before pushing the pipe through the tank outlet and into the gasket. Do not push the pipe more than 2" through the gasket. Seal the area where the effluent line passes through the tank wall. Make sure this is watertight and done in compliance with local codes. (See Figure 1).

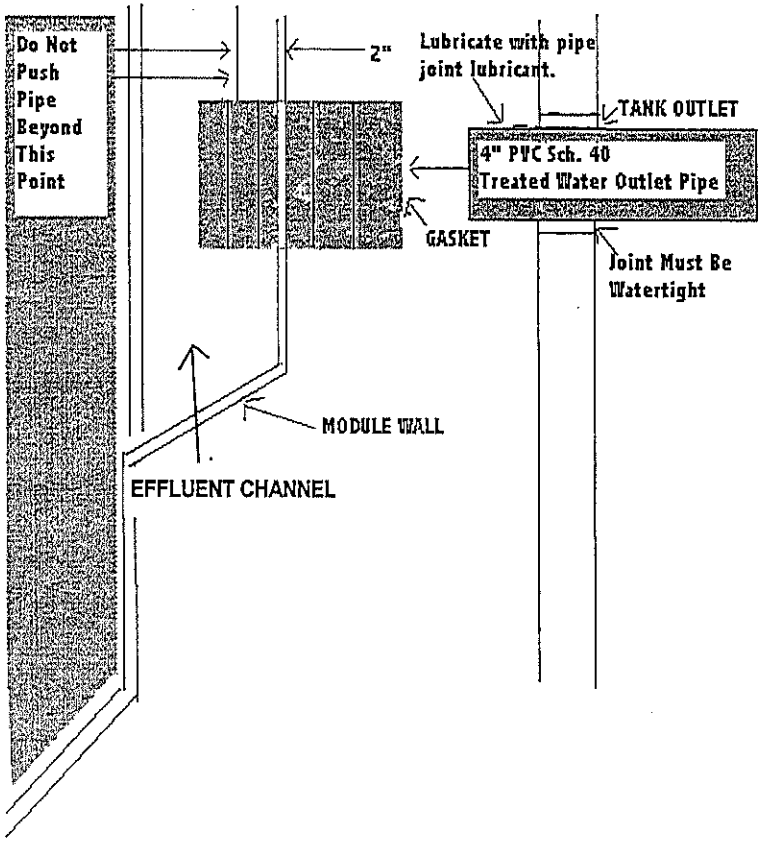
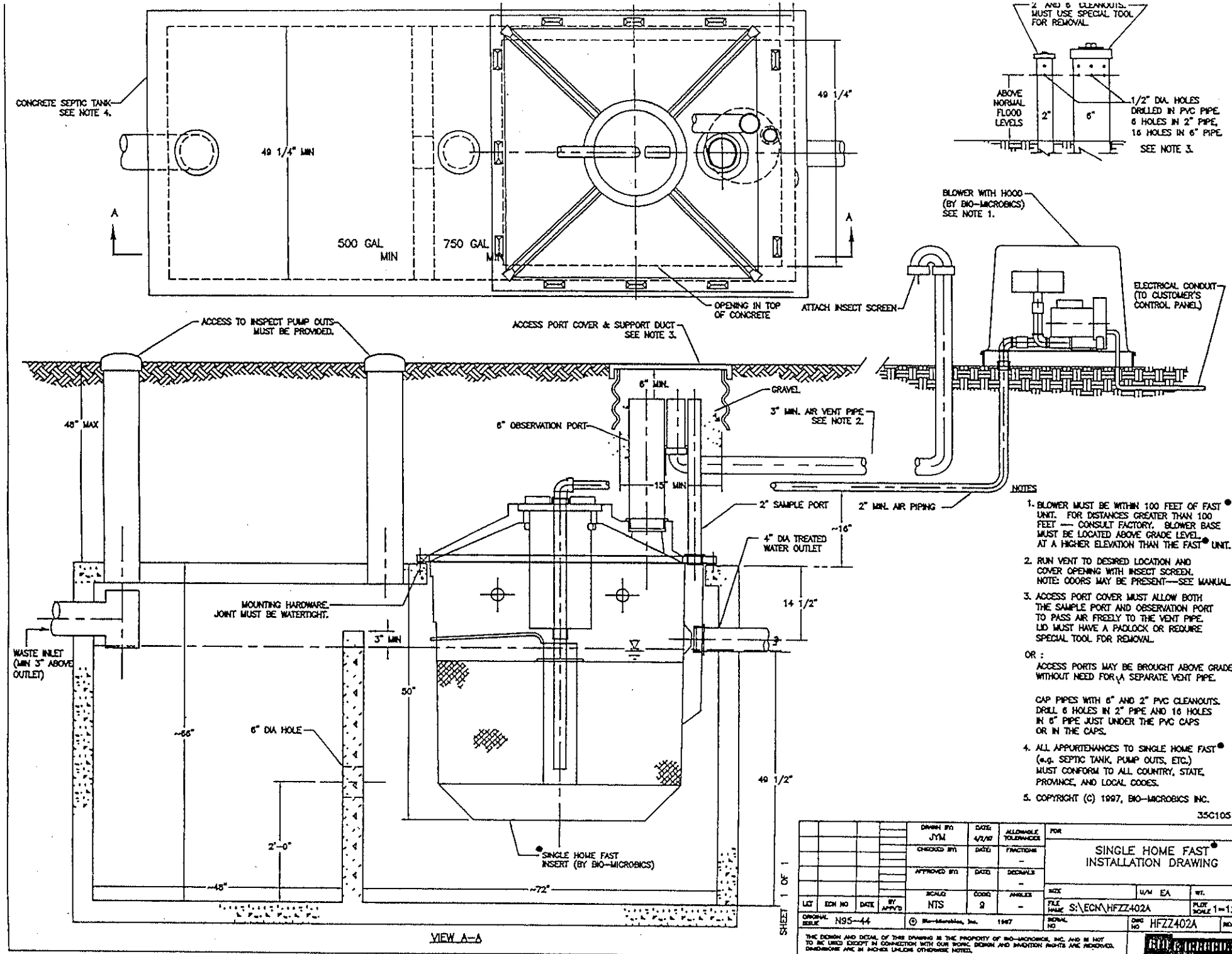


FIGURE 1



VIEW A-A

NOTES

1. BLOWER MUST BE WITHIN 100 FEET OF FAST® UNIT. FOR DISTANCES GREATER THAN 100 FEET — CONSULT FACTORY. BLOWER BASE MUST BE LOCATED ABOVE GRADE LEVEL, AT A HIGHER ELEVATION THAN THE FAST® UNIT.
2. RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH INSECT SCREEN. NOTE: ODORS MAY BE PRESENT—SEE MANUAL.
3. ACCESS PORT COVER MUST ALLOW BOTH THE SAMPLE PORT AND OBSERVATION PORT TO PASS AIR FREELY TO THE VENT PIPE. LID MUST HAVE A PADLOCK OR REQUIRE SPECIAL TOOL FOR REMOVAL.

   OR :

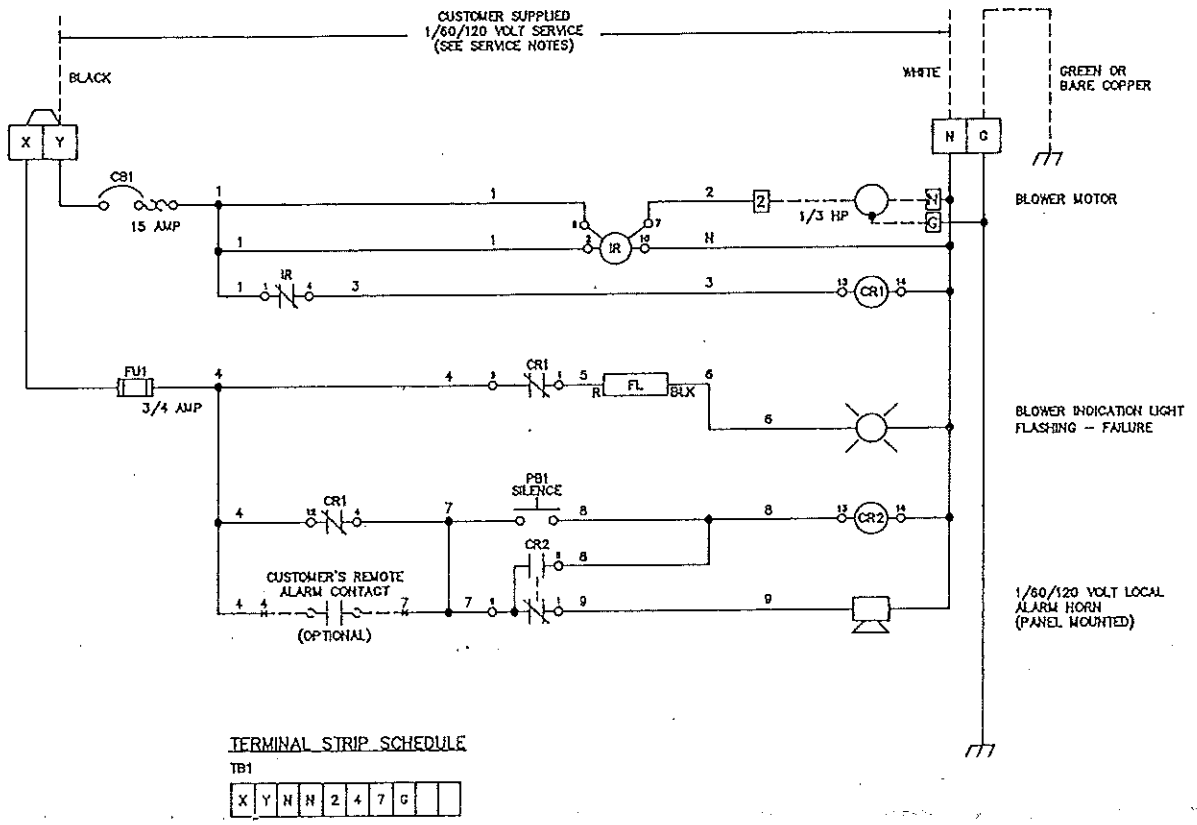
   ACCESS PORTS MAY BE BROUGHT ABOVE GRADE WITHOUT NEED FOR A SEPARATE VENT PIPE.

