



WHATCOM COUNTY HEALTH DEPARTMENT  
**ON-SITE SEWAGE SYSTEM  
 CONSTRUCTION PERMIT**

509 Girard Street  
 Bellingham, WA 98225  
 Telephone: 360-676-6724  
 Fax: 360-676-6771

Parcel # 380223 488514 Permit Approval Date: 08/19/2014  
 Name Welch, Dan & Ashley Permit Expiration Date: 08/19/2017  
 Last First  
 Site Address 2930 Birchwood Avenue Phone Number 296-2657  
 Installer HOME OWNER Installer Number 296-2657

Called for Inspection: \_\_\_\_\_

It is hereby agreed that the installation of this OSS shall comply with all applicable requirements of WCC 24.05 On-Site Sewage Control Regulations. **A CONSTRUCTION INSPECTION BY THE WHATCOM COUNTY HEALTH DEPARTMENT IS REQUIRED BEFORE COVERING.**

Issuance of an OSS permit does NOT imply or signify fulfillment or satisfaction of any other legal requirement, such as building codes or zoning ordinances. Permit holders are cautioned that compliance with other agency permit requirements, such as obtaining a land disturbance permit from Whatcom County Planning and Development Services, should be accomplished prior to commencement of any construction.

Operation and Maintenance (O&M) is required for every OSS. Attached are the O&M requirements for this OSS.

**OSS TO BE INSTALLED ONLY BY LICENSED INSTALLER. HOMEOWNER MAY NOT INSTALL OSS WITHOUT PRIOR APPROVAL FROM HEALTH DEPARTMENT.**

I have read and understand the above statements.

Name and Signature of Fee Simple Owner, Contract Purchaser, or Owner's Authorized Agent.

Print Dan Welch Signature Dan Welch Date Sept 4, 2014

- OSS TYPE:**
- |                                                                          |                                                        |                                               |
|--------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------------|
| <input type="checkbox"/> Conventional Gravity                            | <input type="checkbox"/> Pressure Distribution         | <input type="checkbox"/> Mound                |
| <input type="checkbox"/> Drip Irrigation                                 | <input type="checkbox"/> ATU w/ Pressure Distribution  | <input type="checkbox"/> ATU w/ Mound         |
| <input type="checkbox"/> ATU w/ Drip Irrigation                          | <input type="checkbox"/> Sand Filter w/ Pressure Dist. | <input type="checkbox"/> Sand Filter w/ Mound |
| <input type="checkbox"/> Biofilter                                       | <input type="checkbox"/> Septic Tank Only              | <input type="checkbox"/> Holding Tank         |
| <input checked="" type="checkbox"/> Other- Greywater & Composting Toilet |                                                        |                                               |

Comments / Conditions: 1) WCHD to be notified when installation begins. 2) Designer to be on site for phased inspections as noted in design on page 11. 3) Connection to City of Bellingham Sanitary Sewer upon failure of OSS is required. No reserve area. 4) Designer to perform drawdown & complete CPS form. 5) "Greywater Only" labels required as on p.12. 6) Final disposal of composted or partially composted materials to be as shown on p.13 of design.

7) Leak test of tank required - see p. 11. 8) Homeowner installation approved. 9) City of Bellingham plumbing permit & requirements must be met.

Construction Inspection By Lee Thripps Date 10-31-14  
 Final Approved By Lee Thripps Date 11-18-14

**IMPORTANT: Clean your outlet filter and/or pump screen YEARLY!!**

Office Use Only:  
 ed By J Deptner Date 9-4-14

# REDESIGN JULY 17, 2014



## WHATCOM COUNTY HEALTH DEPARTMENT ON-SITE SEWAGE SYSTEM PERMIT APPLICATION

509 Girard Street  
Bellingham, WA 98225  
Telephone: 360-676-6724  
Fax: 360-676-6771

Tax Parcel # 380223 488514 0000  
Owner Welch, Dan & Ashley  
Address 907 W. Connecticut St.  
Bellingham, WA 98225  
Phone (360) 296-2657

Date July 16, 2014  
Applicant Same as owner  
Address \_\_\_\_\_  
Phone \_\_\_\_\_

Site Address 2930 Birchwood Ave, Bellingham, WA 98225 Lot Size 0.77 Acres

S E W side of Birchwood Ave. Rd. 0.14 Miles N S E  of Pinewood Ave. Rd.

Subdivision Name Silk Purse Short Plat Lot 2 Blk \_\_\_\_\_ Div \_\_\_\_\_

No. of Bedrooms 3 GPD 180 Water Supply  Private  Public

Property is within the boundaries of a recognized sewer utility  No  Yes City of Bellingham

APPLICATION TYPE:  New Construction  Repair  Expansion  As-built  Operational

SEWAGE TYPE:  Residential  Commercial  Food Service Other greywater plus minimal

DESIGNER/ENGINEER Mike Moren, P.E., Aqueous Solutions Engineering, PLLC  
Print Name

COMMENTS: The Owners desire to build a highly energy and water-efficient home within the City of Bellingham. Although City water and sewer service can serve the property, the Owners desire to have a fully permitted "off the grid" home with a sole-source roof rainwater collection, storage, and treatment system for potable uses, passive and active solar energy use, and Sun-Mar Excel composting toilet with the minimal leachate routed to an on-site septic system treating household greywater in a greywater tank and pressurized gravel bed drainfield.

Name and Signature of Fee Simple Owner, Contract Purchaser, or Owner's Authorized Agent.  
Print Michael Moren Signature \_\_\_\_\_ Date 7/16/14

If you do not agree with the decision made regarding this application you may request that the decision be reviewed. See Whatcom County Code section 24.07.090 for more information. Contact Whatcom County Health Department for further information and procedures. A fee is charged.

Application Reviewed & Design Approved Rae Phipps Date 8-19-14

OSS Permit Type Greywater OSS & Composting Toilet

Conditions (1) WCHD to be notified when installation begins. (2) Designer to be on site for phased inspections as noted in design on p. 11.

(3) Connection to City of Bellingham Sanitary Sewer upon failure of OSS is required. No reserve Area. (4) Designer to perform drawdown & complete

Application Not Approved \_\_\_\_\_ Date \_\_\_\_\_

Reasons \_\_\_\_\_

(5) Greywater "Only" labels required as on P. 12.

(6) Final disposal of composted or partially composted materials to be as shown on P. 13 of design. (7) LEAK TEST of Tank required - see p. 11.

Received by: DB

6-21-13 HCL2052 Check \$950.00



WHATCOM COUNTY HEALTH DEPARTMENT  
FILE NOTES

509 Girard Street  
Bellingham, WA 98225  
Telephone: 360-676-6724  
Fax: 360-676-6771

Address 2930 Birchwood Ave  
Tax Parcel # 380223-488514

Page # 3

Date	EHS/Clerk	Notes
8-18-14	(LP)	Discussed in office with Mike Moren. His final corrections of p. 5 & 11 are sufficient.
8-19-14	(LP)	Discussed on phone with Dan Welch. He will provide photos of Drain-Waste-Vent lines in house with labeling "Gray Water Only - Not for Combined Waste Water", and email photos. Told him if we didn't get photos from him we could ask for proof after the fact - such as removal of drywall. Application Approved.
10-20-14	(LP)	Discussed on phone with Mike Moren. He made inspection of excavation. Said it was as designed. He will be present for Squirr test. They have to put transport line in as well as pipe in drainfield.
10-31-14	(LP)	<p>Rev 11-24-14</p> <p>Construction inspection - Squirr = 60". Drainfields located as designed, tank has moved. Record Drawing required. Designer and owner (homeowner installed) both on site. Anti-siphon hole added in transport line in 2<sup>ND</sup> compartment of pump/septic tank (2 compartment). Spring-loaded check valve installed with access box prior to drainfields. Orifice shields &amp; Filter Fabric on site. Monitoring ports to be added - 1 to bottom of gravel, one to bottom of sand, in each bed, as designed. Designer to provide (1) Drawdown info &amp; CPS Form (2) Record Drawing, (3) Water-tightness certification (4) Summary of phased inspections. Owner to Notify WCHD when composting toilets are installed. Should have an annual re-check date to verify Compost is handled appropriately, as designed.</p> <p>Rev 1-5-15</p>



WHATCOM COUNTY HEALTH DEPARTMENT  
**FILE NOTES**

509 Girard Street  
 Bellingham, WA 98225  
 Telephone: 360-676-6724  
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Address 2930 Birchwood Ave  
 Tax Parcel # 386223-488514

Page # 4

Date	EHS/Clerk	Notes
11-17-14	LP	<p>Construction Inspection - of Composting Toilets. They are in and operable, with 120 V outlets for vent fans &amp; heaters. Leachate drains connected to Greywater OSS.</p> <p>Verified with Mark Sniffen, COB Building Inspector. He had conducted inspection today and ran flow test from all fixtures to verify they each go to Greywater OSS. All fixtures connected to OSS (verified at Sewer Cleanout). Also discussed venting with Mark. He said venting for Composting toilets runs through attic and to rear of house (North side) terminating outside.</p>
11-18-14	LP	<p>Discussed Traffic Barriers with owner. He is aware of the need and will place them soon.</p> <p>Final Approval Granted.</p>

REDESIGN JULY 17, 2014

**APPENDIX A**

**SOIL LOGS**

# REDESIGN JULY 17, 2014



## WHATCOM COUNTY HEALTH DEPARTMENT ON-SITE SEWAGE SYSTEM SOIL LOGS

509 Girard Street  
Bellingham, WA 98225  
Telephone: 360-676-6724  
Fax: 360-676-6771

Tax Parcel # 380223 488514 0000 Date 2/5/2013 Page No 1 of 3

Subdivision Name Lot 2, Silk Purse Short Plat SSSLSS # \_\_\_\_\_

Owner Welch, Dan & Ashley Designer Mike Moren, P.E., Aqueous Solutions Engr.

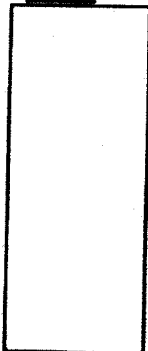
### Soil Loading Rate

Coarsest Textured Soil Type 3 - loamy med. sand, 0.8 gal/ft<sup>2</sup>/day · Designed Treatment Level E

Finest Textured Soil Type 4 - Sandy Loam, 0.6 gal/ft<sup>2</sup>/day · Design Vertical Separation: 24"-36"

### - DESIGNER -

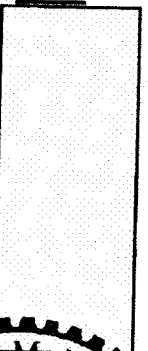
# SL#1



0-10" Dark brown loamy topsoil, loose  
10"-22" light reddish/brown sandy loam, loose  
22"-46" Brown/grey medium sand, loose  
46"-48" Grey silty clay loam, more dense, some mottling  
48"+ grey silty clay loam, dense, distinct mottling.  
No seepage or groundwater observed  
Roots to 22"

Restrictive Layer Depth 48"  
Wet Season Water Table Depth 46"  
(based on mottling beginning at 46")

# SL#2



0-10" Dark brown loamy topsoil, loose  
10"-24" light reddish brown sandy loam, loose  
24"-46" Brown/grey medium sand, loose  
46"-48" Grey silty clay loam, more dense, some mottling  
48"+ grey silty clay loam, dense, distinct mottling  
No seepage or groundwater observed  
Roots to 24"

Restrictive Layer Depth 48"  
Wet Season Water Table Depth 46"  
(based on mottling beginning at 48")

### - HEALTH DEPARTMENT USE ONLY -

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Professional Designer/Engineer Stamp

Soil log holes must conform to Chapter 24.05 WCC. Use additional pages for additional soil log test holes.

LEAVE THESE LOGS IN PLACE FOR A MINIMUM OF 30 DAYS



# REDESIGN JULY 17, 2014

## WHATCOM COUNTY HEALTH DEPARTMENT ON-SITE SEWAGE SYSTEM SOIL LOGS

509 Girard Street  
Bellingham, WA 98225  
Telephone: 360-676-6724  
Fax: 360-676-6771

Tax Parcel # 380223 488514 0000 Date 2/5/2013 Page No 2 of 3

Subdivision Name Lot 2, Silk Purse Short Plat SSSLSS # \_\_\_\_\_

Owner Welch, Dan & Ashley Designer Mike Moren, P.E., Aqueous Solutions Engr.

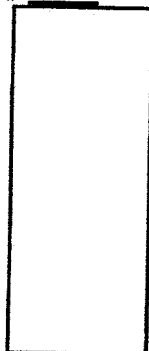
### Soil Loading Rate

Coarsest Textured Soil Type 3 - loamy med. sand, 0.8 gal/ft<sup>2</sup>/day Designed Treatment Level E

Finest Textured Soil Type 4 - Sandy Loam, 0.6 gal/ft<sup>2</sup>/day Design Vertical Separation: 24"-36"

### - DESIGNER -

# SL#3

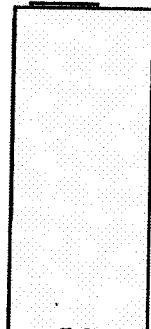


0-12" Dark brown loamy topsoil, loose  
12"-16" Lighter dark brown loamy soil, loose  
16"-32" Grey semi-compact fine sandy silt w/mottling N. side of pit only, possible fill  
32"-38" Dark brown loamy soil, loose, N. side of pit only, possible fill, wood chunks at 36", appears to be fill  
No seepage or groundwater observed  
Roots to 24"

Restrictive Layer Depth 16" (fill)

Wet Season Water Table Depth 16"  
(based on mottling beginning at 16")

# SL#4



0-8" Dark brown loamy topsoil, loose  
8"-18" Dark to med. brown loamy soil, a little more clay content  
18"-26" Grey/brown silty clay loam w/ mottling  
26"+ Grey silty clay loam w/mottling, more dense  
No seepage or groundwater observed  
Roots to 18"

Restrictive Layer Depth 26"

Wet Season Water Table Depth 18"  
(based on mottling beginning at 18")

### - HEALTH DEPARTMENT USE ONLY -

Blank lines for Health Department use.



Professional Designer/Engineer Stamp

Soil log holes must conform to Chapter 24.05 WCC. Use additional pages for additional soil log test holes.