   CAP PIPES WITH 6" AND 2" PVC CLEANOUTS. DRILL 6 HOLES IN 2" PIPE AND 16 HOLES IN 6" PIPE JUST UNDER THE PVC CAPS OR IN THE CAPS.
4. ALL APPURTENANCES TO SINGLE HOME FAST® (e.g. SEPTIC TANK, PUMP OUTS, ETC.) MUST CONFORM TO ALL COUNTRY, STATE, PROVINCE, AND LOCAL CODES.
5.

35C105

				DRAWN BY: JYM	DATE: 4/1/97	ALLOWABLE TOLERANCES	FOR
				CHECKED BY:	DATE:	FRACTIONS: -	SINGLE HOME FAST® INSTALLATION DRAWING
				APPROVED BY:	DATE:	DECIMALS: -	
LET	ECN NO	DATE	BY APP'D	SCALE: NTS	CODE: 9	ANGLES: -	MDL: U/M: EA WT:
							FILE NAME: S:\ECN\HFZZ402A PLOT SCALE: 1=12.000
ORIGINAL ISSUE: N95-44							SIGNAL NO: DWG NO: HFZZ402A REV:

BIO-MICROBICS



TERMINAL STRIP SCHEDULE

TB1

X	Y	N	N	2	4	7	G			

SHEET 1 OF 1

LEGEND

CB1	CIRCUIT BREAKER; MONITORING CIRCUIT
CR1	CONTROL RELAY; BLOWER OVER-CURRENT
CR2	CONTROL RELAY; ALARM HORN SILENCE
FL	FLASHER; ALARM LIGHT
FU1	FUSE; ALARM CIRCUIT
IR	CURRENT RELAY; BLOWER MOTOR MONITOR
PB1	PUSHBUTTON; ALARM SILENCE

WIRE NOTES

1. NEUTRAL (N) IS WHITE.
2. POWER LEAD IS BLACK.
3. GROUND (G) IS GREEN OR BARE COPPER.
4. DASHED ITEMS SIGNIFY FIELD CONNECTIONS.
5. LAST WIRE NUMBER USED: 9
6. WIRE NUMBER(S) NOT USED:
7. ANY WIRING OF CONTROL CIRCUITS IN THE PANEL THAT ARE ENERGIZED FROM AN EXTERNAL SOURCE ARE TO BE YELLOW IN COLOR.

—○— DEVICE TERMINAL CONNECTION

—|— TERMINAL BLOCK CONNECTION (DENOTES CONDUCTOR ENTERING OR LEAVING ENCLOSURE.)

SERVICE NOTES

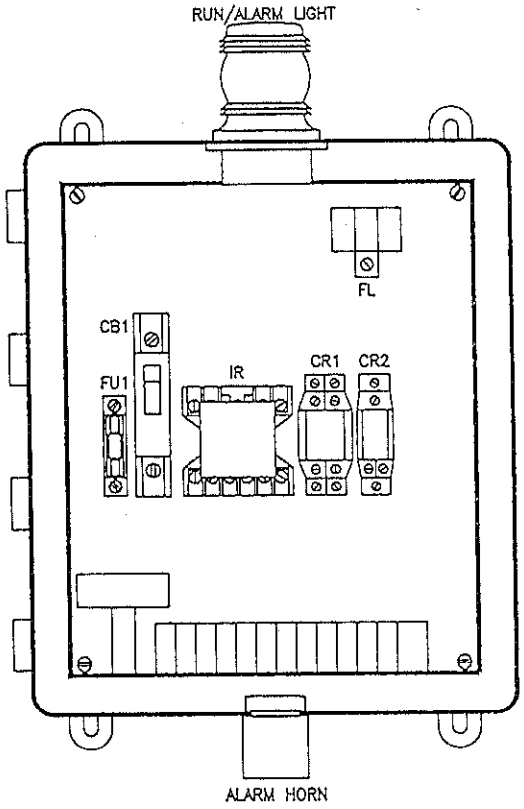
1. ALL EQUIPMENT IS TO BE GROUNDED IN ACCORDANCE WITH THE NEC ARTICLE 250 AND TABLE 250-95, USING THE GROUND TERMINALS PROVIDED IN THE SYSTEM CONTROL PANELS AND THE MOTOR CONDUIT BOXES.
2. ANY CUSTOMER SUPPLIED NEUTRAL MUST BE SOLIDLY GROUNDED AT THE SERVICE SWITCH.
3. BEFORE CLOSING THE CONTROL CIRCUIT BREAKERS, VERIFY THAT THE VOLTAGE BETWEEN X AND N IS WITHIN THE RANGE OF 105-135 VAC.
4. IT IS RECOMMENDED THAT A 20 AMP CIRCUIT BREAKER BE PROVIDED FOR CUSTOMER'S POWER SERVICE. BREAKER AND INSTALLATION SHALL MEET ALL LOCAL CODES.
5.

FAST® SCHEMATIC WIRING DIAGRAM

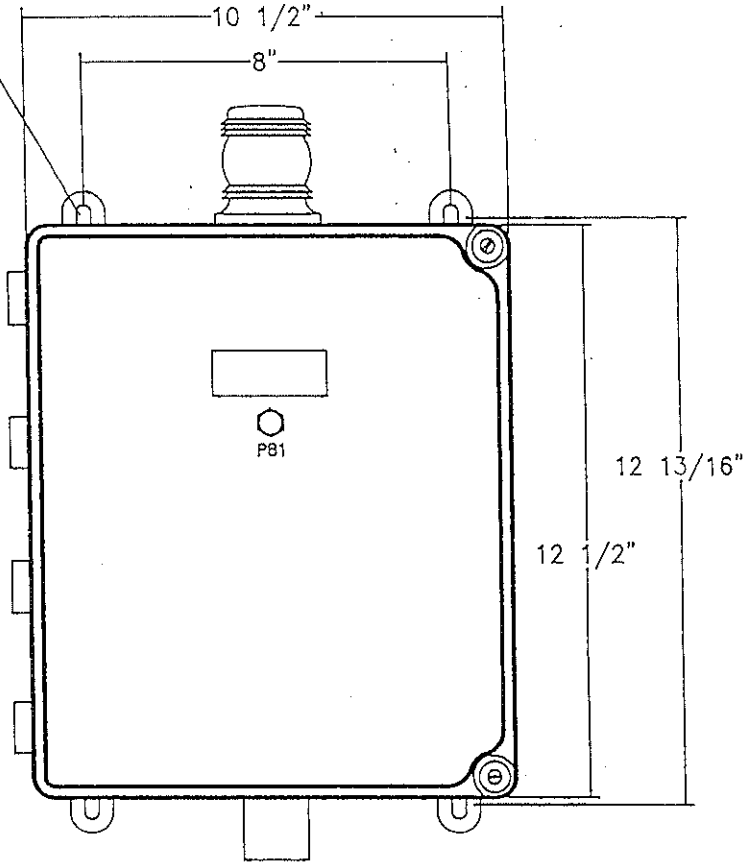
FASTCTRL

CONTROLS

Rev B



INTERIOR VIEW
DOOR REMOVED FOR CLARITY



EXTERIOR VIEW

NEMA 4X POLYCARBONATE ENCLOSURE – 6" DEEP

NOTES:

					DRAWN BY: AL	DATE: 11/XX/96	ALLOWABLE TOLERANCES	FOR
					CHECKED BY: TF	DATE: 11/96	FRACTIONS ±1/16"	SINGLE HOME FAST® CONTROL PANEL LAYOUT SALES
B		12/4/96	ADK		APPROVED BY: BMN	DATE: 11/96	DECIMALS .-	
A		12/4/96	ADK		SCALE: NTS	CODE: 1	ANGLES .-	SIZE: A4 EA WT.
LET	ECN NO	DATE	BY APPD					FILE NAME: HFZZ358 PLOT SCALE: 1=2.000

ORIGINAL RELEASE

TECHNICAL NO.

DWG NO. HFZZ35 REV B

BIO-MICROBICS

SHEET 1 OF 1

BIO-MICROBICS INCORPORATED

FAST wastewater treatment system

BIO-MICROBICS INCORPORATED

Bio-Microbics, Inc.
8271 Melrose Drive
Lenexa, KS 66214
913-492-0707
1-800-753-FAST
Fax: 913-492-0808
E-mail: onsite@biomicrobics.com
Web site: www.biomicrobics.com

FAST
FAST
FAST
FAST
FAST
FAST
FAST
FAST
FAST

Service Manual

SERVICE MANUAL

SINGLE HOME FAST®
AND MICRO FAST®
WASTEWATER TREATMENT SYSTEMS

BIO-MICROBICS
INCORPORATED

IMPORTANT: *All work must conform to local electrical, plumbing, and building codes.*

Revised May, 1997

TABLE OF CONTENTS

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LIMITED 24-MONTH WARRANTY

Bio-Microbics, Inc. warrants every new Single Home FAST or Micro FAST against defects in materials and workmanship for a period of two years after installation subject to the following terms and conditions:

During the warranty period, if any part is defective or fails to perform as specified when operating at design conditions and if the equipment has been installed and is being operated and maintained in accordance with the written instructions provided by Bio-Microbics, Inc., Bio-Microbics, Inc. will repair or replace at its discretion such defective parts free of charge. Defective parts must be returned by owner to Bio-Microbics, Inc.'s factory postage paid, if so requested. The cost of labor and all other expenses resulting from replacement of the defective parts and from installation of parts furnished under this warranty and regular maintenance items such as filters or bulbs shall be borne by the owner. This warranty does not cover aerator components which have been damaged by flooding or improper storage or any components that have been disassembled by unauthorized persons, improperly installed or damaged due to altered or improper wiring or overload protection. This warranty applies only to the treatment plant, and does not include any of the house wiring, plumbing, drainage, septic tank or disposal system. Bio-Microbics, Inc. reserves the right to revise, change, or modify the construction and/or design of the Single Home FAST or Micro FAST , or any component part or parts thereof, without incurring any obligation to make such changes or modifications in present equipment. Bio-Microbics, Inc. is not responsible for consequential or incidental damages of any nature resulting from such things as, but not limited to, defects in design, material, workmanship, or delays in delivery, replacements, or repairs.

THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. ANY WARRANTY IMPLIED BY LAW, INCLUDING WARRANTIES OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE, IS IN EFFECT ONLY FOR THE WARRANTY PERIOD SPECIFIED ABOVE. NO REPRESENTATIVE OR PERSON IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR TO ASSUME FOR BIO-MICROBICS, INC., ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF ITS PRODUCTS.

CONTACT YOUR LOCAL DISTRIBUTOR FOR PARTS AND SERVICE.

IMPORTANT INFORMATION

Please read and follow the cautionary notes given below and those found elsewhere in this manual. If you have questions regarding the safety or operation of the Single Home FAST® or Micro FAST® Sewage Treatment system, contact Bio-Microbics at 1-800-753-3278 (1-800-753-FAST).

WARNING: *Hazards exist in confined spaces such as a new or used buried septic tank. No one should be allowed to enter the tank under any circumstances. The hazards include presence of dangerous or fatal gases, insufficient oxygen, or the collapse of the tank and entrapment of personnel.*

WARNING: *Anyone coming in contact with wastewater must remove any contaminated clothing and thoroughly wash all body areas and clothing exposed to wastewater with soap and water, then consult a physician to minimize the risk of illness.*

INTRODUCTION

The Bio-Microbics, Inc. FAST® process is an aerobic biological treatment system. The unit will operate on a continuous treatment basis versus a batch type process. The entire treatment process consists of a primary sedimentation zone and the secondary aerobic biological zone.

The acronym, FAST, stands for **F**ixed **A**ctivated **S**ludge **T**reatment. This describes the method of fixing a bacteria colony in the treatable fluid. A honeycomb type media block is submerged in the wastewater in the aerobic zone. The bacterial colony will attach itself to the surface of the media.

This process is protected by one or more of the following patents: 3,966,599; 3,966,608; 3,972,965; 5,156,742.

The Single Home FAST treatment plant is designed to process the waste produced by all typical activities of up to a twelve member family (ten when nitrification and denitrification are desired.) Micro FAST is designed to process the waste produced by all typical activities of up to an eight member family. There are peaks and lulls in the daily flow rate. The plant can still treat the waste produced at peak flows as well as preserve life of the biomass during the lull periods.

The treatment plant is designed to operate on standard household current. The input power required for the motor is 120 volts, A.C., 60 Hz. The input power to the alarm circuit is also 120 volts, A.C., 60 Hz.

DEFINITIONS

Some definitions are helpful in understanding how the biological process of waste treatment occurs.

AEROBIC: Living or occurring only in the presence of oxygen.

ALKALINITY: The quantity of ions in the solution that will react to neutralize hydrogen ions. It is thus a measure of the ability of the solution to neutralize acids.

ANAEROBIC: A condition where the supply of oxygen has stopped.

BIOMASS: The bacteria colony that establishes itself in the secondary zone of the treatment plant. This colony utilizes the sewage and oxygen as food. Its waste is primarily carbon dioxide and water.

RECOMMENDED SPARE PARTS

The following is a list of factory recommended spare parts and the quantity that should be kept in stock per the number of units sold. The quantities listed are minimums. If field experience suggests additional components or quantities are required, this list may be expanded.

QUANTITY	DESCRIPTION
1 ea./10 units	Pilot light assembly
1/unit	Pilot light lamp
1/5 units	Relay (CR1 & CR2)
1/10 units	Circuit breaker
1/10 units	Blower
1/10 units	Fuses
	Horn
	E.T.M. (optional)
	Switch
	Flasher
	Current Sensor
	Air Filter

For more information about the FAST systems, or for purchase of spare parts, contact:

BIO-MICROBICS INCORPORATED

8271 Melrose Drive
Lenexa, KS 66215
Tel: (913) 492-0707 (800) 753-FAST
Fax: (913) 492-0808
e-mail: onsite@biomicrobics.com

Blower Filter

Removal:

1. Follow steps 1 and 2 of Blower Assembly Removal procedure.

DANGER: Electrical Hazard.
Disconnect power before servicing. Failure to do so may result in electrical shock causing serious bodily injury or death.

2. Remove wing nut from top of blower housing and remove filter housing cover.
3. Remove filter while preventing any particles or dirt from entering inlet piping to blower.
4. Clean filter base while preventing any particles or dirt from entering inlet piping to blower.

Installation:

1. Make sure the circuit breaker in the Single Home FAST or Micro FAST control panel is in the OFF position.

DANGER: Electrical Hazard.
Disconnect power before servicing. Failure to do so may result in electrical shock causing serious bodily injury or death.

2. Make sure filter base is clean of any particles or dirt.
3. Install filter onto base.
4. Install filter assembly cover and secure with the wing nut removed during the removal procedure.
5. Follow steps 9 and 10 of Blower Assembly Installation procedure.

Underground Components

As there are no components underground which require repair or maintenance, there is no need to gain manual access to any underground components of the Single Home FAST or Micro FAST system.

Control Panel Components

See drawing affixed in the center of this book.

COLLOIDS: These are very small particles that are, by definition, suspended solids, but have characteristics of dissolved solids such as passing through filters.

DISSOLVED SOLIDS: This consists of molecules and ions that are held in suspension by the molecular structure of the solution medium.

EFFLUENT: The treated waste that is discharged from the reactor. The Bio-Microbics, Inc. The FAST system utilizes part of the reactor tank for primary treatment. The secondary treatment is achieved in the aerobic zone inside the insert.

FLOCCULATION: The action of suspended and colloidal solids to collect together into a larger mass.

HARDNESS: This is the concentration of multivalent metallic cations in solutions.

INFLUENT: This is the raw waste that enters the reactor for treatment.

PRIMARY TREATMENT: The purpose of the primary treatment of wastewater is to remove the solid materials from the incoming stream. It is generally done by screens and/or settling zones.

REACTOR: The physical vessel or container plus all of its related components where the treatment processes take place.

SECONDARY TREATMENT: This usually consist of the biological conversion of dissolved and colloidal organics to biomass that will settle to the bottom of the reactor.

SUSPENDED SOLIDS: Particles larger than molecular size that are supported by the buoyant and viscous forces of the solution medium.

TERTIARY TREATMENT: This most often involves further removal of suspended solids and/or nutrients.

TURBIDITY: This is a measure of the extent that light is either absorbed or scattered by suspended material in the solution medium.

PROCESS DESCRIPTION

The primary treatment zone can be called the anaerobic zone and is the area from the inlet to the septic tank baffle. In this zone, primary sedimentation takes place. Heavy solids will readily settle out. Most suspended solids in wastewater are "sticky" in nature and flocculate naturally. The flocculation will aid the suspended solids in settling. In the primary treatment zone, there are no chemical coagulants or mechanical mixing to aid in flocculation. There is no skimmer in the primary zone to remove greases, oils or foam. Any floating material is prevented from passing from the primary to the secondary zone by placing the inlet to the secondary zone 24 inches above the floor.

Several biological processes and physical operations take place in the aerobic or secondary treatment zone of the FAST system. The addition of oxygen and food, plus the circulation of the fluid, allows biological cells to grow and attach themselves to the fixed media. Because of the wide variety of organics in the waste stream, a wide variety of organisms or a *mixed culture* biomass is formed. The most predominant biological reactions involve the degrading of organic matter such as proteins, carbohydrates, and lipids to carbon dioxide.

Once the biomass has established itself, several external factors may affect the rate of biomass reproduction and food utilization. The rate of biomass reproduction generally increases with increasing temperatures within the range of 0° C (32° F) to 32° C (90° F). The biological reaction rate increases with increasing temperatures. A rule of thumb for this rate is the reaction rate will double with every 10° C (50° F) temperature increase up to a maximum temperature of 32° C (90° F).

The microorganisms that degrade the wastewater organics function best in the pH range of 6 to 9. This is the typical pH range of domestic waste, but should be verified.

Toxins can poison the biomass. High salt concentrations (seawater concentrations) interfere with the internal-external pressure relationships and oxidants destroy enzyme and cell materials.

Although the microorganisms are capable of adjusting to a wide range of environmental factors, sudden changes and shocks may damage the existing biomass.

8. Remove the mounting bolts securing the blower flange to the blower housing base.
9. Lift the blower assembly off the blower housing base.

Installation:

1. Make sure the circuit breaker in the Single Home FAST or Micro FAST control panel and the main circuit breaker to the building are in the OFF position.

DANGER: Electrical Hazard.
Disconnect power before servicing. Failure to do so may result in electrical shock causing serious bodily injury or death.

NOTICE: *All electrical work should be performed by a qualified electrician and per all applicable electrical codes.*

2. Set the blower assembly on the blower housing base by matching the blower flange holes with the holes in the blower housing base.
3. Bolt the blower flange to the blower housing base using the bolts removed during the removal procedure.
4. Connect the blower outlet piping to the air line by connecting the union (if used), screwing the air line into the blower, or installing a coupling at the cut, depending on the method of removal.
5. Check the power leads coming into the blower housing with an appropriate measuring device to determine if there is power at the leads.
6. If there is no power at the leads, connect the leads to the blower using the correct scheme as noted on the inside of the motor conduit box cover.
7. Insulate the wires and fit them inside the conduit box in a professional manner.
8. Attach the conduit box cover to the conduit box using the two screws removed during the removal procedure.
9. Test the blower for correct operation by switching the circuit breakers in the control panel and the building to the ON position.
10. Put the blower housing cover on the blower housing base by matching the cover bolt holes with the base bolt holes. Bolt the cover to the base using the bolts removed during the removal procedure.

REPAIRING AND REPLACING SYSTEM COMPONENTS

Blower Assembly

Removal:

1. Remove power from the blower assembly by switching the circuit breaker in the Single Home FAST or Micro FAST control panel to the OFF position. Also, switch off the circuit breaker in the building's main service panel. If the blower is planned to be disconnected for more than 48 hours, it may be necessary to prevent the discharge of wastewater into the drain field.

DANGER: Electrical Hazard.
Disconnect power before servicing. Failure to do so may result in electrical shock causing serious bodily injury or death.

NOTICE: *All electrical work should be performed by a qualified electrician and per all applicable electrical codes.*

2. Remove blower housing cover by unscrewing the blower housing cover mounting bolts and lifting the lid off the blower housing base.
3. Remove the motor conduit box cover on the blower motor by unscrewing the two screws securing it to the conduit box.
4. Check with an appropriate measuring device to determine if there is power at the electrical wire leads in the conduit box before proceeding.
5. If there is no power at the wire leads, disconnect the power leads from the motor leads noting the connections for proper re-connection during installation. Insulate and support the wires out of the way of the blower so they won't interfere with the blower removal process.
6. Disconnect the outlet piping of the blower either by disconnecting the union (if used), unscrewing the pipe from the blower, or cutting a section of the outlet piping. If the piping needs to be cut, be sure to cut the pipe in an area such that a coupling or union (preferred) can be installed at the cut when the blower is re-installed.
7. Cover the openings in the pipe where the separation has occurred to prevent any foreign material from entering the piping.