# REDESIGN JULY 17, 2014

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509 Girard Street  
Bellingham, WA 98225  
Telephone: 360-676-6724  
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Tax Parcel # 380223 488514 0000 Date 2/5/2013 Page No 3 of 3

Subdivision Name Lot 2, Silk Purse Short Plat SSSLSS # \_\_\_\_\_

Owner Welch, Dan & Ashley Designer Mike Moren, P.E., Aqueous Solutions Engr.

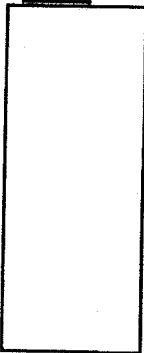
### Soil Loading Rate

Coarsest Textured Soil Type 3 - loamy med. sand, 0.8 gal/ft<sup>2</sup>/day Designed Treatment Level E

Finest Textured Soil Type 4 - Sandy Loam, 0.6 gal/ft<sup>2</sup>/day Design Vertical Separation: 24"-36"

### - DESIGNER -

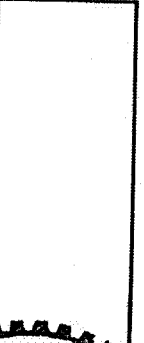
# SL#5



0-10" Dark brown loamy topsoil, loose  
10"-12" Lighter dark brown loamy soil, more dense  
12"-20" Grey/brown silty fine/v. fine sand, more dense w/mottling  
20"+ Grey silty fine/v. fine sand, more dense w/mottling  
No seepage or groundwater observed  
Roots to 18"

Restrictive Layer Depth 20"  
Wet Season Water Table Depth 16"  
(based on mottling beginning at 16")

# SL#6

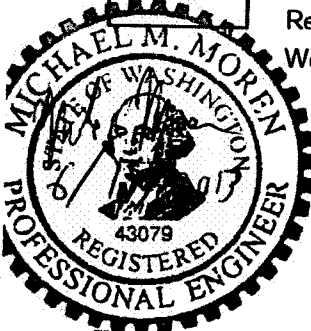


0-10" Dark brown loamy topsoil, loose  
10"-20" Reddish brown sandy loam a little more clay content  
20"-46" Grey/brown med. loamy sand  
46"-60"+ Coarse sand  
No seepage or groundwater observed  
Roots to 24"

Restrictive Layer Depth 60"+  
Wet Season Water Table Depth 60"+

### - HEALTH DEPARTMENT USE ONLY -

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Professional Designer/Engineer Stamp

Soil log holes must conform to Chapter 24.05 WCC. Use additional pages for additional soil log test holes.

(ENR Form 555 - Modification 5/03 - 10/03 - 1/03 - 2/07 - 1)





WHATCOM COUNTY HEALTH DEPARTMENT  
**ON-SITE SEWAGE SYSTEM  
 CONTROL PANEL SETTINGS**

509 Girard Street  
 Bellingham, WA 98225  
 Telephone: 360-676-6724  
 Fax: 360-676-6771

Tax Parcel Number 380223 488514 0000 Site Address 2930 Birchwood Ave

**Calculate The Installed Pump Rate In Gallons Per Minute** Bellingham, WA 98225

Tank Size 305 (gross) Gallons Per Inch 5.75 (approx)  
 (pump chamber only)  
 Drawdown 7.2 Inches 1.5 Minutes

( 7.2 inches x 5.75 gpi ) ÷ 1.5 minutes drawdown test run = 27.6 gpm

**Calculate The On Time:** (not required for Glendon BioFilters)

36 gal/dose from design ÷ gpm from above = 1.3 min (on time) **1 min, 20 sec. ON**

Off Time From Design 4.78 hours => **4 hrs., 46 min OFF**

All risers are to grade, properly sealed, and are watertight  Septic Tank/Pump Tank are watertight

Building sewer cleanout is installed

**Level Settings in Tank** [Riser Height: 16.5" = 1.36' (top of riser to top inside of tank)]

Redundant Off Level 49.25" On/Off Level 41" High Water Alarm Level 28.5" Float Tether Length 2"

Measured from Top of Riser  Bottom of Tank   
 (measurements to clamp location on float tree)

**Aquaworx Panel Only (\*measured from bottom of transducer)**

\*Veto On level \_\_\_\_\_ in. Veto On Time \_\_\_\_\_ min. sec. Z-Bias Setting \_\_\_\_\_ \*High Level \_\_\_\_\_ in.

\*Start Level \_\_\_\_\_ in. Veto Off Time \_\_\_\_\_ min. sec. Distance between tank bottom & transducer \_\_\_\_\_ in.

**Pump and Control Panel Info**

Elapsed Time Meter Reading 1 hr. 6 min Dose Counter Reading 50 @ 09:00 on 11/10/14

Pump Brand Oreco Pump model Easypak PI3005 Pump hp 0.5

Control Panel Brand Oreco Control Panel Model BEP30TDD

Alarm is wired on a circuit independent of the pump

ASTM C-33 Sand?  Yes  No If Yes, Supplier ABB Rock

Drawdown completed by Mike Moren, P.E. Timer set by Dan Welch (Owner), witnessed by Mike

**Other Settings** System uses in-line adjustable check valve to keep supply line mostly full, located in valve box at drainfield. 1/8" hole drilled in pump chamber discharge assy. piping to prevent siphon.

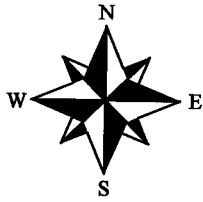
**Timer panel, settings and float operation meet the approved design.**

Installer Signature [Signature] Print Dan Welch (Owner) Date 11/10/14

Company Owner-installed

Designer Signature [Signature] Print Michael Moren, P.E. Date 11/10/14

**Originals must be submitted to Health Department. No photocopies - No faxes.  
 All spaces must be complete or marked N/A if not applicable.**



SCALE: 1" = 60'

PROPERTY LINE  
(TYP)

RAINWATER  
CISTERNS  
(BY OTHERS)

3-BEDROOM HOME  
(BY OTHERS)

4"Ø CLEANOUT  
SEE SHEET 9

4"Ø GRAVITY SEWER,  
SLOPE 2% MIN TOWARDS  
SEPTIC TANK

BODE'S 750-GAL TWO-  
COMPARTMENT SEPTIC/ PUMP  
TANK FOR GREYWATER ONLY,  
SEE SHEET 6

2924

EXISTING  
HOUSE

12' WIDE  
DRIVEWAY  
(BY OTHERS)

EXISTING  
SHOP

15.0' EASEMENT

1-1/4"Ø  
PRESSURE  
EFFLUENT  
SEWER LINE,  
SEE SHEET 9

EXISTING  
GARAGE

EXISTING  
HOUSE  
2932

EXISTING  
HOUSE  
2926

DRAINFIELD,  
SEE SHEET 5

EXIST. COB  
WATER LINE  
BIRCHWOOD  
AVE. ROW



# RECORD DRAWING

Know what's below.  
Call before you dig.

**AQUEOUS SOLUTIONS ENGINEERING, PLLC**  
P.O. BOX 1635  
BELLINGHAM, WA 98227  
Phone: (360) 318-4704  
E-mail: mike.more75@gmail.com



TITLE: OVERALL SITE PLAN		
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225		
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000		
DRAWN BY: M. MOREN	DATE: NOVEMBER 10, 2014	4/14



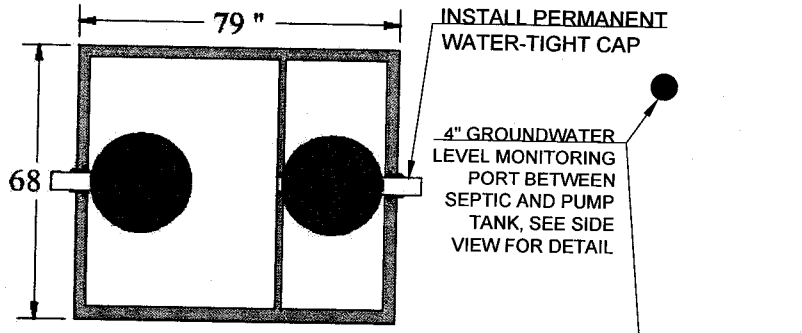
# BODE'S PRECAST CONCRETE

7900 lbs.

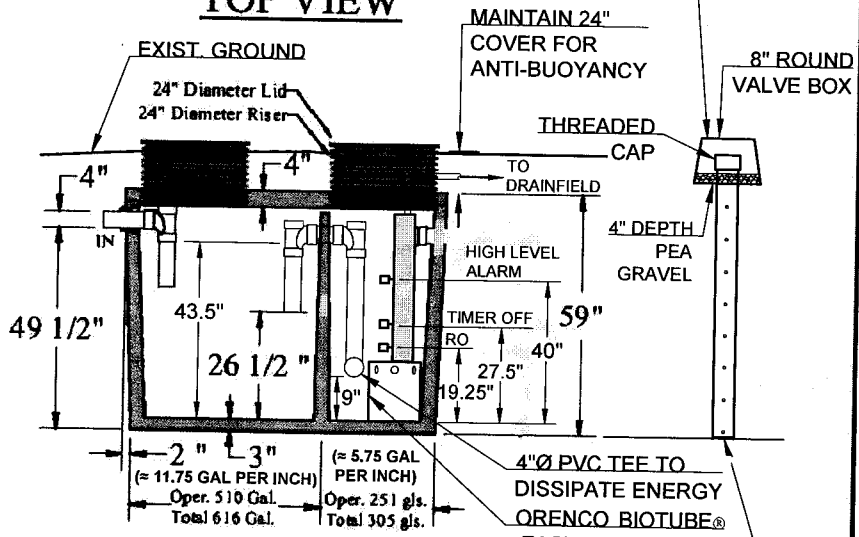
### NOTE:

1. THE PUMP DISCHARGE PIPING SHALL BE ROUTED THROUGH PVC RISER USING A WATER-TIGHT RUBBER GROMMET, AND THE 4" TANK OUTLET PIPING SHALL BE CAPPED WITH A PERMANENT (GLUED) WATER-TIGHT CAP.

2. SEE NOTE AT BOTTOM OF SHEET 2 REGARDING DESIGN ENGINEER'S JUSTIFICATION FOR USING ONLY A TWO-COMPARTMENT SEPTIC/PUMP TANK INSTEAD OF A TWO-COMPARTMENT SEPTIC TANK FOLLOWED BY A SINGLE COMPARTMENT PUMP TANK.



### TOP VIEW



### SIDE VIEW

#### General Notes

- Standard inlet and outlet is 4" diameter - custom penetrations are available
- Pipe penetrations are flexible watertight seals with clamps for pipe
- Inlet and outlet tee baffles are to be 4" diameter pvc, abs or approved
- Typical access holes are 24" diameter ribbed pipe with screwed watertight gasketed lids
- Joint between the tank and tank top is sealed with Con-Seal CS-665 mastic rope or equal
- Concrete shall be 4000 psi within 28 days
- Rebar shall meet ASTM A 615 grade 60 specifications
- Wire mesh shall meet ASTM A-185 grade 65 specifications
- Fibermesh reinforcing shall meet ASTM C1116

4" GROUNDWATER MONITORING PORT WITH 0.5" PERFORATIONS EVERY 6" TO BOTTOM OF TANK ELEVATION. WRAP IN PERMEABLE GEOTEXTILE FABRIC AND BOND WITH STAINLESS STEEL STRAPS OR ZIP TIES AT 2.0' ON CENTER. MONITORING PORT USED TO OBSERVE GROUNDWATER LEVEL WHEN PUMPING TANKS.

**BODE'S PRECAST, INC.**  
1861 East Pole Rd.  
Everson, Wa. 98247  
(360) 354-3912

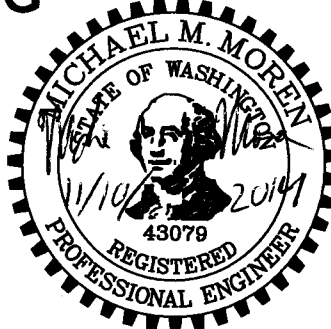
## 750 Gallon Septic Tank

### 2 Chambers

Model Number: S750-2

Date Issued: November 2010

## RECORD DRAWING



**BUOYANCY CALCS - GROUNDWATER 12" BELOW GRADE (M. MOREN)**  
 $F_b = [(6.58 \times 5.67 \times 4.92) + (3.14 \times 1.0 \times 2)] \times 62.4 \text{ LBS/FT}^3 = 11,846 \text{ LBS} \uparrow$   
 $W_s = 7,900 \text{ LBS} \downarrow$   
 $W_s = [(6.58 \times 5.67) - (2 \times 3.14 \times 1.0)] \times [(1.0 \times (120 - 62.4 \text{ LBS/FT}^3)) + (1.0 \times 120 \text{ LBS/FT}^3)]$   
 $= 5,511 \text{ LBS} \downarrow$  (weight of submerged soil) (weight of saturated soil)  
 Net Force = 13,411 LBS $\uparrow$  + 11,846 LBS $\uparrow$  = 1,565 LBS $\downarrow$   
 Factor of Safety, FS = 13,411 LBS + 11,846 LBS = 1.13. OK

AQUEOUS SOLUTIONS ENGINEERING, PLLC  
P.O. BOX 1635  
BELLINGHAM, WA 98227  
Phone: (360) 318-4704  
E-mail: mike.moren75@gmail.com

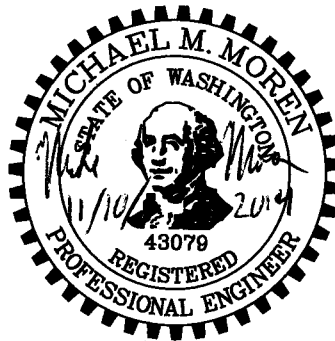
TITLE: SEPTIC/PUMP TANK DETAILS  
 FOR: DAN & ASHLEY WELCH  
 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225  
 WHATCOM COUNTY TAX PARCEL NO.:  
 380223 488514 0000  
 DRAWN BY: M. MOREN  
 DATE: NOVEMBER 10, 2014