The physical operations that take place in the secondary treatment zone are the aeration and circulation of the wastewater by the blower and airlift. This is a method of providing the biomass with a continuous fresh food and oxygen supply.

WATER QUALITY

The effluent quality standards of this unit have been found to be in compliance with and exceed the EPA standard for secondary wastewater treatment (40CFR, part 133.102) and NSF Standard 40, Class 1, which are as follows:

Parameter		Limit
$CBOD_5$		
	30 day average	25 mg/L
	7 day average	40 mg/L
TSS		
	30 day average	30 mg/L
	7 day average	45 mg/L
pH		6-9

Other factors that can be used for evaluation are the clarity of the effluent sample to within 15 units and a non-offensive odor.

INTRODUCING SUBSTANCES INTO THE SYSTEM

Introduction of harmful substances into the treatment system may reduce the efficiency of the system or stop the treatment process by destroying the biomass. These substances that reduce the efficiency or stop the treatment process can be grouped into two groups: prohibited substances and limited-use substances. While the Single Home FAST or Micro FAST will process most waste produced by the average household, the following information will maximize the system's efficiency and reduce the time period between septic tank pump-outs.

NOTICE: *Introducing prohibited substances into your Single Home FAST or Micro FAST may void the warranty.*

A. Prohibited Substances

Prohibited substances are those substances which, when present in even small amounts, will prevent the Single Home FAST or Micro FAST from providing wastewater treatment. Substances that will not dissolve may clog and possibly damage the aeration unit. Do NOT introduce the following prohibited substances into your Single Home FAST or Micro FAST:

- Plastic or rubber products,
- Petroleum products such as motor oil, paint, paint thinner, gasoline and solvents,
- Non-biodegradable products such as sanitary napkins, con doms and disposable diapers,
- Toxic substances such as pesticides, strong disinfectants and large amounts of strong caustic drain cleaners,
- Large amounts of paper products such as paper towels and synthetic fiber-reinforced products advertised as having "wet strength"
- Animal fats, such as bacon grease or lard (normal cleaning of pots and pans is acceptable).

Spills

Chemicals can enter the treatment system from chemical spills that occur on the ground around the Single Home FAST or Micro FAST septic tank or leach field. The following chemicals are prohibited substances and should not be poured into the Single Home FAST or Micro FAST septic tank or leach field:

- Herbicides,
- Pesticides,
- Paint thinner,
- Motor oil.

Problem	Possible Causes	Solutions
Wastewater is backing up into the home sewer piping.	There is an obstruction in the home sewer piping.	Check the piping lead to the FAST system visually or with drain cleaning equipment for an obstruction and correct.
	There is an obstruction in the discharge line from the FAST system.	Check the effluent piping and lateral field piping visually or with drain cleaning equipment for an obstruction and correct.
	The lateral field pump has failed.	Check the operation of the lateral field pump per the pump manufacturer's specifications.
	The flow rate to the FAST system is too high.	Check the maximum flow rate to the FAST system to see that it is within normal limits.
	The tank requires cleaning and/or a pumpout is required.	Check the sludge depth in both chambers of the tank to see if it is below required levels. If the depth is too great, have the tank pumped out and, if necessary, cleaned.
There is an unpleasant odor emanating from the FAST unit.	The blower and air piping are not operating correctly.	Check the blower, vents, and air piping for proper operation.
	The system is overloaded.	Check the maximum flow rate to the FAST unit to see that it is within normal limits.
		Check the quality and contents of the flow into the FAST unit for any abnormal or prohibited substances.

Problem	Possible Causes	Solutions
	The power cable to the blower has been damaged or is not connected properly.	Have a certified electrician check the wiring to the blower.
	The original cause for alarm has been corrected, but the flashing circuit for the indicator light has not been reset by technician.	Reset flash circuit.
The audible alarm is on.	An alarm condition has occurred. See troubleshooting items under flashing alarm indicator.	Push reset button to silence alarm.
Blower motor is making a loud whining or grinding noise.	Blower motor bearing has failed.	Remove blower and have blower motor serviced.
	A foreign object has entered blower housing.	Remove blower for service and check condition of air filter.
The blower is flooded.	Water has entered the blower housing.	The blower should be located in an area where water does not accumulate and located at least two feet above the treated water outlet pipe from the FAST system.

B. Limited-Use Substances

Limited-use substances in large concentration will reduce or stop the treatment process. These same substances in smaller concentrations will have no harmful effect on the treatment process. You may use the following substances without harming your Single Home FAST or Micro FAST if you use the substance according to the manufacturer's directions, use the substance sparingly, and do not introduce concentrated doses into the system:

- Laundry bleach
- Detergents with bleach
- Household cleaners containing sodium bactericides such as:
  - ⇒ Pine oil (disinfectant used in general purpose liquid cleaners),
  - ⇒ N-alkyl dichlorobenzyl ammonium chloride (disinfectant used in detergents and spray cleaners),
  - ⇒ Sodium hydroxide (lye-chemical used in drain openers and cleaners),
  - ⇒ Sodium dichloro-s-triazinetrione (powdered bleach used in scouring powders and automatic dishwasher detergents),
  - ⇒ Ortho-phenylphenol (bactericide used in tub and toilet bowl cleaners).

Food Waste

Some food waste, whether or not it is run through a garbage disposal, will not be treated by the Single Home FAST or Micro FAST, but will remain in solid form and fall to the bottom of the septic tank. This will not harm the Single Home FAST or Micro FAST, but frequent pump-out of the septic tank may be necessary. Therefore, you should consider not disposing of these food items through the Single Home FAST or Micro FAST:

- Animal bones
- Melon rinds
- Corn cobs
- Pits and seeds
- Eggshells
- Any other non-edible food waste

C. Acceptable Substances

The following substances may be used regularly without harming your Single Home FAST or Micro FAST:

- Laundry detergents without bleach,
- Dishwashing detergents without bleach,
- Toilet paper,
- Household cleaners containing sodium bicarbonate, sodium carbonate and sodium borate.

NOTICE: *Sodium borate is found in some household cleaners. It will not harm the FAST system, but its use may be restricted by local wastewater codes. Check with the appropriate authority before using products containing sodium borate*

PREVENTIVE MAINTENANCE

Little maintenance is required for the Bio-Microbics, Inc. Single Home FAST or Micro FAST. The treatment plant is designed to be as maintenance-free as possible. However, some routine preventive maintenance should be performed to ensure a long, reliable life of the plant according to the following preventive maintenance schedule.

As Needed

Clean the screen covering the vent pipe and the screens located on the blower housing. If these are left unchecked, there is risk of the blower becoming starved and of blower damage should this condition develop. Blockage of the air inlet or vent could also reduce the efficiency of the treatment process if the oxygen is not allowed to replenish for aeration.

Annually

Check and replace the blower inlet filter when it is dirty. If this is left unchecked, damage to the blower may result and the treatment quality may also suffer.

Remove the nut on top of the filter and lift off the cover. The filter element is inside. If it is dirty, replace it with a new one. Do not attempt to clean the filter with compressed air and re-use. This will loosen much of the dust and allow it to enter the blower.

Check for vibration and the amperage draw of the blower to be sure it is within acceptable limits as noted on the blower nameplate.

TROUBLESHOOTING GUIDE

Problem	Possible Causes	Solutions
The indicator light on the control panel is flashing.	The air intake is blocked.	Clean intake screens on blower housing. Check air filter on blower for blockage.
	The air discharge line or vent line is blocked.	Check discharge line and vent line visually or with drain cleaning equipment for obstructions.
	The discharge line is open.	Check discharge line for breaks or leaks. A pressure gauge measuring in inches of water can be located on the discharge line near the blower. With the blower running, the gauge should indicate a pressure near 25 in H_2O.
	The FAST system is flooded.	Determine cause of flooding (e.g. line obstruction, lateral field pump failure, high flows, etc.) and correct.
	The blower has failed.	Determine if blower failure was caused by an obstructed intake or discharge line.
		Investigate overheating (i.e. internal thermal overload protection), short-circuiting, or other electrical failure, and mechanical failure (i.e. bearing failure) and correct.
		Check to see whether circuit protection device for blower has tripped.

B. ELECTRICAL FAILURE
Electrical failure of the blower:

This may take place in the form of overheating or shorting out because of moisture or dirt.

Both of these modes of failure have been addressed by using a TEFC motor. With the motor being totally enclosed, the problem of dirt and moisture collecting on the windings to shorten insulation life has been eliminated. The fan cooling will help the motor maintain allowable running temperature. The totally enclosed rating helps maintain the internal cleanliness of the motor.

C. PROCESS FAILURE
Process failure from oxygen starvation of the biomass:

If the biomass is starved of oxygen, the typical odors associated with anaerobic bacterial treatment will be noticed. This is caused by insufficient air flow into the biological zone. A blockage in the air line or blower is the most probable cause.

a. The inlet screens have been located on each end of the blower housing. If one screen becomes blocked by debris, the opposite screen should still be sufficient. The suggested routine preventative maintenance calls for brushing off the screen as needed. The configuration of the inlet screens and the required maintenance will protect the unit from oxygen starvation due to insufficient air flow.
b. The blower is equipped with an inlet air filter. If this filter becomes blocked with debris it could cause oxygen starvation of the biomass. The blower inlet filter should be checked every 6 months and replaced as needed.
c. The vent pipe could also become blocked, causing insufficient air flow out of the reactor. The screen should be checked for debris, and if the pipe is blocked, a drain augur can be used to clean out the line.
d. There is a possibility that the air line from the blower could become blocked. If this condition is suspected, disconnect the air line from the blower and check for blockage. A drain auger can be used to check the entire length of air line.

As Required by Measurement of Sudge Depth

As the Single Home FAST or Micro FAST processes the raw domestic waste, sludge and sloughed-off bacteria will collect on the bottom of the reactor. This will have to be pumped out periodically. This time interval will change with changing load conditions. The time interval is also dependent on the size of the reactor.

To accurately determine the sludge depth, open the pumpout cover to the primary zone and insert a sludge measuring instrument and take samples. If the sludge depth in the primary zone is greater than 20 inches, it is necessary to pump the unit down.

The sludge depth of the secondary zone (which contains the Single Home FAST® or Micro FAST®) must also be checked. Open the pumpout cover to the secondary zone and measure the sludge depth. If the sludge depth in the secondary zone is greater than 14 inches, it is necessary to pump the unit down. Always pump out both sections of the reactor even though only one zone may require it.