# CONSTRUCTION NOTES

**DRAINFIELD BED CONSTRUCTION NOTES:**

1. CONSTRUCTION OF THE DRAINFIELD SHALL BE DONE WITH A TRACK-MOUNTED EXCAVATOR OR BULLDOZER ONLY TO REDUCE COMPACTION OF THE SOIL ON AND AROUND THE DRAINFIELD. DO NOT USE A WHEELED BACKHOE ON THE DRAINFIELD OR RESERVE AREAS.
2. FOR BED 1, THE INSTALLER WILL HAVE TO OVEREXCAVATE THE LOAMY SOIL TO GET TO THE MEDIUM SAND LAYER AND IMPORT ASTM C-33 SAND TO GET BACK TO THE BOTTOM GRADE OF THE DRAINROCK BED. THE ENGINEER/DESIGNER SHALL BE NOTIFIED AT LEAST 72 HOURS IN ADVANCE OF THE DRAINFIELD BED EXCAVATION AND SHALL BE ON SITE DURING THE EXCAVATION TO DETERMINE THE DEPTH OF LESS PERMEABLE LOAMY SOIL TO BE REMOVED, EXAMINE THE INFILTRATIVE SURFACE, AND CHECK DRAINROCK BED LEVEL.
3. THE BOTTOM OF THE DRAINFIELD DRAINROCK BEDS AS WELL AS THE SURFACE THE LATERALS AND MANIFOLD REST ON SHALL BE CONSTRUCTED LEVEL IN BOTH DIRECTIONS (LONGITUDINAL AND TRANSVERSE).
4. ORIFICES IN THE DRAINFIELD LATERALS SHALL BE DRILLED SMOOTH WITH A NEW SHARP DRILL BIT AND SHOULD NOT HAVE ANY VISIBLE BURRS.
5. ALL DRAINFIELD LATERALS SHALL BE FLUSHED WITH CLEAN WATER TO REMOVE ANY PVC SHAVINGS, DIRT AND DEBRIS PRIOR TO INSTALLING THE END CAP.
6. ONCE THE DRAINFIELD LATERALS ARE LAID OVER THE 9 INCHES OF THE GRAVEL BED, A SQUIRT HEIGHT TEST SHALL BE PERFORMED. THE SQUIRT HEIGHT TEST SHALL BE PERFORMED WITH WATER. A SQUIRT HEIGHT OF 5.0 FEET SHALL BE ACHIEVED AT THE MOST DISTAL ORIFICES (FURTHEST FROM MANIFOLD) IN THE SYSTEM. THE INSTALLER SHALL NOTIFY THE ENGINEER/DESIGNER AND WHATCOM COUNTY INSPECTOR AT LEAST 72 HOURS PRIOR TO CONDUCTING THE SQUIRT HEIGHT TEST. AT THIS TIME, THE CONTRACTOR AND ENGINEER SHALL CONDUCT OTHER FINAL MEASUREMENTS (I.E. FLOAT SETTINGS, PUMP DRAWDOWN PER DOSE, TIMER SETTINGS), AND ENSURE CORRECT OPERATION OF THE ENTIRE SYSTEM. ALL INITIAL BASELINE SETTINGS/READINGS SHALL BE RECORDED AND SHOWN ON FINAL AS-BUILT DRAWINGS. ALL SYSTEM TESTING SHALL BE CONDUCTED WITH CLEAN WATER.
7. AFTER COMPLETION OF THE SQUIRT HEIGHT TEST, THE INSTALLER SHALL PLACE THE ORIFICE SHIELDS OVER EACH ORIFICE AND ADD THE REMAINING DRAINROCK AND GEOTEXTILE FABRIC. AFTER INSTALLING THE COVER MATERIAL, THE AREA SHALL BE SEEDED WITH GRASS SEED.
8. INSTALL VALVE BOXES SUCH THAT THE TOP ONE (1) TO TWO (2) INCHES IS ABOVE FINISHED GRADE. ALL VALVE BOXES SHALL HAVE A 4-INCH DEPTH OF PEA GRAVEL BELOW THE PIPING OR PIPE SUPPORT BLOCKS. THE LATERAL END CAPS SHALL BE INSTALLED IN THE CENTER OF THE VALVE BOXES
9. ONCE THE OSS SYSTEM HAS BEEN CONSTRUCTED AND PRIOR TO ACCEPTING SEWAGE, THE INSTALLER SHALL NOTIFY THE ENGINEER FOR FINAL INSPECTION. THE ENGINEER IS RESPONSIBLE FOR COMPLETING AS-BUILT DRAWINGS, AND THE INSTALLER IS RESPONSIBLE FOR COMPLETING THE WHATCOM COUNTY TANK WATER TIGHTNESS CERTIFICATION FORM, AND CONTROL PANEL SETTINGS FORM AND SUBMITTING THE ORIGINALS TO THE WHATCOM COUNTY HEALTH DEPARTMENT AND COPIES TO THE DESIGN ENGINEER, AND THE OWNER.
10. UNDER NO CIRCUMSTANCES SHALL ANY SEWAGE BE DIRECTED TO THE NEW OSS UNTIL THE WHATCOM COUNTY HEALTH DEPARTMENT HAS ISSUED THE FINAL OSS PERMIT.
11. THE FOLLOWING IS A LIST OF CONSTRUCTION INSPECTIONS THE ENGINEER/DESIGNER SHALL MAKE AFTER NOTIFICATION FROM THE INSTALLER:
  - 11.A. PRE-CONSTRUCTION MEETING PRIOR TO BEGINNING ANY OSS CONSTRUCTION ACTIVITIES 10/6/2014 -MMM
  - 11.B. SEPTIC/PUMP TANK PLACEMENT AND LEAK TEST 10/23-24/2014 -MMM
  - 11.C. ACTUAL EXCAVATION OF BOTH DRAINFIELD BEDS AND BACKFILL WITH ASTM-C33 SAND WHERE REQUIRED. 10/21/2014 -MMM
  - 11.D. MANIFOLD AND LATERAL PIPING, FLOW CONTROL VALVE BOX INSTALLATION, AND SQUIRT HEIGHT TEST AS DESCRIBED IN NOTE NUMBER 8 ABOVE AS WELL AS BASELINE SETTINGS (FLOAT SETTINGS AND OPERATION, TIMER OPERATION, PUMP DRAWDOWN, ETC.) 10/31/2014 -MMM
  - 11.E. FINAL COVER OVER TANK, PIPING, AND DRAINFIELD BEDS AND RECORD DRAWING DOCUMENTATION. 11/10/2014 -MMM

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 Phone: (360) 318-4704  
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## RECORD DRAWING

TITLE: CONSTRUCTION NOTES		
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225		
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000		
DRAWN BY: M. MOREN	DATE: NOVEMBER 10, 2014	11 14

# COMPONENTS & SPECIFICATIONS

**GRAVITY SEWER LINES AND FITTINGS:** All gravity sewer lines must be 4-inch dia. conforming to ASTM 3034 PVC for solvent-cemented or gasketed joints. Gaskets shall conform to ASTM F477, Elastomeric Seals. Septic tank shall be connected to the home with 4-inch dia. ASTM 3034 PVC with a minimum slope of 1/4"/ft. (2%) and a cleanout within 4 ft. of the home. Any changes in direction of the gravity sewer line shall have a cleanout. 90° bends shall be made with two 45° bends. All pipe connections shall be water-tight. External piping connections to tank inlet and outlet piping shall be made with Fernco® flexible rubber couplings with stainless steel band clamps.

**PRESSURE SEWER LINES AND FITTINGS:** All pressure pipe and fittings including drainfield laterals shall be Sch. 40 OR SCH 80 PVC. All pipe and fitting connections shall be solvent-cemented and shall be water-tight.

**HOUSEHOLD DRAIN-WASTE-VENT (DWV) PLUMBING:** All household drain-waste-vent (DWV) and OSS system plumbing shall be clearly labeled "GREYWATER ONLY - NOT FOR COMBINED WASTEWATER".

**SEPTIC/PUMP TANK:** Use 750-gallon, two-compartment concrete septic tank from Bode's Precast, Inc. Installation shall be per manufacturer's requirements. At a minimum, the tank shall be placed on a min. 4" depth bed of sand or pea gravel unless otherwise specified by the tank manufacturer. The tank shall be set level in both directions. External piping connections to the tank's inlet and outlet piping shall be made with Fernco® flexible rubber couplings with stainless steel band clamps (for gravity sewer lines only).

**TANK RISERS, LIDS, and RISER-TO-TANK ADAPTERS:** Use Orenco Systems, Inc. (OSI) Model RR2424+S4+12 Ultra-Rib 24"Ø PVC Risers or Engineer-Approved equivalent. Use OSI Model FL24G-4B 24"Ø fiberglass lids or Engineer-Approved equivalent. Use OSI Model PRTA24 24"Ø ABS Riser Tank Adapters, OSI Model PRTA24BDKIT bolt-down kit to fasten riser tank adapters to concrete tank unless the riser tank adapter was cast into the concrete lid. Use OSI Model ADH100 adhesive/sealant for sealing PVC risers to riser tank adapters, or Engineer-Approved equivalent. When installed, the riser-to-tank connection shall be verified water-tight using the procedures outlined in the "Septic Tank Testing for Water-Tightness" document included in Appendix F of this design.

**TANK BEDDING MATERIAL:** Bedding material and placement methods for the tanks shall be per manufacturer's requirements.

**TANK BACKFILL:** Bedding material and placement methods for the tanks shall be per manufacturer's requirements.

**PIPE ZONE BEDDING MATERIAL FOR UTILITY (SEWER, ELECTRICAL) TRENCH:** Pipe zone bedding material for buried utilities shall be native material free from rocks larger than 3" in diameter and organics (vegetation, wood debris, etc.). If native soil is inadequate, use ASTM C-33 sand.

**TRENCH BACKFILL MATERIAL:** Trench backfill material shall be native soil compacted by boot-packing or by excavator tread in areas not subject to vehicular traffic, and shall be compacted by vibratory compactor in areas subject to vehicular traffic (i.e. driveway crossing).

**PUMP TANK EFFLUENT PUMP VAULT:** Use Orenco® Systems, Biotube EasyPak™ Model BEP30TDD Pump Package.

Included in package:

- Biotube® EasyPak™ pump vault with filter cartridge
- High-head effluent pump, Model PI3005, 1/2 HP, 115 V, single phase in PVC flow inducer
- 1-1/4" Discharge assembly with ball valve, check valve, and anti-siphon valve (OSI Model HV125 BCAS)
- Float switch assembly (redundant off, timer on/off, high-level alarm)
- PVC internal splice box
- Control Panel (panel shall be capable of time dose settings via a digital timer and shall also have a pump run-time meter and dose event counter).

**NOTE: THE ALARM MUST BE ON A SEPARATE CIRCUIT FROM THE PUMP.**

**DRAINFIELD BED MEDIA:** The drainfield bed media shall be clean, washed 3/4" - 2-1/2" drainrock.

**DRAINFIELD MANIFOLD, LATERALS, AND ASSOCIATED FITTINGS:** Drainfield manifolds shall be 1" Ø Schedule 40 PVC. Laterals shall be 3/4" Ø Schedule 40 PVC. A new 1/8" drill bit shall be used to drill the orifices. Fittings shall be Schedule 40 or Schedule 80 PVC. The laterals shall be connected to the manifolds with PVC tees or 90° elbows (at end).

**PVC BALL VALVES:** High-pressure PVC ball valves shall be Orenco® Systems, Inc. Model VLT1000S or Engineer-approved equivalent.

**FLOW CONTROL VALVES:** Orenco® Systems, Inc. Model VLT1000S PVC ball valves, or Engineer-approved equivalent.

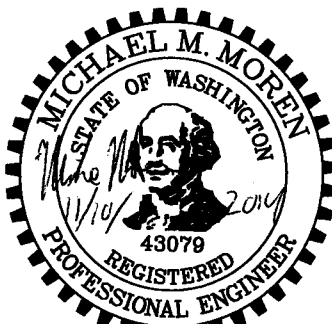
**IN-LINE ADJUSTABLE CHECK VALVE:** Use Spears® Manufacturing Company Part No. S1102-10 1"Ø In-line Adjustable PVC Spring Check Valve. The valve shall be adjusted to maintain a full drainfield supply line when the dosing pump is off (under static conditions).

**VALVE BOX FOR FLOW CONTROL VALVE ASSEMBLY:** The flow control valve assembly shall be contained with valve box extending to 1"-2" above finish grade. The valve boxes shall be large enough to contain both flow control valves, unions, and in-line adjustable spring check valve. Three layers of geotextile fabric shall be placed on the bottom of the valve boxes, and a 4-inch depth of pea gravel shall be placed in the bottom of the boxes. The piping and valves shall rest on the 4"x4" pressure-treated wood blocks. The vault shall also have a lid.

**MAGNETIC LOCATOR TAPE:** Magnetic locator tape shall be marked "CAUTION SEWER LINE BELOW" for all buried sewer/effluent lines, and "CAUTION - BURIED ELECTRICAL LINE" for all buried electrical lines.

**COMPOSTING TOILET SYSTEM:** Two(2) Sun-Mar Excel self-contained composting toilets each with integral compost chamber, evaporation tray, fan, heater, and leachate overflow drain.