To pump the unit down, follow this recommended procedure:

NOTICE: *Avoid pumping the unit down after periods of heavy rain or when the ground water is likely to be above the bottom of the concrete tank. Emptying the tank under these conditions could cause the tank to float up and become dislodged.*

Open the pumpout cover and insert the hose. Be sure to pump out both sections of the reactor.

Once the unit has been pumped out, immediately refill the tank with clean water to reduce the risk of the tank floating. Close the pumpout cover making sure it is watertight.

The disposal of the solids that have been removed must comply with local and state regulations.

EVALUATION OF SYSTEM PERFORMANCE

The following basic evaluations give an indication of the process quality and can be made by the distributor or service personnel.

SOUNDS	During normal operation, a uniform humming sound of approximately 60 dBA emanates from the system. If unusual noises are heard, it is possible the blower could need maintenance or repairs. Note: 60 dBA is equivalent to normal conversation at 3 ft.
SMELL	The Single Home FAST® is an aerobic system. During normal operation, the system has an earthy smell like that of a well-maintained compost pile. If other odors are noticed, the aeration process may not be operating, or the system may be overloaded. Check the blower for proper operation and make sure the airlift is operating by viewing through the observation port (see Figure 2 in Installation Manual.)
SIGHT	Samples can be taken from the sample port to make a visual evaluation. Normally, the effluent is reasonably clear, colorless and odorless. If the effluent becomes turbid, the treatment process has developed a problem. Turbid effluent will be present with a septic odor. The same checks are made for this that are made if odors are present.

COLLECTION OF EFFLUENT SAMPLE

Obtain a sample probe capable of fitting inside the 2-inch PVC sample port. Insert sample probe to bottom of effluent channel (see Figure 1, Installation Manual). Collect appropriate volume of sample for tests to be performed. Samples must be handled in accordance to guidelines from an EPA certified laboratory.

ALARM CIRCUIT

The Single Home FAST is furnished with an alarm circuit that will monitor the mechanical aeration components. In normal operation, a red running lamp will be lit. If the blower should fail, the lamp will flash. (The audible alarm will also sound.)

The alarm circuit operates by monitoring the power drawn by the blower. Under normal operating conditions, the blower will draw a specified amperage load. If the blower should fail and trip the circuit breaker, a relay will then sense no load to the motor and go into the alarm mode.

If a high water condition exists, the blower will draw more amps and the alarm circuit will activate. Blockage of the air filter or discharge air line will also activate the alarm.

SYSTEM FAILURES

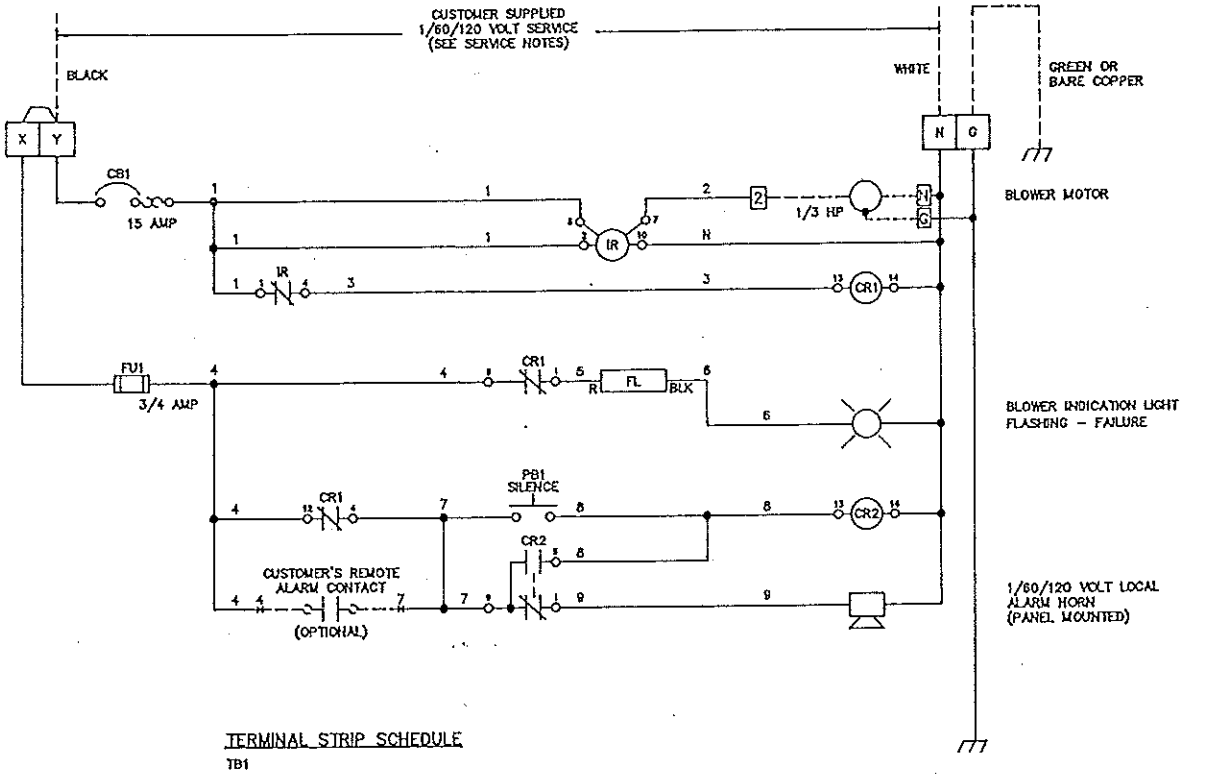
This section is a summary of the different types of failures that are the most likely to occur in the Bio-Microbics, Inc. Single Home FAST or Micro FAST. The consequences of, and the steps taken to prevent these failures are also explained.

Several types of failures can occur in a unit with the wide variety of components and systems present in this plant. Mechanical, electrical and process failures are the predominant concerns. Some components are subjected to more than one type of failure. Any mechanical or electrical failure will result in a process failure.

A. MECHANICAL FAILURE

Mechanical failure of blower:
The prime opportunity for failure of the blower is the internal sealed bearings. They can fail from lack of lubricant or contaminated lubricant. Another opportunity for failure is excessive wear of the impeller resulting in lower volumes of air delivery.

1. To avoid failure, the blower selected for the unit is equipped with double sealed bearings to maximize their life.
2. Excessive wear of the impeller has been avoided by installing an inlet filter to take out any dust that could pass through the inlet screen.
3. When the unit is operated continuously, less heat is generated than would be the case with frequent starts and stops.



NOTE:
REMOVE THE JUMPER BETWEEN X AND Y IF A SEPERATE CIRCUIT IS PROVIDED FOR THE ALARM CIRCUIT.

TERMINAL STRIP SCHEDULE

TB1

X	Y	N	N	2	4	7	G		

LEGEND

CB1	CIRCUIT BREAKER; MONITORING CIRCUIT
CR1	CONTROL RELAY; BLOWER OVER-CURRENT
CR2	CONTROL RELAY; ALARM HORN SILENCE
FL	FLASHER; ALARM LIGHT
FU1	FUSE; ALARM CIRCUIT
IR	CURRENT RELAY; BLOWER MOTOR MONITOR
PB1	PUSHBUTTON; ALARM SILENCE

WIRE NOTES

1. NEUTRAL (N) IS WHITE.
2. POWER LEAD IS BLACK.
3. GROUND (G) IS GREEN OR BARE COPPER.
4. DASHED ITEMS SIGNIFY FIELD CONNECTIONS.
5. LAST WIRE NUMBER USED: 9
6. WIRE NUMBER(S) NOT USED:
7. ANY WIRING OF CONTROL CIRCUITS IN THE PANEL THAT ARE ENERGIZED FROM AN EXTERNAL SOURCE ARE TO BE YELLOW IN COLOR.

—○— DEVICE TERMINAL CONNECTION

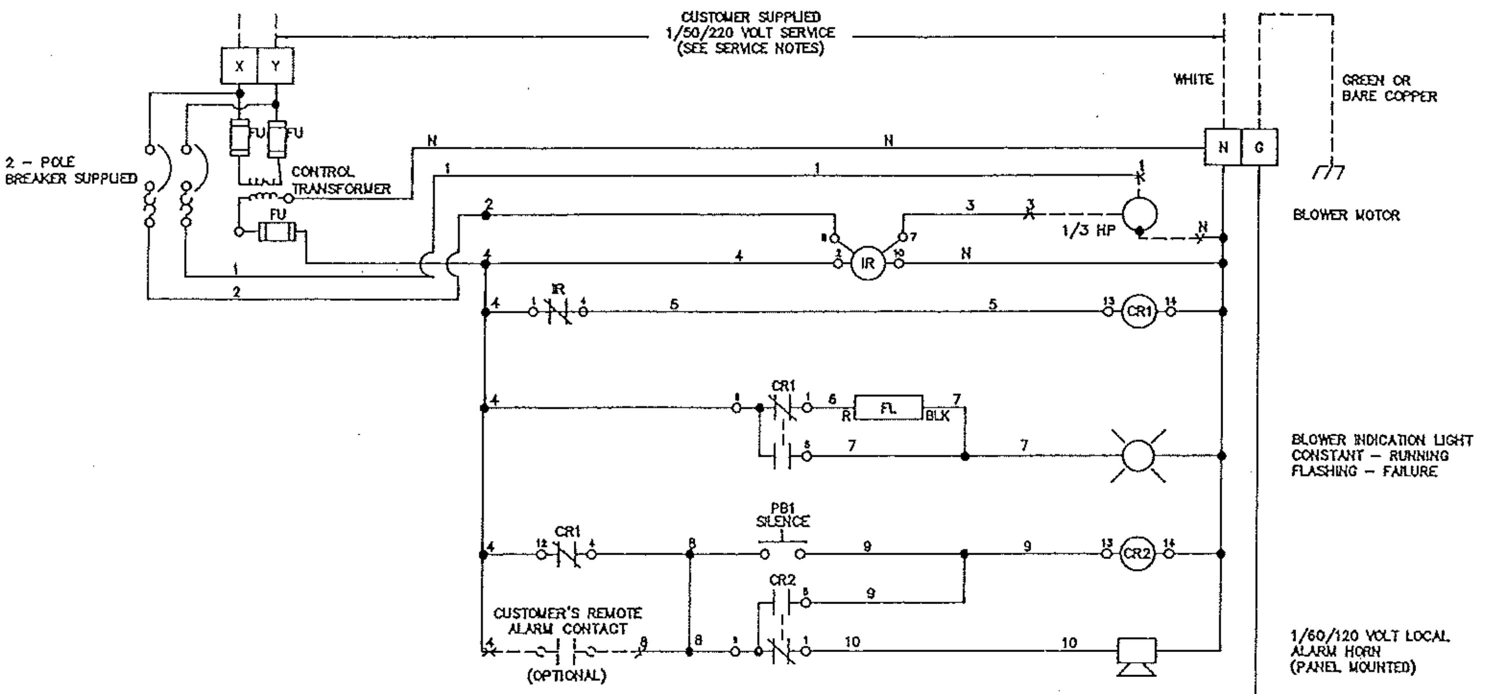
—|N|— TERMINAL BLOCK CONNECTION (DENOTES CONDUCTOR ENTERING OR LEAVING ENCLOSURE.)