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## RECORD DRAWING

TITLE: COMPONENTS & SPECIFICATIONS	
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM., WA 98225	
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000	
DRAWN BY: M. MOREN	DATE: NOVEMBER 10, 2014

12/14

# REDESIGN JULY 17 2014

## TABLE OF CONTENTS

### RESIDENTIAL ON-SITE COMPOSTING TOILET AND GREYWATER TREATMENT SYSTEM

Whatcom County Tax Parcel No. 380223 488514 0000

**Site Address**  
2930 Birchwood Ave.  
Bellingham, WA 98225

**Legal Description**  
LOT 2 AS DELINEATED ON THE FACE OF SILK PURSE  
SHORT PLAT, ACCORDING TO THE PLAT THEREOF, UNDER  
WHATCOM COUNTY AUDITOR'S FILE #2120803323, RECORDS  
OF WHATCOM COUNTY, WASHINGTON.  
SITUATE IN WHATCOM COUNTY, WASHINGTON

**Prepared at Request of Owner**

Dan & Ashley Welch  
907 West Connecticut St.  
Bellingham, WA 98225

**Prepared By**

Michael Moren, P.E.  
Aqueous Solutions Engineering, PLLC

Submitted to Whatcom County Health Department

on

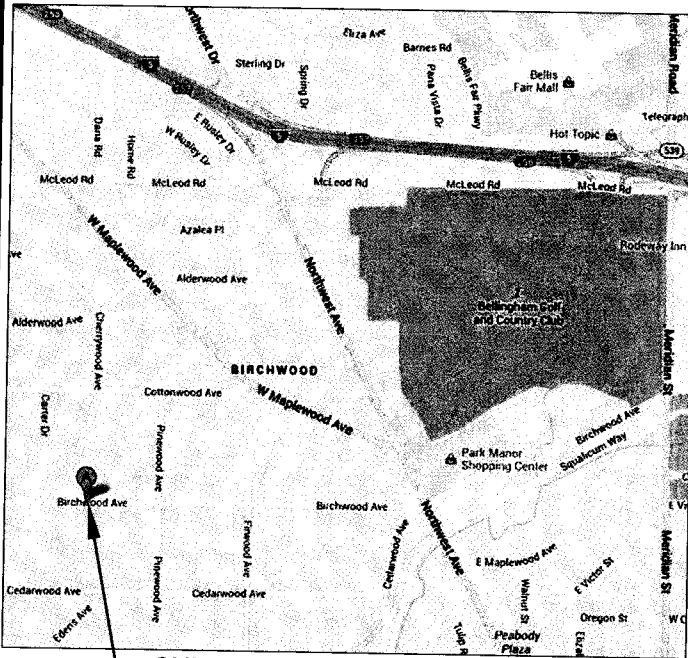
July 16, 2014

**ITEM PAGE**

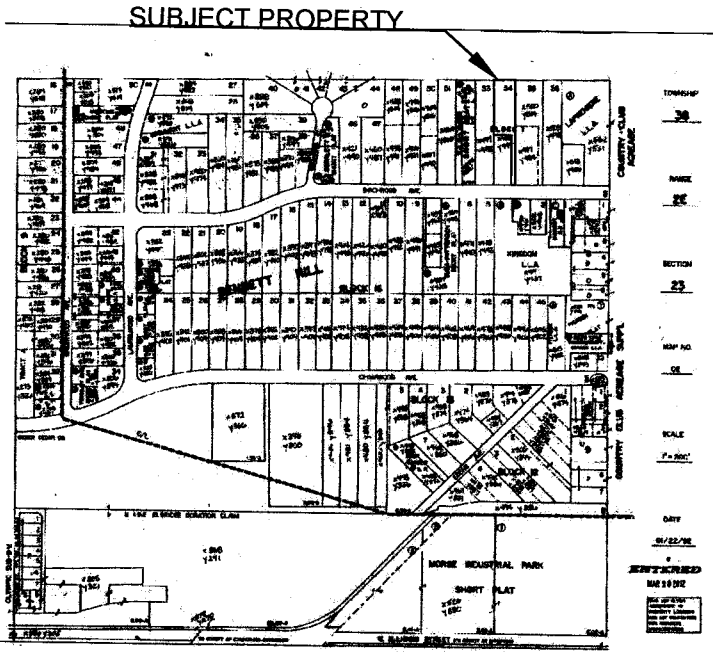
1. COVER PAGE AND PROJECT LOCATION	1
2. DESIGN CONSIDERATIONS	2
3. DESIGN & OPERATION SUMMARY	3
4. OVERALL SITE PLAN AND TANK PLAN	4
5. DRAINFIELD PLAN	5
6. SEPTIC/PUMP TANK DETAIL	6
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**APPENDICES**

- A. SOIL LOGS
- B. DESIGN CALCULATIONS
- C. LETTER FROM SUSTAINABLE CONNECTIONS REGARDING THE WELCH HOUSE GREEN BUILDING DEMONSTRATION PROJECT
- D. SUNMAR COMPOSTING TOILET INFORMATION
- E. NOT USED
- F. ORENCO® BIOTUBE® EASYPAK™ PUMP PACKAGE
- G. WHATCOM COUNTY WATER-TIGHTNESS CERTIFICATION OF SEWAGE TANKS FORM - BLANK
- H. WHATCOM COUNTY CONTROL PANEL SETTINGS FORM - BLANK
- I. ASSESSOR'S INFO ON NEW TAX PARCEL NUMBER
- J. EASEMENT AREA DESCRIPTION AND EXHIBIT



**SUBJECT PROPERTY  
VACINITY MAP**



**PARCEL MAP**

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TITLE: COVER PAGE & PROJECT LOCATION	
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225	
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000	
DRAWN BY: M. MOREN	DATE: JULY 16, 2014
1/14	

# DESIGN CONSIDERATIONS

Dan & Ashley Welch have proposed to build an environmentally sustainable 3-bedroom home on approximately 0.77 acres within the city limits of Bellingham, Washington. The Welches and [bundle] LLC have partnered with local non-profit organization Sustainable Connections to promote the use of green building techniques and use the proposed Welch house as a case study to demonstrate the use of these techniques to the community. This home will be unique in that it will utilize a rainwater catchment, storage, and treatment system to provide all of their water demands and well as, passive and active solar energy design, on-site greywater treatment system, two composting toilets, and green building materials. A letter from Sustainable Connections discussing the project is included in Appendix C. This OSS design covers the proposed on-site greywater treatment system and composting toilet.

The following summarizes the composting toilet and greywater treatment system design considerations:

- **Lot Size: 0.77 acres** including a 0.18-acre easement as determined from available documents.
- **Maximum Daily Greywater Design Flow: 180 gal/day**, which is based on one single-family residence with a maximum of three (3) bedrooms.
- **Proposed Composting Toilets:** Two (2) SunMar Excel composting toilets with integral electric heater and fan, each rated for a home or cabin with full-time occupancy of three (3) persons.
- **Wastewater Characteristic:** The wastewater will be household greywater (wastewater from household bathroom sinks and showers, clothes washer, dishwasher, and kitchen sink) plus leachate from the composting toilets. For proper operation of the system the effluent from the greywater septic tank must be within the following ranges:

<u>Parameter</u>	<u>Average</u>	<u>Peak</u>
Wastewater Flow (gal/day):	100	180
cBOD <sub>5</sub> (mg/L)	125	200
TSS (mg/L):	50	100
O&G (mg/L):	20	25

- **Receiving Soils: USDA Type 3 - Medium Sand** with a typical hydraulic loading rate of **0.8 gal/day/ft<sup>2</sup>** based on six soil logs summarized in Appendix A. Drainfield Bed 2 will be installed such that the infiltrative surface will be in Type 3 - medium sand. Bed 1 will require some minor overexcavation of loamy soil to get to the medium sand layer and import of ASTM C-33 sand to return to the bottom of bed elevation.
- **Vertical Separation:** The vertical separation between the proposed bottom of the gravel bed and restrictive layer is **greater than 24 inches**.
- **Required Treatment Level: Treatment Level E.**
- **Slopes & Topography:** Ground slopes within and surrounding the proposed primary drainfield range between 2% and 4%.
- **Easement/Rights-of-Way Setback Issues:** There is a 15-ft. wide easement on the southern portion of the property to allow the neighbors to the west access to their shop. No part of this OSS will be located within the easement. The easement is shown on Sheet 4 - Overall Site Plan, and the recorded easement can be found in Appendix J.
- **Cuts/Banks:** There are no significant cuts or banks within 50 ft. of the proposed drainfield area.
- **Surface Water:** There is no known surface water within 100 ft. of the proposed drainfield.
- **Interceptor Drains/Ditches:** There are no interceptor drains/ditches within 30 ft. downgradient or 10 ft. upgradient of the proposed drainfield, or with 5 ft. downgradient of the septic and pump tanks.
- **Existing Wells and Water Supply:** There are no known groundwater wells within 100 ft. of the proposed drainfield. This property and the surrounding properties are served by the City of Bellingham municipal water system, although this site does currently not have a water or sewer connection. The proposed drainfield is greater than 10 ft. horizontally from an existing municipal water line within the Birchwood Avenue Right-Of-Way as shown on Sheet 5 - Drainfield Plan.
- **Wetlands:** There are no known wetlands within 100 ft. of the proposed drainfield and within 50 ft. of the proposed septic and pump tanks.

**Note:**

Regarding the two-compartment septic/pump tank being proposed for this greywater plus compost toilet leachate OSS: The first compartment of the two-compartment septic/pump tank exceeds the minimum storage requirement of 450 gallons for a 3-bedroom home only discharging greywater (Table 1 of Water Conserving RS&G's, July 2012). The first chamber working volume is 510 gallons and has an outlet baffle to keep floating scum in that chamber. The pump chamber utilizes modified cross-over piping to reduce the downward velocity and thus potential stirring up of settled solids and also has an effluent filter around the pump housing as a second means of preventing excess solids from entering the pump. It is also anticipated that the wastewater strength from the greywater plus any compost toilet leachate will be much less than combined wastewater, and therefore the Engineer feels that a stand-alone two-compartment septic tank plus a separate pump tank is not necessary for this home.

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Redesign

8/1/2014 - MAM

TITLE: DESIGN CONSIDERATIONS		
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225		
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000		
DRAWN BY: M. MOREN	DATE: JULY 16, 2014	2/14

**LOCAL VARIANCE REQUEST - ADDITION OF COMPOST LEACHATE TO HOUSEHOLD ON-SITE "GREYWATER" TREATMENT SYSTEM.**

The proposed composting toilet may generate leachate that will need to be directed to the "greywater" system. It is anticipated that very little if any compost leachate will flow to the greywater system due to the compost toilet being located within the warmer home environment and utilizing both a heater (operating on a thermostat) and a small fan that operates full time. The Sunmar Excel product literature states that "In normal use the Excel can usually evaporate all liquids, however a 1/2" emergency drain is fitted at the rear and this should be connected if the unit is to be used residentially or heavily, or if prolonged power outages are expected." The leachate drains for both composting toilets will be connected to the home's drain-waste-vent system and drain to the greywater tank. The "greywater" system has been designed for greywater flows (180 GPD for a 3-bedroom home), and it is estimated that the average daily volume of leachate, if any is generated at all, will be much less than a gallon per day.

**DESIGN & OPERATION SUMMARY**

<b>HYDRAULIC LOADING AND DRAINFIELD DESIGN</b>	
Drainfield Design Flow (gpd):	180
Design Wastewater Strength:	Residential Greywater plus Urine
Receiving Soil Type:	3 - Medium sand
Design Hydraulic Loading Rate (GPD/FT <sup>2</sup> ):	0.8
Vertical Separation (in):	> 24"
Required Effluent Treatment Level:	E
Septic Tank Size (gallons):	500
Pump Tank Size (gallons):	250
Type of Drainfield:	Bed w/pressurized laterals
Trench Media Type:	Gravel - 3/4" - 2-1/2" Washed Drainrock
Required Bed Bottom Area (ft <sup>2</sup> ):	225
Bed Bottom Area Provided:	225
Bed Width (ft):	8
Total Bed Length Required (ft):	28
Total Bed Length Provided (ft):	28
Number of Beds:	2
Bed Separation, Edge to Edge (ft):	10
Manifold Configuration:	End Manifold
Number of Laterals (lateral-to-manifold connections):	4
Length of Longest Lateral (ft):	14
Length of Shortest Lateral (ft):	14
Lateral Orifice Spacing (ft):	2.0
Orifice Diameter (in):	1/8
Orifice Orientation:	12 O'clock (up)
Residual Squirt Height (most distal orifice) (ft):	5.0
<b>OPERATION</b>	
Number of Laterals Dosed at One Time:	8
Number of Doses per Day:	5
Volume per Dose (gallons):	36
Approx. Pump Tank Drawdown per Dose (in):	6.25
Approx. Pump Flow Rate at Operating Head (gpm):	24.5
Method of Drainfield Dosing:	Time-dosed
Approx. Pump Run Time per Dose (min):	1.5 (time drainfield is pressurized)
Timer OFF Time (hr,min):	4, 46.5

**Redesign**

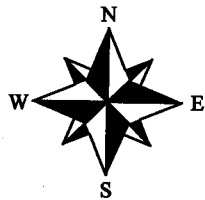
8/1/2014 - MMR

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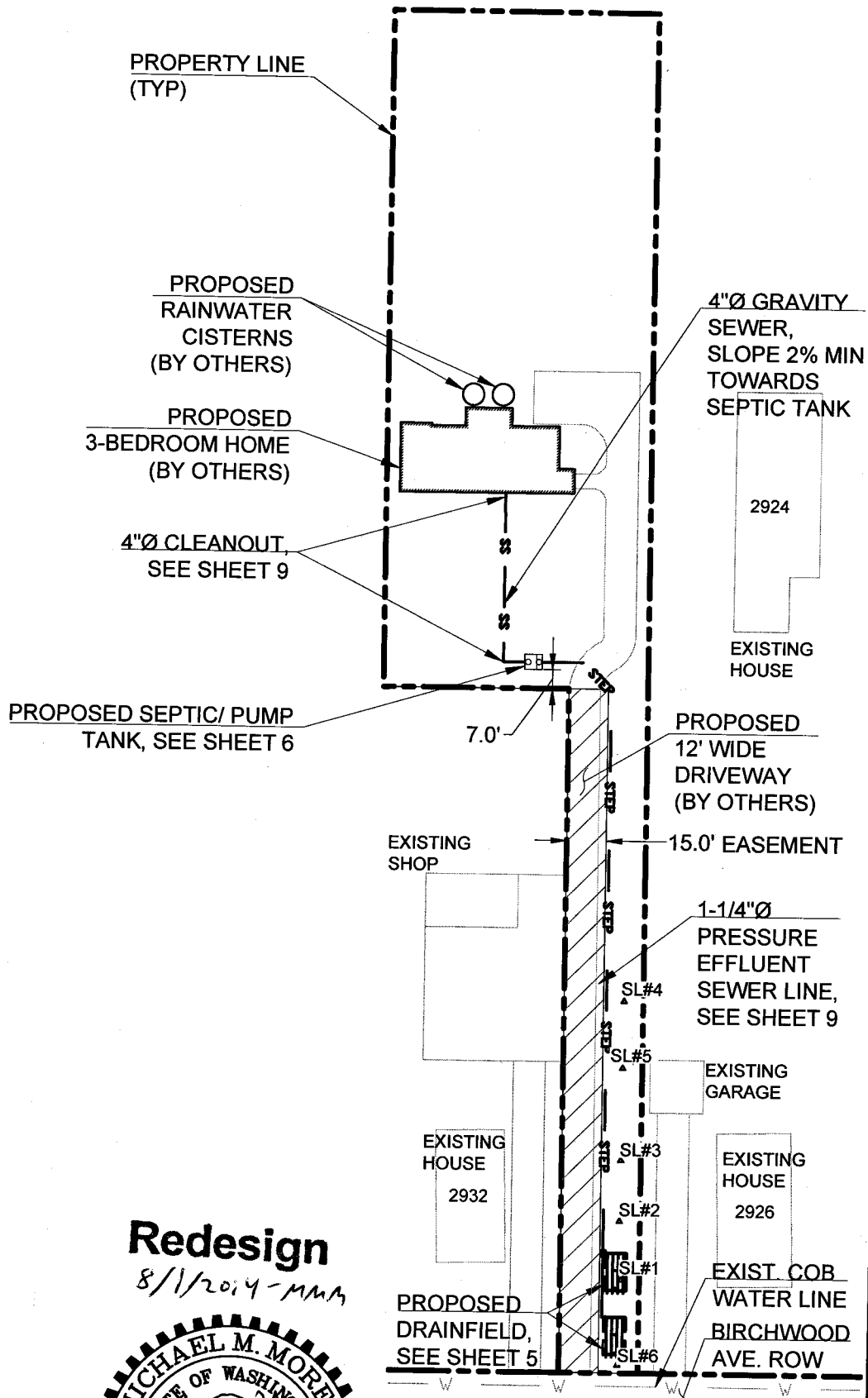


TITLE: DESIGN SUMMARY	
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225	
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000	
DRAWN BY: M. MOREN	DATE: JULY 16, 2014
	3/14



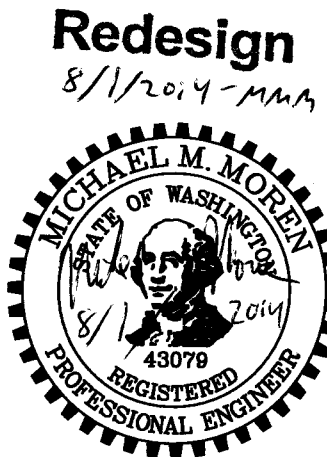


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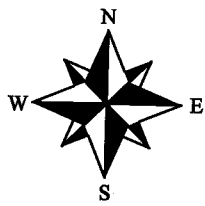


Know what's below.  
Call before you dig.

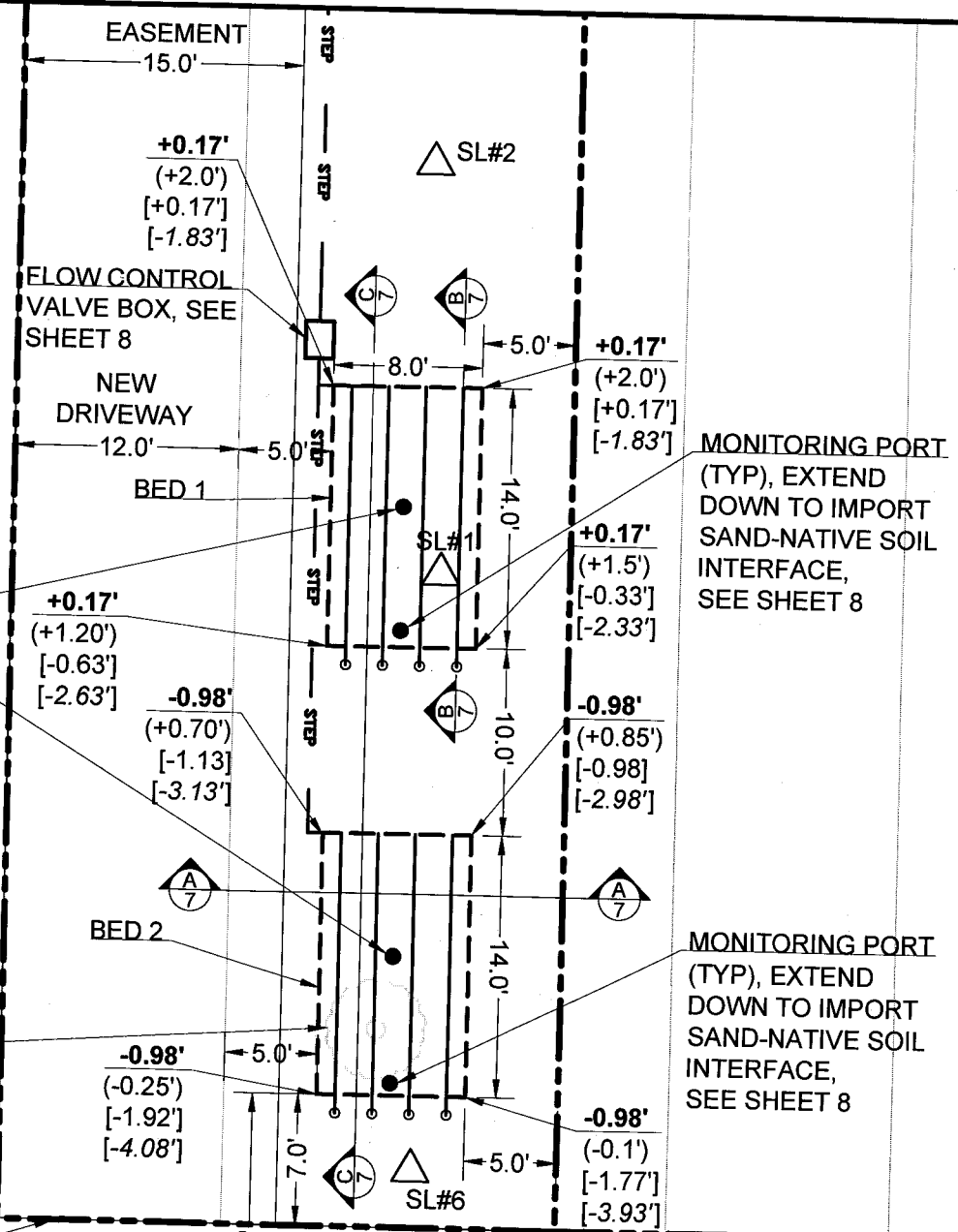
AQUEOUS SOLUTIONS ENGINEERING, PLLC  
P.O. BOX 1635  
BELLINGHAM, WA 98227  
Phone: (360) 318-4704  
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TITLE: OVERALL SITE PLAN		
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225		
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000		
DRAWN BY: M. MOREN	DATE: JULY 16, 2014	4/14



SCALE: 1" = 10'



MONITORING PORT (TYP), EXTEND DOWN TO GRAVEL BED-IMPORT SAND INTERFACE, SEE SHEET 8

MONITORING PORT (TYP), EXTEND DOWN TO IMPORT SAND-NATIVE SOIL INTERFACE, SEE SHEET 8

MONITORING PORT (TYP), EXTEND DOWN TO IMPORT SAND-NATIVE SOIL INTERFACE, SEE SHEET 8

TREE AND ROOTWAD TO BE REMOVED, REPLACE HOLE WITH C-33 SAND

DRIVEWAY ENTRANCE

GRADE POINT, 0.0' (TOP OF REBAR CAP AT SOUTHEAST PROPERTY CORNER)

CITY OF BELLINGHAM WATER LINE (APPROX)

**ELEVATION LEGEND**

- X.XX' (BOTTOM OF GRAVEL BED ELEV. RELATIVE TO GRADE POINT)
- (X.XX') (EXIST GROUND ELEV. RELATIVE TO GRADE POINT)
- [X.XX'] (TOP OF TYPE 3 - MEDIUM SAND LAYER RELATIVE TO GRADE POINT)
- [X.XX'] (BOTTOM OF TYPE 3 - MEDIUM SAND LAYER REL. TO GRADE POINT)



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Call before you dig.



**Redesign**

8/18/14

EDGE OF SIDEWALK (APPROX.)

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TITLE: DRAINFIELD PLAN	
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225	
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000	
DRAWN BY: M. MOREN	DATE: JULY 16, 2014
	5/14



REDESIGN JULY 17, 2014

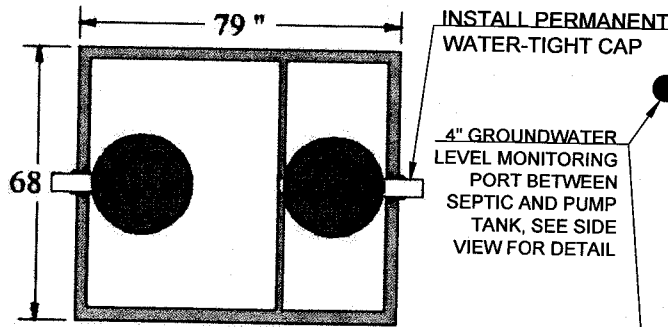
**BODE'S**  
PRECAST CONCRETE

7900 lbs.

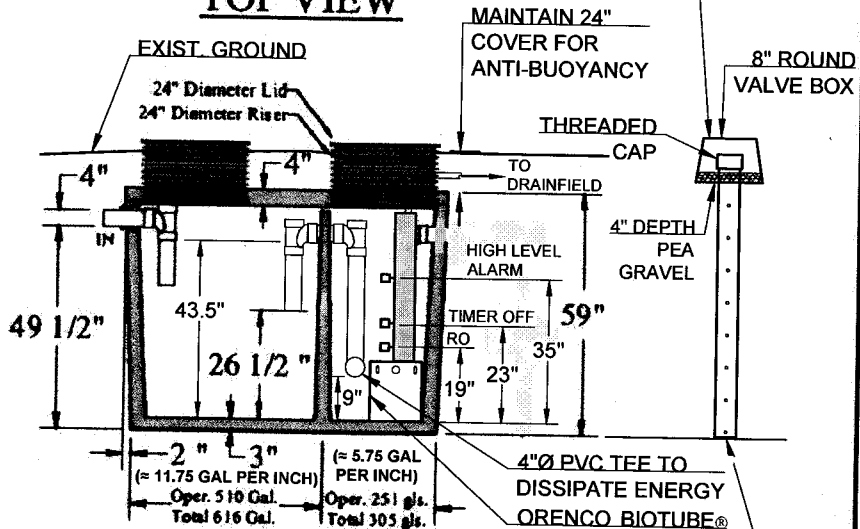
**NOTE:**

1. THE PUMP DISCHARGE PIPING SHALL BE ROUTED THROUGH PVC RISER USING A WATER-TIGHT RUBBER GROMMET, AND THE 4" TANK OUTLET PIPING SHALL BE CAPPED WITH A PERMANENT (GLUED) WATER-TIGHT CAP.

2. SEE NOTE AT BOTTOM OF SHEET 2 REGARDING DESIGN ENGINEER'S JUSTIFICATION FOR USING ONLY A TWO-COMPARTMENT SEPTIC/PUMP TANK INSTEAD OF A TWO-COMPARTMENT SEPTIC TANK FOLLOWED BY A SINGLE COMPARTMENT PUMP TANK.



**TOP VIEW**



**SIDE VIEW**

**General Notes**

Standard inlet and outlet is 4" diameter - custom penetrations are available  
Pipe penetrations are flexible watertight seals with clamps for pipe  
Inlet and outlet tee baffles are to be 4" diameter pvc, abs or approved  
Typical access holes are 24" diameter ribbed pipe with screwed watertight gasketed lids  
Joint between the tank and tank top is sealed with Con-Seal CS-685 mastic rope or equal  
Concrete shall be 4000 psi within 28 days  
Rebar shall meet ASTM A 615 grade 60 specifications  
Wire mesh shall meet ASTM A-185 grade 65 specifications  
Fibermesh reinforcing shall meet ASTM C1116

4" Ø PVC TEE TO DISSIPATE ENERGY  
ORENCO BIOTUBE®  
EASYPAK™ PUMP VAULT & PUMP  
4" GROUNDWATER MONITORING PORT WITH 0.5" PERFORATIONS EVERY 6" TO BOTTOM OF TANK ELEVATION. WRAP IN PERMEABLE GEOTEXTILE FABRIC AND BOND WITH STAINLESS STEEL STRAPS OR ZIP TIES AT 2.0' ON CENTER. MONITORING PORT USED TO OBSERVE GROUNDWATER LEVEL WHEN PUMPING TANKS.