SERVICE NOTES

1. ALL EQUIPMENT IS TO BE GROUNDED IN ACCORDANCE WITH THE NEC ARTICLE 250 AND TABLE 250-95, USING THE GROUND TERMINALS PROVIDED IN THE SYSTEM CONTROL PANELS AND THE MOTOR CONDUIT BOXES.
2. ANY CUSTOMER SUPPLIED NEUTRAL MUST BE SOLIDLY GROUNDED AT THE SERVICE SWITCH.
3. BEFORE CLOSING THE CONTROL CIRCUIT BREAKERS, VERIFY THAT THE VOLTAGE BETWEEN X AND N IS WITHIN THE RANGE OF 105-135 VAC.
4. IT IS RECOMMENDED THAT A 20 AMP CIRCUIT BREAKER BE PROVIDED FOR CUSTOMER'S POWER SERVICE. BREAKER AND INSTALLATION SHALL MEET ALL LOCAL CODES.
5.

SHEET 1 OF 1

SCHEMATIC WIRING DIAGRAM
FASTCTRL
CONTROLS



TERMINAL STRIP SCHEDULE

TB1

X	Y	N	N	1	3	4	8	G

SHEET 1 OF 1

FAST®
SCHEMATIC WIRING DIAGRAM
220Vac

FILE NAME HFZZ30C

DWG NO HFZZ30

REV B

LEGEND

CB1	CIRCUIT BREAKER; MONITORING CIRCUIT
CR1	CONTROL RELAY; BLOWER OVER-CURRENT
CR2	CONTROL RELAY; ALARM HORN SILENCE
FL	FLASHER; ALARM LIGHT
FU1	FUSE; ALARM CIRCUIT
IR	CURRENT RELAY; BLOWER MOTOR MONITOR
PB1	PUSHBUTTON; ALARM SILENCE
XF	TRANSFORMER 220–120VAC

WIRE NOTES

1. NEUTRAL (N) IS WHITE.
2. POWER LEAD IS BLACK.
3. GROUND (G) IS GREEN OR BARE COPPER.
4. DASHED ITEMS SIGNIFY FIELD CONNECTIONS.
5. LAST WIRE NUMBER USED: 10
6. WIRE NUMBER(S) NOT USED:
7. ANY WIRING OF CONTROL CIRCUITS IN THE PANEL THAT ARE ENERGIZED FROM AN EXTERNAL SOURCE ARE TO BE YELLOW IN COLOR.

—○— DEVICE TERMINAL CONNECTION

—⊬— TERMINAL BLOCK CONNECTION (DENOTES CONDUCTOR ENTERING OR LEAVING ENCLOSURE.)

SERVICE NOTES

1. ALL EQUIPMENT IS TO BE GROUNDED IN ACCORDANCE WITH THE NEC ARTICLE 250 AND TABLE 250–95, USING THE GROUND TERMINALS PROVIDED IN THE SYSTEM CONTROL PANELS AND THE MOTOR CONDUIT BOXES.
2. ANY CUSTOMER SUPPLIED NEUTRAL MUST BE SOLIDLY GROUNDED AT THE SERVICE SWITCH.
3. BEFORE CLOSING THE CONTROL CIRCUIT BREAKERS, VERIFY THAT THE VOLTAGE BETWEEN X AND N IS WITHIN THE RANGE OF 195–245 VAC.
4. IT IS RECOMMENDED THAT A 20 AMP CIRCUIT BREAKER BE PROVIDED FOR CUSTOMER'S POWER SERVICE. BREAKER AND INSTALLATION SHALL MEET ALL LOCAL CODES.
5.

BIO-MICROBICS INCORPORATED

FAST® wastewater treatment system

BIO-MICROBICS INCORPORATED

FAST

FAST
FAST
FAST

Owner's Manual

Bio-Microbics, Inc.
8271 Melrose Drive
Lenexa, KS 66214
913-492-0707
1-800-753-FAST
Fax: 913-492-0808
E-mail: onsite@biomicrobics.com
Web site: www.biomicrobics.com

BIO-MICROBICS INCORPORATED

BIO-MICROBICS FAST®
WASTEWATER TREATMENT SYSTEM
OWNER OPERATION MANUAL

PLEASE READ

We urge you to fully read this manual. The contents are important to your safety and the operation of the Bio-Microbics, Inc. wastewater treatment system. Keep this manual with other important household manuals for future reference.

Revised November, 1997

TABLE OF CONTENTS

LIMITED 24-MONTH WARRANTY

Bio-Microbics, Inc. warrants every new FAST wastewater treatment system® against defects in materials and workmanship for a period of two years after installation subject to the following terms and conditions:

During the warranty period, if any part is defective or fails to perform as specified when operating at design conditions, and if the equipment has been installed and is being operated and maintained in accordance with the written instructions provided by Bio-Microbics, Inc., Bio-Microbics, Inc. will repair or replace at its discretion such defective parts free of charge. Defective parts must be returned by owner to Bio-Microbics, Inc.'s factory postage paid, if so requested. The cost of labor and all other expenses resulting from replacement of the defective parts and from installation of parts furnished under this warranty shall be borne by the owner. This warranty does not cover aerator components which have been damaged by flooding or any components that have been disassembled by unauthorized persons, improperly installed or damaged due to altered or improper wiring or overload protection. This warranty applies only to the treatment plant and does not include any of the house wiring, plumbing, drainage, septic tank or disposal system. Bio-Microbics, Inc. reserves the right to revise, change or modify the construction and/or design of the FAST wastewater treatment system, or any component part or parts thereof, without incurring any obligation to make such changes or modifications in present equipment. Bio-Microbics, Inc. is not responsible for consequential or incidental damages of any nature resulting from such things as, but not limited to, defects in design, material, or workmanship, or delays in delivery, replacements or repairs.

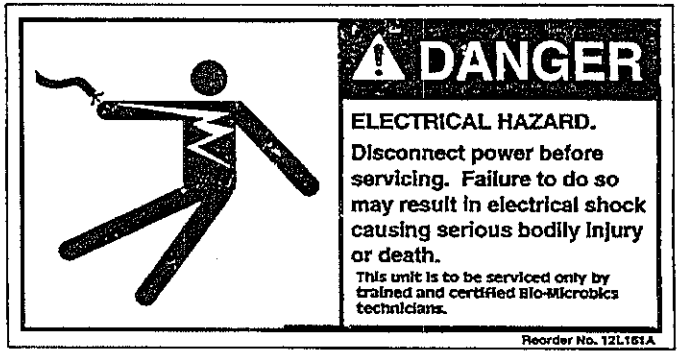
THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. ANY WARRANTY IMPLIED BY LAW, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, IS IN EFFECT ONLY FOR THE WARRANTY PERIOD SPECIFIED ABOVE. NO REPRESENTATIVE OR PERSON IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR TO ASSUME FOR BIO-MICROBICS, INC., ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF ITS PRODUCTS.

CONTACT YOUR LOCAL DISTRIBUTOR FOR PARTS AND SERVICE.

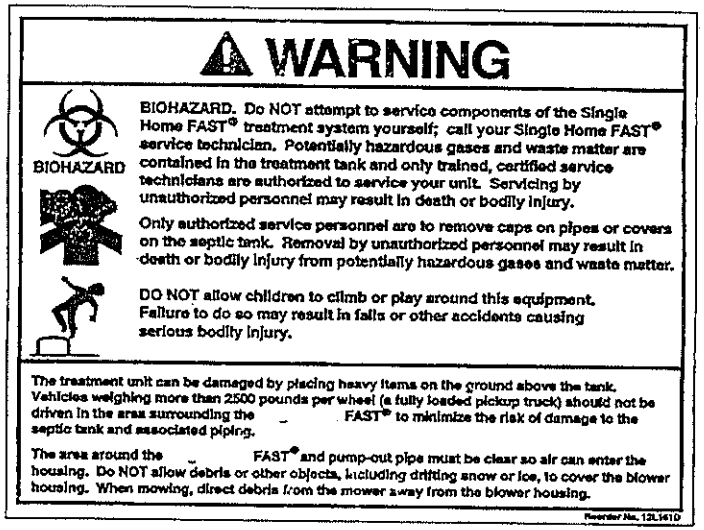
WARNING LABELS

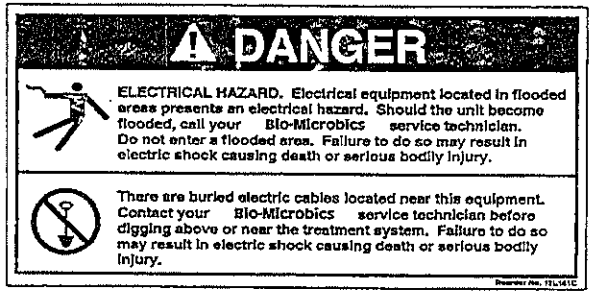
These warning labels are located on the control panel and blower housing. You must follow the information on these labels to ensure your safety.

Located on the Front of the Control Panel



Located on the access port cover





Located on the Blower Housing

IMPORTANT INFORMATION

Please read and follow the cautionary notes given below and those found elsewhere in this manual. If you have questions regarding the safety or operation of your Single Home FAST or Micro FAST Sewage Treatment System, contact your authorized Bio-Microbics service technician.

DANGERS

- Electrical equipment located in flooded areas presents an electrical hazard. Should the unit become flooded, call your Bio-Microbics service technician. Do not enter a flooded area. Entering a flooded area may result in electrical shock causing death or serious bodily injury.
- There are buried electric cables located near this equipment. Contact your Bio-Microbics service technician before digging above or near the treatment system. Failure to do so may result in electrical shock causing death or serious bodily injury.