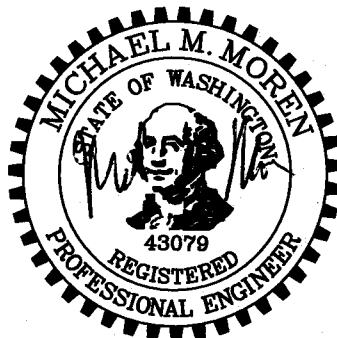
**BODE'S PRECAST, INC.**  
1861 East Pole Rd.  
Everson, Wa. 98247  
(360) 354-3912

**750 Gallon Septic Tank**  
2 Chambers

Model Number: S780-2

Date Issued: November 2010

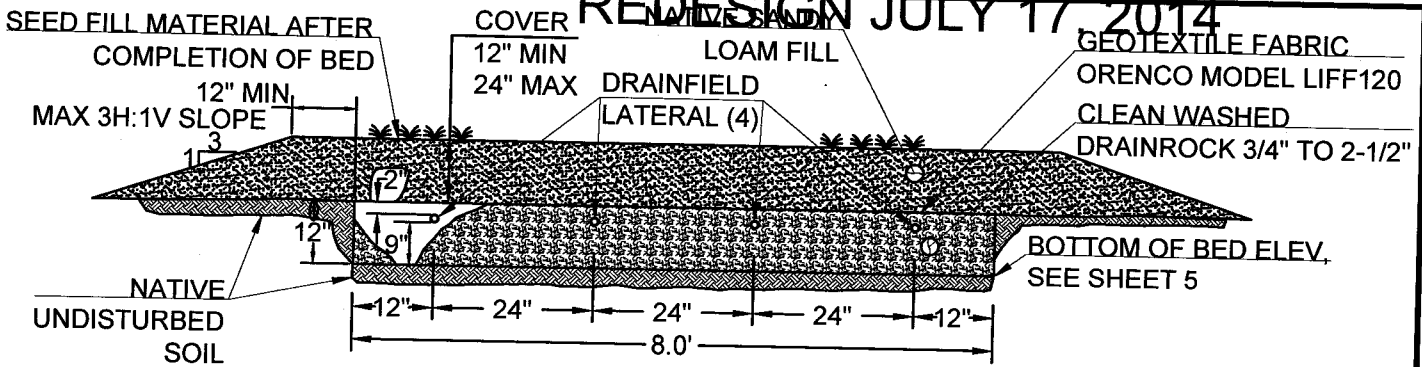
**BUOYANCY CALCS - GROUNDWATER 12" BELOW GRADE (M. MOREN)**  
Fb = [(6.58'x5.67'x4.92')+(3.14FT²x1.0'X2)]x62.4 LBS/FT³=11,846 LBS†  
W=7,900 LBS‡  
Ws=[(6.58'x5.67')-(2'x3.14FT²)]x[(1.0'x(120-62.4 LBS/FT³))+(1.0'X120 LBS/FT³)]  
=5,511 LBS‡ (weight of submerged soil) (weight of saturated soil)  
Net Force = 13,411 LBS‡ + 11,846 LBS† = 1,565 LBS‡  
Factor of Safety, FS = 13,411 LBS ÷ 11,846 LBS = 1.13, OK



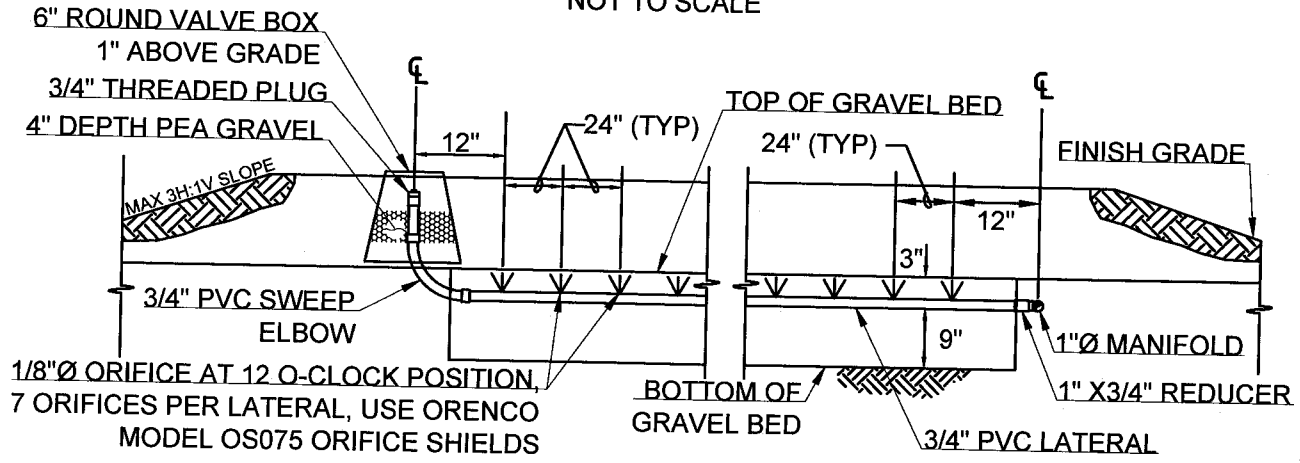
AQUEOUS SOLUTIONS ENGINEERING, PLLC  
P.O. BOX 1635  
BELLINGHAM, WA 98227  
Phone: (360) 318-4704  
E-mail: mike.moren75@gmail.com

TITLE: SEPTIC/PUMP TANK DETAILS  
FOR: DAN & ASHLEY WELCH  
2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225  
WHATCOM COUNTY TAX PARCEL NO.:  
380223 488514 0000  
DRAWN BY: M. MOREN  
DATE: JULY 16, 2014

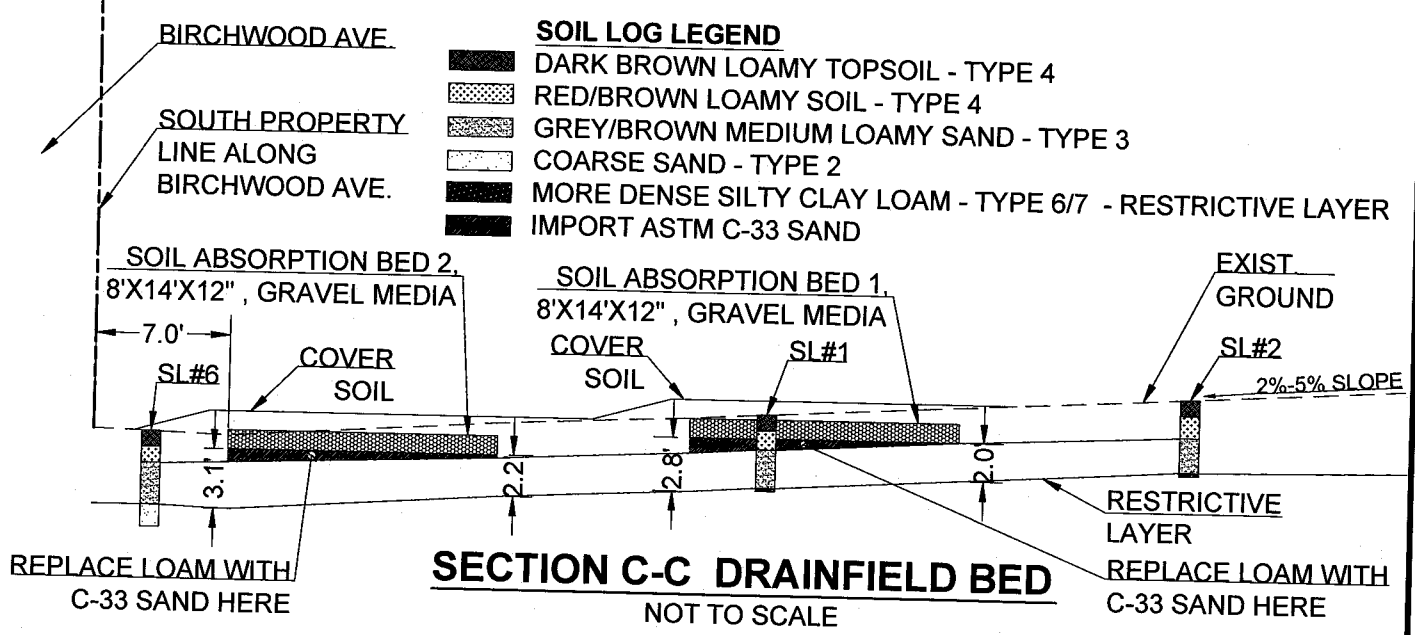
REDESIGN JULY 17, 2014



**SECTION A-A DRAINFIELD BED**  
NOT TO SCALE



**SECTION B-B DRAINFIELD LATERAL** NOT TO SCALE



**SECTION C-C DRAINFIELD BED**  
NOT TO SCALE

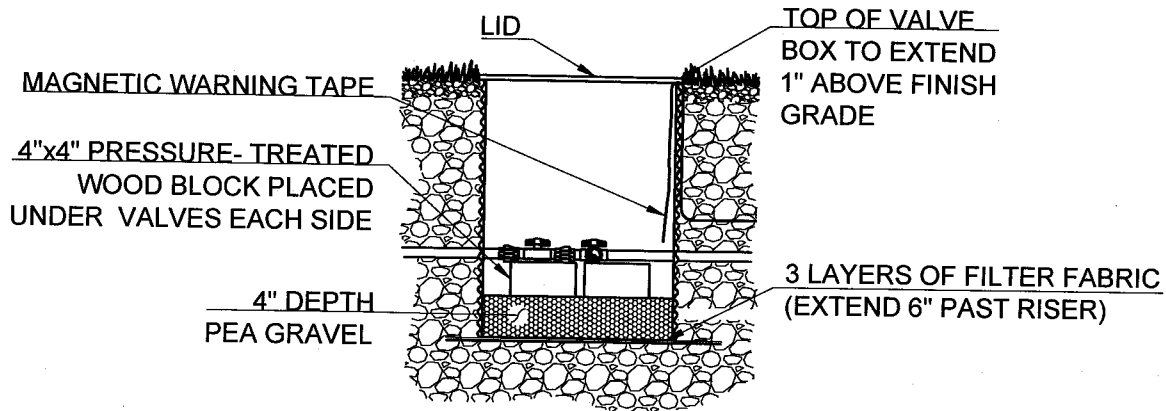
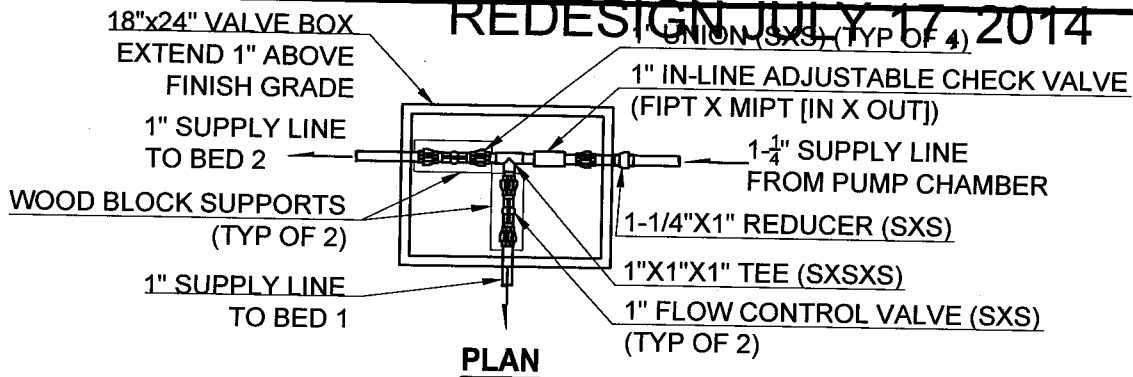
- SOIL LOG LEGEND**
- DARK BROWN LOAMY TOPSOIL - TYPE 4
  - RED/BROWN LOAMY SOIL - TYPE 4
  - GREY/BROWN MEDIUM LOAMY SAND - TYPE 3
  - COARSE SAND - TYPE 2
  - MORE DENSE SILTY CLAY LOAM - TYPE 6/7 - RESTRICTIVE LAYER
  - IMPORT ASTM C-33 SAND

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TITLE: DRAINFIELD DETAILS	
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225	
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000	
DRAWN BY: M. MOREN	DATE: JULY 16, 2014
	7/14

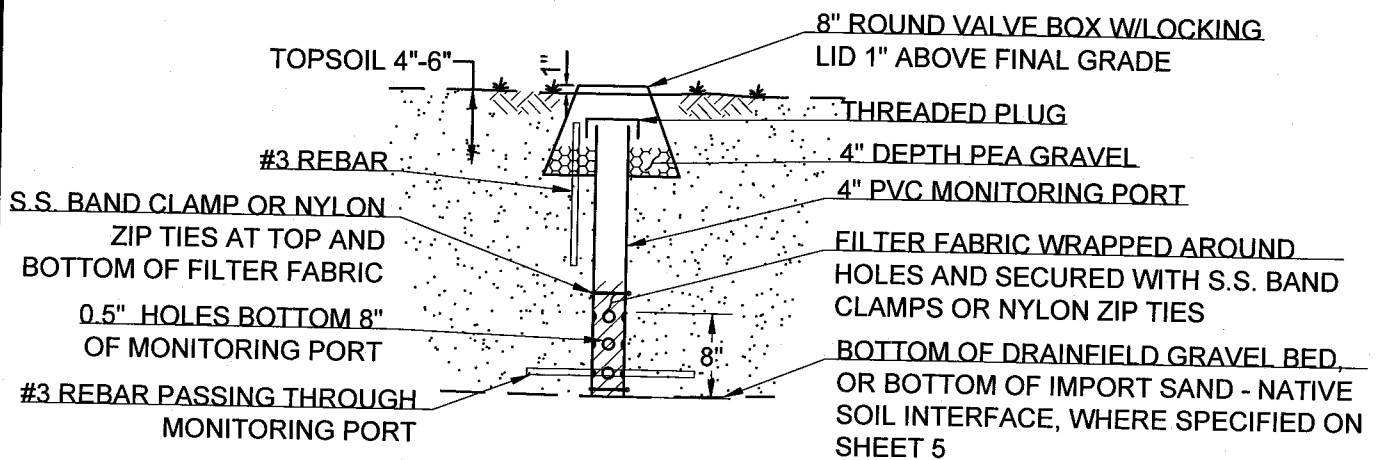
# REDESIGN JULY 17, 2014



## SECTION

### FLOW CONTROL VALVE ASSEMBLY DETAIL

NOT TO SCALE



### MONITORING PORT DETAIL

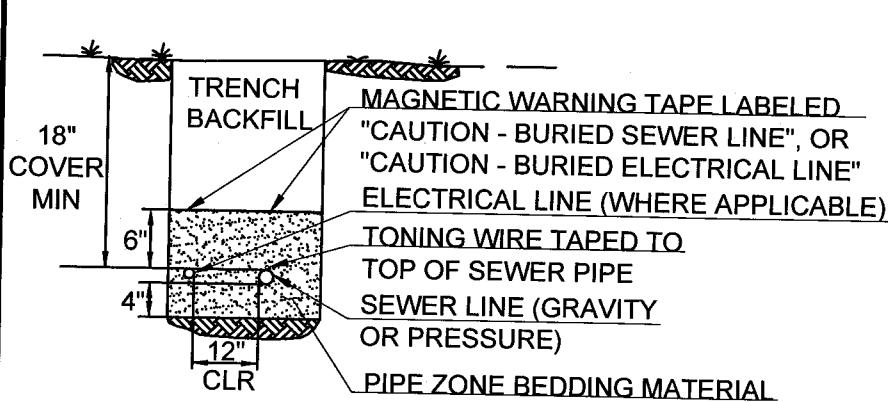
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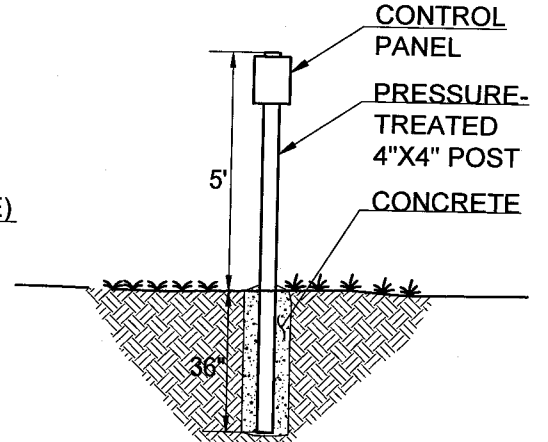
TITLE: DRAINFIELD DETAILS	
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225	
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000	
DRAWN BY: M. MOREN	DATE: JULY 16, 2014

REDESIGN JULY 17, 2014



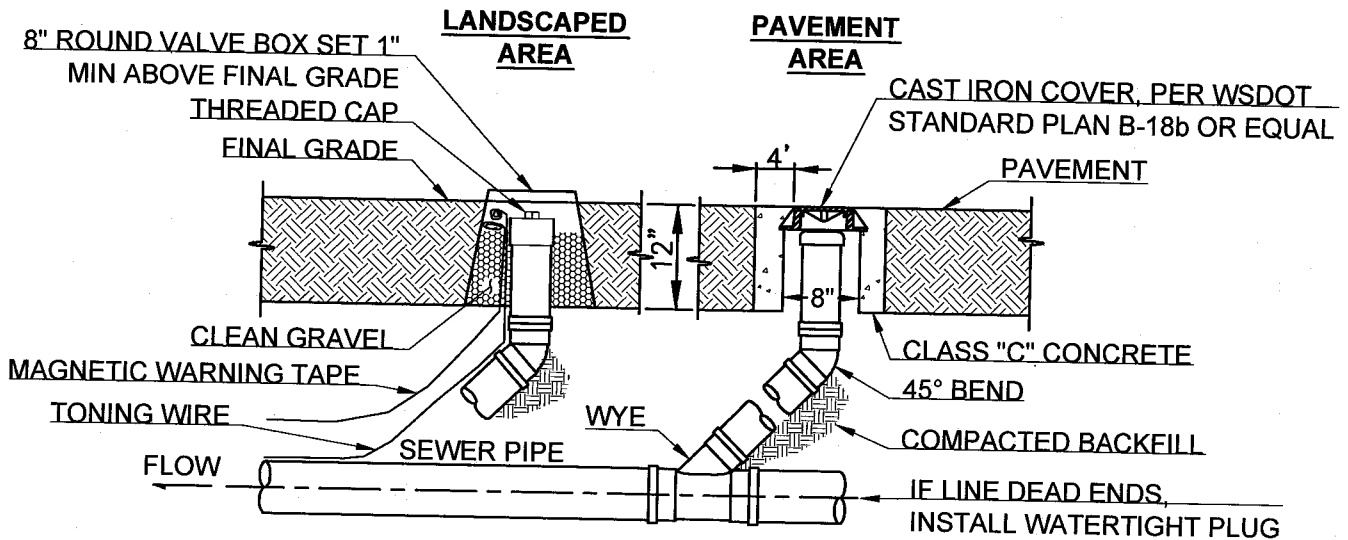
**TYPICAL TRENCH DETAIL**

NOT TO SCALE



**CONTROL PANEL DETAIL**

NOT TO SCALE

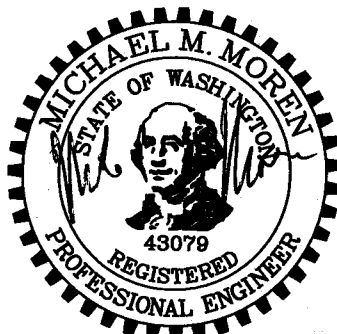


**NOTE:**  
EXCAVATE UNSTABLE MATERIAL DOWN TO FIRM SOIL  
AND REPLACE WITH TYPE A BACKFILL.

**GRAVITY SEWER CLEANOUT**

NOT TO SCALE

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TITLE: DETAILS		
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225		
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000		
DRAWN BY: M. MOREN	DATE: JULY 16, 2014	9/14

# REDESIGN JULY 17, 2014 CONSTRUCTION NOTES

## GENERAL NOTES:

1. THE ON-SITE SEWAGE SYSTEM (OSS) PERMIT SHALL BE ISSUED BY THE WHATCOM COUNTY HEALTH DEPARTMENT PRIOR TO BEGINNING CONSTRUCTION ON THE OSS.
2. THE INSTALLER SHALL BE A WHATCOM COUNTY-LICENSED SEPTIC SYSTEM INSTALLER. IF THE OWNER WISHES TO INSTALL THIS SYSTEM, THE **OWNER MUST FIRST OBTAIN WRITTEN APPROVAL FROM THE WHATCOM COUNTY HEALTH DEPARTMENT FOR A HOME OWNER INSTALL BEFORE BEGINNING ANY CONSTRUCTION OF THE OSS**.
3. THE INSTALLER SHALL MAKE EVERY EFFORT TO LOCATE ANY EXISTING UNDERGROUND UTILITIES AHEAD OF ANY EXCAVATION. CALL TWO BUSINESS DAYS BEFORE DIGGING FOR UNDERGROUND UTILITIES LOCATION. CALL 811.
4. THE INSTALLER SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, AND PROTECTIVE EQUIPMENT DURING THE DURATION OF CONSTRUCTION. PROPER SHORING OF THE TANK EXCAVATION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
5. THE INSTALLER SHALL NOTIFY THE ENGINEER/DESIGNER AT LEAST 72 HOURS PRIOR TO STARTING CONSTRUCTION ON THE OSS AND SHALL ATTEND A PRE-CONSTRUCTION CONFERENCE WITH THE ENGINEER/DESIGNER AND OWNER.
6. IF THE INSTALLER FINDS ANY DISCREPANCIES IN THESE PLANS OR SPECIFICATIONS, THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY. ANY CHANGES TO THE DESIGN SHALL BE REVIEWED AND APPROVED BY THE ENGINEER/DESIGNER.

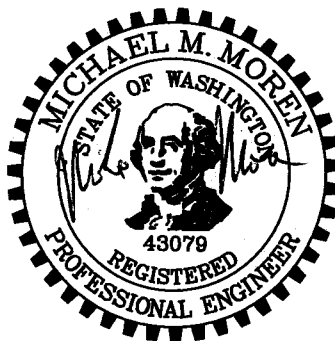
## TANK CONSTRUCTION NOTES:

1. THE INSTALLER SHALL MODIFY THE PROPOSED 750-GALLON TWO-COMPARTMENT SEPTIC TANK AS SHOWN ON THE PLANS. THE 4-INCH OUTLET OF THE SMALLER CHAMBER SHALL BE PERMANENTLY PLUGGED WATER-TIGHT, AND THE PRESSURE DISCHARGE LINE SHALL EXIT OUT OF THE SIDE OF THE PVC RISER THROUGH A WATER-TIGHT GROMMET APPROXIMATELY 6 INCHES ABOVE THE TOP OF THE TANK LID.
2. ALL RISER ADAPTOR-TO-CONCRETE TANK AND PVC RISER-TO-RISER ADAPTOR CONNECTIONS SHALL BE WATERTIGHT. THE INSTALLER IS RESPONSIBLE FOR VERIFYING WATER-TIGHTNESS AND FOR SUBMITTING THE TANK WATER-TIGHTNESS CERTIFICATION FORM TO THE WHATCOM COUNTY HEALTH DEPARTMENT ALONG WITH THE CONTROL PANEL SETTINGS FORM.
3. GRAVITY SEWER PIPING SHALL CONNECT TO THE TANK INLETS AND OUTLETS (IF APPLICABLE) WITH RUBBER FERNCO-TYPE FLEXIBLE COUPLINGS WITH STAINLESS STEEL BAND CLAMPS. THE PIPE ENDS AND COUPLING SHALL BE FREE OF DIRT AND DEBRIS PRIOR TO CONNECTING.
4. BEDDING AND BACKFILL OF THE TANK SHALL BE PER MANUFACTURER'S REQUIREMENTS.
5. THE TANK SHALL BE SET LEVEL IN BOTH DIRECTIONS (IN THE LONGITUDINAL AND TRANSVERSE DIRECTIONS) TO  $\pm 1\%$ .
6. THE FINISH GRADE SHALL SLOPE AWAY FROM ALL TANK RISERS A MINIMUM OF 2% FOR A DISTANCE OF AT LEAST 5.0 FEET IN ALL DIRECTIONS.
7. THE INSTALLER SHALL FOLLOW THE MANUFACTURER'S INSTALLATION GUIDELINES FOR ORENCO BIOTUBE EASYPACK PACKAGE EFFLUENT FILTER AND PUMP SYSTEM. A COPY OF THE INSTALLATION INSTRUCTIONS ARE INCLUDED IN APPENDIX E OF THIS DESIGN.

## SEWER LINE AND ELECTRICAL CONDUIT CONSTRUCTION NOTES:

1. THE INSTALLER SHALL INSTALL THE GRAVITY AND PRESSURE SEWER LINES ACCORDING TO THE DETAILS SHOWN IN THIS DESIGN. ALL SEWER AND ELECTRICAL LINES ASSOCIATED WITH THIS OSS INSTALLATION SHALL HAVE MAGNETIC WARNING TAPE PLACED ON TOP OF THE PIPE ZONE BEDDING MATERIAL, OR APPROXIMATELY 6 INCHES ABOVE THE TOP OF THE PIPE/CONDUIT.
2. ANY ROCKS LARGER THAN 3 INCHES IN DIAMETER, ORGANICS, WOOD DEBRIS, SHALL BE REMOVED FROM THE PIPE BEDDING ZONE.
3. THE PRESSURE SEWER LINE SHALL BE FLUSHED WITH CLEAN WATER PRIOR TO CONNECTING TO THE DRAINFIELD FLOW CONTROL VALVE BOX AND BED MANIFOLDS.

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TITLE: CONSTRUCTION NOTES	
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225	
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000	
DRAWN BY: M. MOREN	DATE: JULY 16, 2014
	10/14

# CONSTRUCTION NOTES

**DRAINFIELD BED CONSTRUCTION NOTES:**

1. CONSTRUCTION OF THE DRAINFIELD SHALL BE DONE WITH A TRACK-MOUNTED EXCAVATOR OR BULLDOZER ONLY TO REDUCE COMPACTION OF THE SOIL ON AND AROUND THE DRAINFIELD. DO NOT USE A WHEELED BACKHOE ON THE DRAINFIELD OR RESERVE AREAS.
2. FOR BED 1, THE INSTALLER WILL HAVE TO OVEREXCAVATE THE LOAMY SOIL TO GET TO THE MEDIUM SAND LAYER AND IMPORT ASTM C-33 SAND TO GET BACK TO THE BOTTOM GRADE OF THE DRAINROCK BED. THE ENGINEER/DESIGNER SHALL BE NOTIFIED AT LEAST 72 HOURS IN ADVANCE OF THE DRAINFIELD BED EXCAVATION AND SHALL BE ON SITE DURING THE EXCAVATION TO DETERMINE THE DEPTH OF LESS PERMEABLE LOAMY SOIL TO BE REMOVED, EXAMINE THE INFILTRATIVE SURFACE, AND CHECK DRAINROCK BED LEVEL.
3. THE BOTTOM OF THE DRAINFIELD DRAINROCK BEDS AS WELL AS THE SURFACE THE LATERALS AND MANIFOLD REST ON SHALL BE CONSTRUCTED LEVEL IN BOTH DIRECTIONS (LONGITUDINAL AND TRANSVERSE).
4. ORIFICES IN THE DRAINFIELD LATERALS SHALL BE DRILLED SMOOTH WITH A NEW SHARP DRILL BIT AND SHOULD NOT HAVE ANY VISIBLE BURRS.
5. ALL DRAINFIELD LATERALS SHALL BE FLUSHED WITH CLEAN WATER TO REMOVE ANY PVC SHAVINGS, DIRT AND DEBRIS PRIOR TO INSTALLING THE END CAP.
6. ONCE THE DRAINFIELD LATERALS ARE LAID OVER THE 9 INCHES OF THE GRAVEL BED, A SQUIRT HEIGHT TEST SHALL BE PERFORMED. THE SQUIRT HEIGHT TEST SHALL BE PERFORMED WITH WATER. A SQUIRT HEIGHT OF 5.0 FEET SHALL BE ACHIEVED AT THE MOST DISTAL ORIFICES (FURTHEST FROM MANIFOLD) IN THE SYSTEM. THE INSTALLER SHALL NOTIFY THE ENGINEER/DESIGNER AND WHATCOM COUNTY INSPECTOR AT LEAST 72 HOURS PRIOR TO CONDUCTING THE SQUIRT HEIGHT TEST. AT THIS TIME, THE CONTRACTOR AND ENGINEER SHALL CONDUCT OTHER FINAL MEASUREMENTS (I.E. FLOAT SETTINGS, PUMP DRAWDOWN PER DOSE, TIMER SETTINGS), AND ENSURE CORRECT OPERATION OF THE ENTIRE SYSTEM. ALL INITIAL BASELINE SETTINGS/READINGS SHALL BE RECORDED AND SHOWN ON FINAL AS-BUILT DRAWINGS. ALL SYSTEM TESTING SHALL BE CONDUCTED WITH CLEAN WATER.
7. AFTER COMPLETION OF THE SQUIRT HEIGHT TEST, THE INSTALLER SHALL PLACE THE ORIFICE SHIELDS OVER EACH ORIFICE AND ADD THE REMAINING DRAINROCK AND GEOTEXTILE FABRIC. AFTER INSTALLING THE COVER MATERIAL, THE AREA SHALL BE SEEDED WITH GRASS SEED.
8. INSTALL VALVE BOXES SUCH THAT THE TOP ONE (1) TO TWO (2) INCHES IS ABOVE FINISHED GRADE. ALL VALVE BOXES SHALL HAVE A 4-INCH DEPTH OF PEA GRAVEL BELOW THE PIPING OR PIPE SUPPORT BLOCKS. THE LATERAL END CAPS SHALL BE INSTALLED IN THE CENTER OF THE VALVE BOXES
9. ONCE THE OSS SYSTEM HAS BEEN CONSTRUCTED AND PRIOR TO ACCEPTING SEWAGE, THE INSTALLER SHALL NOTIFY THE ENGINEER FOR FINAL INSPECTION. THE ENGINEER IS RESPONSIBLE FOR COMPLETING AS-BUILT DRAWINGS, AND THE INSTALLER IS RESPONSIBLE FOR COMPLETING THE WHATCOM COUNTY TANK WATER TIGHTNESS CERTIFICATION FORM, AND CONTROL PANEL SETTINGS FORM AND SUBMITTING THE ORIGINALS TO THE WHATCOM COUNTY HEALTH DEPARTMENT AND COPIES TO THE DESIGN ENGINEER, AND THE OWNER.
10. UNDER NO CIRCUMSTANCES SHALL ANY SEWAGE BE DIRECTED TO THE NEW OSS UNTIL THE WHATCOM COUNTY HEALTH DEPARTMENT HAS ISSUED THE FINAL OSS PERMIT.
11. THE FOLLOWING IS A LIST OF CONSTRUCTION INSPECTIONS THE ENGINEER/DESIGNER SHALL MAKE AFTER NOTIFICATION FROM THE INSTALLER:
  - 11.A. PRE-CONSTRUCTION MEETING PRIOR TO BEGINNING ANY OSS CONSTRUCTION ACTIVITIES
  - 11.B. SEPTIC/PUMP TANK PLACEMENT AND LEAK TEST
  - 11.C. ACTUAL EXCAVATION OF BOTH DRAINFIELD BEDS AND BACKFILL WITH ASTM-C33 SAND WHERE REQUIRED.
  - 11.D. MANIFOLD AND LATERAL PIPING, FLOW CONTROL VALVE BOX INSTALLATION, AND SQUIRT HEIGHT TEST AS DESCRIBED IN NOTE NUMBER 8 ABOVE AS WELL AS BASELINE SETTINGS (FLOAT SETTINGS AND OPERATION, TIMER OPERATION, PUMP DRAWDOWN, ETC.)
  - 11.E. FINAL COVER OVER TANK, PIPING, AND DRAINFIELD BEDS AND RECORD DRAWING DOCUMENTATION.