WARNINGS

- Do NOT attempt to service components of the FAST wastewater treatment system yourself; call your Bio-Microbics service technician.
- Only authorized service personnel are to remove caps on pipes or covers on the septic tank. Removal by unauthorized personnel may result in death or bodily injury from potentially hazardous gases and waste matter.

SPECIFICATIONS

Power Requirements

120 volts AC, 60 Hz Rated Daily Capacity:

Single Home FAST	10-12 people
Micro FAST	6-8 people
Noise Level	Less than 60 dB

IMPORTANT PHONE NUMBERS

Space is provided below for you to record important phone numbers. Should any problems arise concerning the installation, use, maintenance or shutdown of your FAST wastewater treatment system, contact your Bio-Microbics service technician or Bio-Microbics, Inc. Bio-Microbics, Inc. will answer your question as well as provide the name, location and phone number of an authorized Bio-Microbics service technician. **We have provided basic information and recommend that the homeowner fill in the rest.** You should also record the phone numbers of a licensed plumber and electrician to call should a problem arise when your Bio-Microbics service technician cannot be contacted.

BIO-MICROBICS INCORPORATED 1-800-753-3278

Bio-Microbics Service Technician _____
Plumber _____
Electrician _____

FAST WASTEWATER TREATMENT SYSTEM INFORMATION

Model No. _____
Serial No. _____
Rating (gal. per day) _____
Persons (max.) _____

The FAST wastewater treatment system is an odor-free system. Therefore, there should be no septic smell emanating from your system. Should there be a sulfurous "septic" smell associated with the FAST system, contact your Bio-Microbics service technician.

Visual Evaluation

Wastewater backup is characterized by wastewater flowing back into the house or slow movement of wastewater in the drains. This may indicate a problem with your FAST wastewater treatment system unit. Identify where the backup is occurring within your home's plumbing system. If no material is blocking the drain, contact your Bio-Microbics service technician.

DANGER: *DO NOT attempt to service any components of the FAST yourself; call your Bio-Microbics service technician.* ***Potentially hazardous gases and waste matter are contained in the treatment tank*** *and only trained, certified service technicians are authorized to service your unit. Servicing by unauthorized personnel may result in death or bodily injury.*

NO USE FOR AN EXTENDED PERIOD

The FAST wastewater treatment system will function normally even if wastewater does not enter the system for nine days. The power to the system should be left on during short periods when there is no wastewater flow to the system. If the system will not be used for several months or longer, you should contact your Bio-Microbics service technician so the system can be checked for proper operation and serviced if necessary. A slight odor may be detected for a couple of days while the system returns to normal operation.

ABANDONMENT OR DECOMMISSIONING

If you plan to connect your house's sewer system to a municipal sewer system, or if your FAST wastewater treatment system is no longer needed, please contact your Bio-Microbics service technician or Bio-Microbics, Inc. (913-492-0707). Procedures specified by regulatory agencies must be followed when the FAST wastewater treatment system is abandoned or decommissioned.

- Do NOT allow children to play on or around the vents and blower housing. Such play may result in falls or other accidents causing serious bodily injury.
- Ice may form around vents during cold weather. Use caution when walking in these areas to avoid falling, causing serious bodily injury.
- Anyone coming in contact with wastewater must remove any contaminated clothing and thoroughly wash all body areas and clothing exposed to wastewater with soap and water. Then consult a physician to minimize the risk of illness.
- The treatment unit can be damaged by placing heavy items on the ground above the tank. Vehicles weighing more than 2,500 pounds per wheel (a fully loaded pickup truck) should not be driven in the area surrounding the Single Home FAST or Micro FAST to minimize the risk of damage to the septic tank and associated piping.
- The area around blower housing and vents must be clear so air can enter the housing. Do NOT allow debris or other objects, including drifting snow or ice, to cover the blower housing or vents. When mowing, direct debris from the mower away from the blower housing and vents.

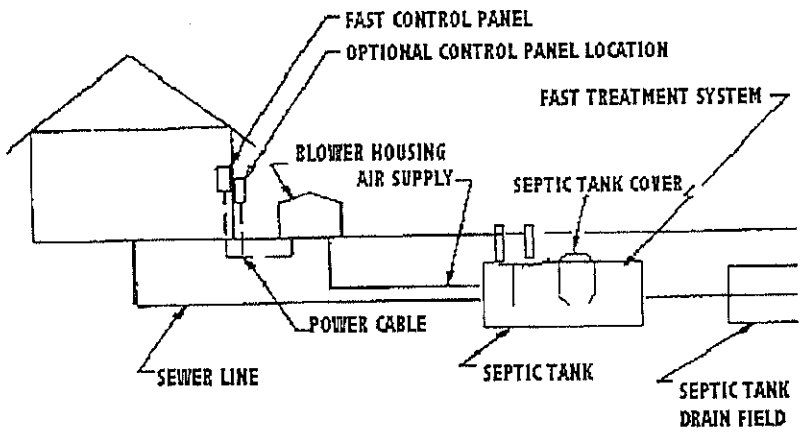
INTRODUCTION

Thank you for choosing a FAST wastewater treatment system for your home. The system is compatible with your garbage disposal, dishwasher and other household appliances connected to the house's wastewater system. The Single Home FAST and Micro FAST have been tested and certified by NSF *International* to meet NSF Standard 40, Class 1.

OPERATING CONDITIONS

The FAST treatment system shall be capable of treating the wastewater produced by typical family activities (bath, laundry, kitchen, etc.) ranging from one to twelve members for the Single Home FAST and one to eight members for the Micro FAST. Single Home FAST High Strength waste streams and capacities will vary with each application.

HOW FAST TREATMENT SYSTEMS WORK



System Diagram

FAST stands for Fixed Activated Sludge Treatment. In the FAST wastewater treatment system process, a colony of bacteria, called the biomass, breaks down biodegradable waste into carbon dioxide and water. The process occurs continuously as long as the biomass is supplied food (incoming waste) and oxygen (air) in a suitable environment. Solid material that the biomass cannot process settles into the septic tank for normal removal by pump-out.

The heart of the FAST wastewater treatment system is a honeycomb-type media suspended in the septic tank below ground. The media contains the biomass. Above ground, an electric blower blows air through an underground pipe into the media to aerate the wastewater. Aeration circulates the wastewater, thereby providing both food and oxygen to the biomass. An outlet pipe directs treated wastewater into the septic tank drain field. If wastewater backup occurs, do not add to the wastewater; and turn off any taps or appliances, such as a clothes washer, that direct water into the wastewater system.

There are no moving mechanical parts in the FAST wastewater treatment system, other than the blower. With normal septic tank maintenance and a proper environment for the biomass, the FAST wastewater treatment system will perform safely and reliably.

If your house has electricity, but the blower is not operating, follow the procedure given under ALARM WARNING given on page 14.

FLOODING

Flood water may cover the septic tank unit, the blower housing, or both, if the Single Home FAST or Micro FAST is installed in a low-lying area.

DANGER: *Electrical equipment located in flooded areas presents an electrical hazard. Should the unit become flooded, call your Bio-Microbics service technician. Stay out of a flooded area. Failure to do so may result in electrical shock causing death or serious bodily injury.*

Should water cover the blower housing, IMMEDIATELY disconnect electrical power to the blower at your house circuit breaker box. Immediately call your Bio-Microbics service technician. Do not attempt to restore electrical power to the blower. The service technician must inspect and evaluate the condition of the FAST unit before electrical power is restored.

Water covering the septic tank unit can be tolerated if there is no backup in the system. Backup is characterized by wastewater flowing back into the house or slow movement of wastewater in the drains.

WARNING: *Anyone coming in contact with wastewater must remove any contaminated clothing and thoroughly wash all exposed body areas with soap and water. Then consult a physician to minimize the risk of illness.*

EVALUATION OF SYSTEM PERFORMANCE

The FAST wastewater treatment system operates automatically and continuously. There are no operating procedures for the user of the FAST wastewater treatment system to perform. However, as with any home appliance or equipment, simple periodic checks should and can be made to aid in the prevention of costly repair problems. Generally, the FAST wastewater treatment system unit can be checked by sight and by smell.

If the drains in your house require an unusual amount of time to drain, the septic tank may require pumping out.

WARNING: *The treatment unit can be damaged by placing heavy items on the ground above the tank. Vehicles weighing more than 2,500 pounds per wheel (approximately a fully loaded 3/4 ton pickup truck) should not be driven in the area immediately surrounding the blower housing to minimize the risk of damage to the septic tank and associated piping.*

NOTICE: *The area around the blower housing and vents must be clear so air can enter the housing. Do NOT allow debris or other objects, including drifting snow or ice, to cover the blower housing or vents. When mowing, direct debris from the mower away from the blower housing and vents.*

ALARM WARNING

The system is equipped with a red system status light on the control panel and an alarm horn. Should the red light flash and the horn activate, check the breaker to ensure it has not tripped. If the breaker has tripped, attempt to reset it. If the breaker fails to remain reset, call your Bio-Microbics service technician. The alarm horn may be shut off by pushing the silence button. Pushing the silence button will not reactivate the unit, only silence the horn.

BLOWER STOPPAGE OR ELECTRICAL POWER OUTAGE

The FAST wastewater treatment system requires a constant supply of oxygen and food for the biomass. Should the blower stop, air flow through the aeration pipe will stop, cutting off the supply of oxygen to the biomass. A prolonged absence of oxygen will seriously affect the condition of the biomass.

When the blower is operating, it will emit a humming sound. If the blower is not operating, first determine whether an electrical power outage has occurred in your community.

If your house is without electricity, call the electric utility. If the electricity is off more than 48 hours, call your Bio-Microbics service technician as well for treatment system advice.

SYSTEM COMPONENTS

A. Underground Treatment System

The underground treatment tank includes the septic tank (supplied by others) and the Single Home FAST or Micro FAST wastewater treatment module. Underground pipes carry wastewater into and away from the tank. Depending upon local codes, a pipe or cover may extend upward from the tank. This pipe may serve as a pump-out pipe to remove solid material from the septic tank. An observation port and a sample port extend from the top of the module. These serve as vents for the module and are also used for service.

WARNING: *Only authorized service personnel are to remove caps on pipes or covers on the septic tank. Removal by unauthorized personnel may result in death or bodily injury from potentially hazardous gases and waste matter.*

WARNING: *The treatment unit can be damaged by placing heavy items on the ground above the tank. Vehicles weighing more than 2,500 pounds per wheel (a fully loaded pickup truck) should not be driven in the area surrounding the Single Home FAST or Micro FAST to minimize the risk of damage to the septic tank and associated piping.*

B. Control Panel

A light on the control panel reports the status of the system's electrical circuit. If the light is flashing, there is a problem in the system. A horn sounds when the light flashes.

If the alarm should sound, check air intake and vents for obvious signs of blockage, but do not attempt to remove caps or open the blower housing.

WARNING: *Only authorized service personnel are to remove caps on pipes or covers on the septic tank. Removal by unauthorized personnel may result in death or bodily injury from potentially hazardous gases and waste matter.*

If there are no signs of blockage, check the circuit breaker switch located in the Single Home FAST or Micro FAST control panel. If the switch has tripped, reset the switch. If the alarm stays on, call your

Bio-Microbics service technician. The alarm circuit may be shut off by pushing the silence button on the control panel.

C. Identification Plate

An identification plate similar to the one shown in figure 1 is located on the control panel and on the blower housing. Information that identifies the unit is found on the plate. For future reference, copy the information on the plate onto page 18. If you contact your Bio-Microbics service technician or Bio-Microbics, Inc. Customer Service, the service technician may request information on the identification plate.

Single Home FAST®
Bio-Microbics, Inc.
8271 Melrose Drive
Lenexa, KS 66214

MODEL NO. _____ SERIAL NO. _____
RATED: _____ GAL. PER DAY, UP TO _____ PERSONS
CLASSIFICATION: NSF INT'L., STD. 40, CLASS 1 PLANT
FOR SERVICE CALL:

Figure 1. Identification Plate

D. Blower Housing

The blower housing sits above ground and contains the blower and an electric motor. Air is drawn into the box, then directed through an underground pipe to the aeration system in the treatment tank.

When operating properly, the blower will emit a humming sound. Should the blower stop, follow the instructions given on page 15 under BLOWER STOPPAGE. If the blower emits an unusual noise, call your Bio-Microbics service technician.

WARNING: *Do NOT allow children to play on or around the blower housing. Such play may result in falls or other accidents causing serious bodily injury.*

problems arise due to chemical spills, power outages or alarms, contact your Bio-Microbics service technician. This unit is to be serviced only by trained and certified Bio-Microbics technicians.

For the homeowner, operational procedures for the FAST wastewater treatment system are minimal. Normal operation of the unit requires continuous operation of the blower and regular discharge of wastewater to the unit. Leaves, snow, or other material must not be allowed to block the blower intake. If the blower should fail, follow the procedure given under ALARM WARNING.

Your FAST wastewater treatment system is furnished with a two-year service policy which includes at least four inspection/service calls to ensure proper operation of the system. During these service calls, the authorized service person will check the blower for proper operation and perform preventative maintenance including lubrication, cleaning of the blower intake, and inspection of control panel light. The service provider will also measure the solids level in the septic tank and recommend pumpout when necessary.

An extended service policy is available and may be purchased through your local Bio-Microbics distributor. The extended service policy meets the local inspection requirements, but as a minimum includes one service call per year. The extended service policy includes lubrication, cleaning of the blower intake, inspection of control panel light, and recommendations on pumpout when necessary.

THE SEPTIC TANK

Periodically, waste will need to be removed from the septic tank using normal pump-out procedures. Only persons experienced in wastewater treatment or service are authorized to remove the septic tank cover.

WARNING: *Do NOT attempt to service components of the FAST wastewater treatment system yourself; call your Bio-Microbics service technician. Only authorized service personnel are to remove caps on pipes or covers on the septic tank. Removal by unauthorized personnel may result in death or bodily injury from potentially hazardous gases and waste matter.*

not disposing of these food items through the FAST wastewater treatment system:

- Animal bones
- Melon rinds
- Corn cobs
- Pits and seeds
- Eggshells
- Any other non-edible food waste

NOTICE: *Sodium borate is found in some household cleaners. It will not harm the FAST wastewater treatment system, but its use may be restricted by local wastewater codes. Check with the appropriate authority before using products containing sodium borate.*

C. Acceptable Substances

Substances that are considered to be typical domestic wastewater are human waste, bath and dish water, edible food waste, and coffee and tea grounds.

The following substances may be used regularly without harming your FAST wastewater treatment system:

- Laundry detergents without bleach
- Dishwashing detergents without bleach
- Toilet paper
- Household cleaners containing sodium bicarbonate, sodium carbonate and sodium borate

SYSTEM MAINTENANCE AND MONITORING

The FAST wastewater treatment system operates automatically and continuously. The maintenance procedures for the user of the FAST wastewater treatment system include keeping the vents and the blower housing clear of debris. The homeowner should monitor the status of the system (alarm indicator light as shown in Figure 2), substances introduced into the system, and the frequency of required pumpout as determined by the service provider.

If the instructions contained in this manual are carefully followed, the FAST wastewater treatment system can provide years of service. If

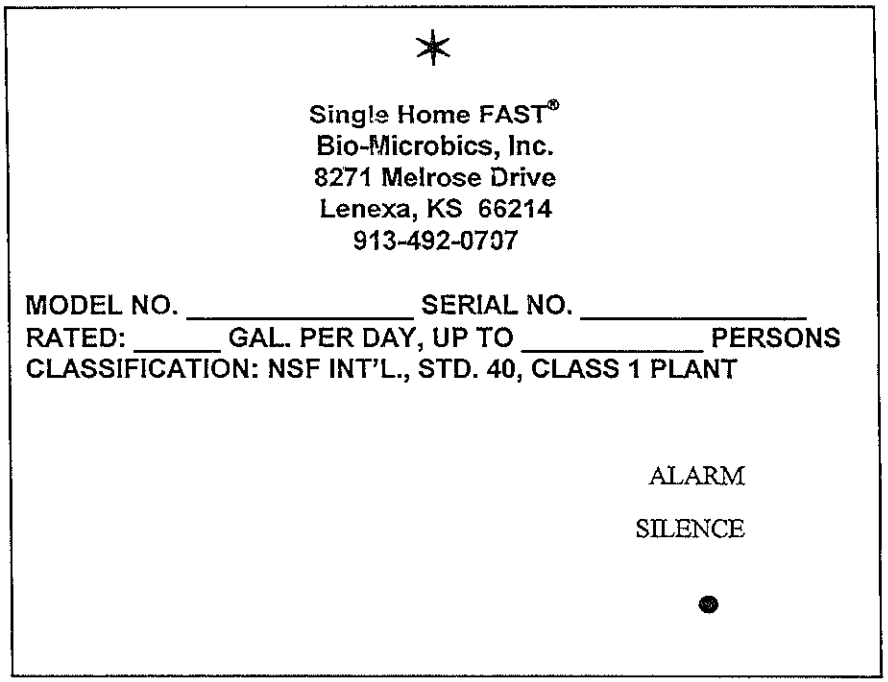


Figure 2. Control Panel

CAUTION: *Ice may form around vents during cold weather. Use caution when walking in these areas to avoid falling, causing serious bodily injury..*

NOTICE: *The area around the blower housing and vents must be clear so air can enter the housing and vents. Do NOT allow debris or other objects, including drifting snow or ice, to cover the blower housing or vents. When mowing, direct debris from the mower away from the blower housing and vents.*

INTRODUCING SUBSTANCES INTO THE SYSTEM

Introducing harmful substances into the system may reduce the efficiency of the system or stop the treatment process by destroying the biomass. These substances that reduce the efficiency or stop the treatment process can be grouped into two groups, prohibited substances and limited-use substances. While the FAST wastewater treatment system will process most waste produced by the average household, the following information will maximize the system's efficiency and reduce the time period between septic tank pump-outs.

If you have a question regarding the effect of a particular substance on the Single Home FAST or Micro FAST, call your Bio-Microbics service technician.

NOTICE: *Introducing harmful or damaging chemicals into your Single Home FAST or Micro FAST may void the warranty.*

A. Prohibited Substances

Prohibited substances are those substances which when present in even small amounts will prevent the Single Home FAST or Micro FAST from providing wastewater treatment. Substances that will not dissolve may clog and possibly damage the aeration unit. Do NOT introduce the following prohibited substances into your Single Home FAST or Micro FAST:

- Plastic or rubber products,
- Petroleum products, such as motor oil, paint, paint thinner, gasoline, and solvents,
- Non-biodegradable products, such as sanitary napkins, condoms and disposable diapers,
- Toxic substances such as pesticides, strong disinfectants and large amounts of strong caustic drain cleaners,
- Large amounts of paper products, such as paper towels and synthetic fiber-reinforced products advertised as having "wet strength",
- Animal fats, such as bacon grease or lard (normal cleaning of pots and pans is acceptable).

Spills

Chemicals can enter the treatment system from chemical spills that occur on the ground around the Single Home FAST or Micro FAST septic tank or leach field. The following chemicals are prohibited substances and should not be poured into the Single Home FAST or Micro FAST septic tank or leach field:

- Herbicides
- Pesticides
- Paint thinner
- Motor oil

NOTICE: *Contact your Bio-Microbics service technician immediately if a substantial spill occurs in the area of the treatment system.*

B. Limited-use Substances

Limited-use substances in large concentration will reduce or stop the treatment process. These same substances in smaller concentrations will have no harmful effect on the treatment process. You may use the following substances without harming your Single Home FAST or Micro FAST if you use the substance according to the manufacturer's directions, use the substances sparingly, and do not introduce concentrated doses into the system.

- Laundry bleach
- Detergents with bleach
- Household cleaners containing sodium bactericides such as:
  - ◊ Pine oil (disinfectant used in general purpose liquid cleaners),
  - ◊ N-alkyl dichlorobenzyl ammonium chloride (disinfectant used in detergents and spray cleaners),
  - ◊ Sodium hydroxide (lye-chemical used in drain openers and cleaners),
  - ◊ Sodium dichlor-s-triazinetrione (powdered bleach used in scouring powders and automatic dishwasher detergents),
  - ◊ Ortho-phenylphenol (bactericide used in tub and toilet bowl cleaners).

Waste Food

Some food waste, whether or not it is run through a garbage disposal, will not be treated by the Single Home FAST or Micro FAST, but will remain in solid form and fall to the bottom of the septic tank. This will not harm the Single Home FAST or Micro FAST, but frequent pump-out of the septic tank may be necessary. Therefore, you should consider