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Redesign

8/18/14

TITLE: CONSTRUCTION NOTES		
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225		
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000		
DRAWN BY: M. MOREN	DATE: JULY 16, 2014	11/14



# COMPONENTS & SPECIFICATIONS

**GRAVITY SEWER LINES AND FITTINGS:** All gravity sewer lines must be 4-inch dia. conforming to ASTM 3034 PVC for solvent-cemented or gasketed joints. Gaskets shall conform to ASTM F477, Elastomeric Seals. Septic tank shall be connected to the home with 4-inch dia. ASTM 3034 PVC with a minimum slope of 1/4"/ft. (2%) and a cleanout within 4 ft. of the home. Any changes in direction of the gravity sewer line shall have a cleanout. 90° bends shall be made with two 45° bends. All pipe connections shall be water-tight. External piping connections to tank inlet and outlet piping shall be made with Fernco® flexible rubber couplings with stainless steel band clamps.

**PRESSURE SEWER LINES AND FITTINGS:** All pressure pipe and fittings including drainfield laterals shall be Sch. 40 OR SCH 80 PVC. All pipe and fitting connections shall be solvent-cemented and shall be water-tight.

**HOUSEHOLD DRAIN-WASTE-VENT (DWV) PLUMBING:** All household drain-waste-vent (DWV) and OSS system plumbing shall be clearly labeled "GREYWATER ONLY - NOT FOR COMBINED WASTEWATER".

**SEPTIC/PUMP TANK:** Use 750-gallon, two-compartment concrete septic tank from Bode's Precast, Inc. Installation shall be per manufacturer's requirements. At a minimum, the tank shall be placed on a min. 4" depth bed of sand or pea gravel unless otherwise specified by the tank manufacturer. The tank shall be set level in both directions. External piping connections to the tank's inlet and outlet piping shall be made with Fernco® flexible rubber couplings with stainless steel band clamps (for gravity sewer lines only).

**TANK RISERS, LIDS, and RISER-TO-TANK ADAPTERS:** Use Orenco Systems, Inc. (OSI) Model RR2424+S4+12 Ultra-Rib 24"Ø PVC Risers or Engineer-Approved equivalent. Use OSI Model FL24G-4B 24"Ø fiberglass lids or Engineer-Approved equivalent. Use OSI Model PRTA24 24"Ø ABS Riser Tank Adapters, OSI Model PRTA24BDKIT bolt-down kit to fasten riser tank adapters to concrete tank unless the riser tank adapter was cast into the concrete lid. Use OSI Model ADH100 adhesive/sealant for sealing PVC risers to riser tank adapters, or Engineer-Approved equivalent. When installed, the riser-to-tank connection shall be verified water-tight using the procedures outlined in the "Septic Tank Testing for Water-Tightness" document included in Appendix F of this design.

**TANK BEDDING MATERIAL:** Bedding material and placement methods for the tanks shall be per manufacturer's requirements.

**TANK BACKFILL:** Bedding material and placement methods for the tanks shall be per manufacturer's requirements.

**PIPE ZONE BEDDING MATERIAL FOR UTILITY (SEWER, ELECTRICAL) TRENCH:** Pipe zone bedding material for buried utilities shall be native material free from rocks larger than 3" in diameter and organics (vegetation, wood debris, etc.). If native soil is inadequate, use ASTM C-33 sand.

**TRENCH BACKFILL MATERIAL:** Trench backfill material shall be native soil compacted by boot-packing or by excavator tread in areas not subject to vehicular traffic, and shall be compacted by vibratory compactor in areas subject to vehicular traffic (i.e. driveway crossing).

**PUMP TANK EFFLUENT PUMP VAULT:** Use Orenco® Systems, Biotube EasyPak™ Model BEP30TDD Pump Package.

Included in package:

- Biotube® Easypak™ pump vault with filter cartridge
- High-head effluent pump, Model PI3005, 1/2 HP, 115 V, single phase in PVC flow inducer
- 1-1/4" Discharge assembly with ball valve, check valve, and anti-siphon valve (OSI Model HV125 BCAS)
- Float switch assembly (redundant off, timer on/off, high-level alarm)
- PVC internal splice box
- Control Panel (panel shall be capable of time dose settings via a digital timer and shall also have a pump run-time meter and dose event counter).

**NOTE: THE ALARM MUST BE ON A SEPARATE CIRCUIT FROM THE PUMP.**

**DRAINFIELD BED MEDIA:** The drainfield bed media shall be clean, washed 3/4" - 2-1/2" drainrock.

**DRAINFIELD MANIFOLD, LATERALS, AND ASSOCIATED FITTINGS:** Drainfield manifolds shall be 1" Ø Schedule 40 PVC. Laterals shall be 3/4" Ø Schedule 40 PVC. A new 1/8" drill bit shall be used to drill the orifices. Fittings shall be Schedule 40 or Schedule 80 PVC. The laterals shall be connected to the manifolds with PVC tees or 90° elbows (at end).

**PVC BALL VALVES:** High-pressure PVC ball valves shall be Orenco® Systems, Inc. Model VLT1000S or Engineer-approved equivalent.

**FLOW CONTROL VALVES:** High-pressure PVC gate valves shall be Orenco® Systems, Inc. Model VG1000S or Engineer-approved equivalent. Ball valves will not be allowed as flow control valves.

**IN-LINE ADJUSTABLE CHECK VALVE:** Use Spears® Manufacturing Company Part No. S1102-10 1"Ø In-line Adjustable PVC Spring Check Valve. The valve shall be adjusted to maintain a full drainfield supply line when the dosing pump is off (under static conditions).

**VALVE BOX FOR FLOW CONTROL VALVE ASSEMBLY:** The flow control valve assembly shall be contained with valve box extending to 1"-2" above finish grade. The valve boxes shall be large enough to contain both flow control valves, unions, and in-line adjustable spring check valve. Three layers of geotextile fabric shall be placed on the bottom of the valve boxes, and a 4-inch depth of pea gravel shall be placed in the bottom of the boxes. The piping and valves shall rest on the 4"x4" pressure-treated wood blocks. The vault shall also have a lid.

**MAGNETIC LOCATOR TAPE:** Magnetic locator tape shall be marked "CAUTION SEWER LINE BELOW" for all buried sewer/effluent lines, and "CAUTION - BURIED ELECTRICAL LINE" for all buried electrical lines.

**COMPOSTING TOILET SYSTEM:** Two(2) Sun-Mar Excel self-contained composting toilets each with integral compost chamber, evaporation tray, fan, heater, and leachate overflow drain.

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Redesign

8/1/2014 - MMS

TITLE: COMPONENTS & SPECIFICATIONS	
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225	
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000	
DRAWN BY: M. MOREN	DATE: JULY 16, 2014
	12/14

# ~~REDESIGN JULY 17, 2014~~ OPERATIONS & MAINTENANCE

## IN-HOME O&M MEASURES

- Practice good water conservation measures in the building. Do not exceed greywater plus compost leachate flows greater than 180 gal/day. Install low-flow fixtures and fix any leaking faucets, fixtures and water-using appliances.
- Feces from toilets shall not be introduced into this OSS. It has been designed to accommodate household greywater and minimal compost toilet leachate only. **Water closet-type toilets (water-using toilets) shall not be connected to this OSS.**
- Avoid introduction of water softener wastewater into the OSS.
- A kitchen garbage grinder (disposal) shall not be allowed in this home due to the reduced septic tank size. Use a screen in the kitchen sink drain to keep large food particles out of the wastewater.
- Don't flush dental floss, sanitary napkins, tampons, coffee grounds, oils, grease, cat litter, any toxics, pharmaceuticals, or other such items down the sinks or toilets.
- Minimize or eliminate the use of chlorine-based cleaners. Chlorine is toxic to the beneficial organisms in your sewage treatment system.
- Avoid the use of powdered detergents, as these sometimes do not completely dissolve.
- Avoid the use of phosphate-containing detergents.
- Avoid the use of liquid fabric softeners in laundry unless they specifically state that they are safe for use with septic systems.

## COMPOSTING TOILET O&M MEASURES

### Operations

The Sun-Mar Excel composting toilet utilizes a self-contained composting chamber. Information on the proposed Sun-Mar Excel composting toilet including installation, operation & maintenance and Frequently Asked Questions can be found in Appendix D.

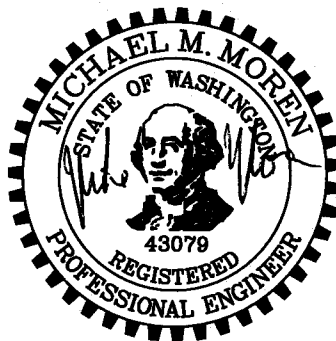
### Disposal of the Final Product

- Composting or composted human excrement is considered either Class I or Class II Domestic Septage and is therefore subject to the federal and state sewage sludge/biosolids programs. Therefore, the product of a composting toilet must be handled and used or disposed of according to WAC 173-308-270 "Septage Applied to Land". **WAC 173-308-270 (2) states that "Septage may not be applied to a public contact site, lawn, or home garden."** Also, the "Water Conserving On-Site Wastewater Treatment Systems - Recommended Standards and Guidance for Performance, Application, Design, and Operation & Maintenance, July 2012" (Water Conserving OSS RS&G's) document published by the Washington State Department of Health (WSDOH) states on page 24, Part B - Management Options "Neither the federal or state sewage sludge/biosolids rules provide any exemptions or allowances for small quantity generators from any parts of the rules. As such, the product from small composting toilets must be managed by the same regulations, and applied with the same degree of stringency, as sewage sludge/biosolids generated from the largest of generators. Because the Washington State program, by law, meet or exceed the stringency of the federal program, the state cannot relax these requirements for the product of composting toilets unless rule changes are made at the federal level."

Therefore due to the stringent federal and state requirements of properly managing sewage sludge/biosolids (and thus the product of composting toilets), the most economical way to legally dispose of the composting or composted material is to:

1. have it hauled away by a licensed domestic septage pumper/hauler (WAC 246-272A-0310, or
2. dispose of the product as solid waste into the municipal solid waste stream if allowed within the given jurisdiction (City of Bellingham)

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TITLE: OPERATIONS & MAINTENANCE	
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225	
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000	
DRAWN BY: M. MOREN	DATE: JULY 16, 2014
	13 14

# OPERATIONS & MAINTENANCE (CONT.)

REDESIGN JULY 17, 2014

## TANK O&M

- Inspect yearly for:
  - Structural integrity
  - Proper baffling
  - Effluent filter condition. If necessary, clean effluent filter screen (spray with hose directing spray back into first chamber of septic tank).
  - Evidence of groundwater intrusion (inspect tank, risers, inlet and outlet piping for leaks)
  - Correct operation and setting of pump floats. Measure distance from bottom of tank to float tether and check against design settings.
  - Correct operation of effluent pump.
  - Control timer. Make sure it is going through the dosing cycles correctly.
  - Correct operation of alarm (light and buzzer).
  - Risers and lids being above grade and lids are secure.
  - Depth of scum and sludge. The tank shall be pumped when the combined depth of scum and sludge is 60% of the design liquid level - approximately 25 inches - or when the sludge is within 6 inches of the lower inlet side of the cross-over piping (a sludge depth of approximately 20 inches).

## DRAINFIELD O&M

- No livestock, gardening, or other significant soil-disturbing activities are permitted on the drainfields and reserve area (if applicable).
- Blackberry bushes, trees, and other similarly invasive vegetation shall not be allowed to grow on or within 20 feet of the drainfields and reserve areas.
- Herbicides and pesticides should not be used in the drainfield and reserve area, not only to avoid toxic effects on human and environmental health, but also to protect the microorganisms within the drainfield that continue to break down the pollutants in the processing tank effluent.
- Do not place any buildings, drains, structures, or other features within 10 feet of the drainfield and reserve areas.
- The drainfield should be protected from vehicular traffic with large boulders, bollards, fencing, or other measures placed around it's perimeter.
- Inspect monitoring ports for ponding yearly. Conditions in the monitoring ports must be observed and recorded by the service provider during all operation & maintenance activities.
- Inspect drainfield monthly for:
  - Areas of surface saturation or puddling;
  - Excessive vegetation growth of lush green grass;
  - Septic odors.

## ACTION CONDITIONS:

When inspections or any other observations reveal any of the following listed conditions, the owner of the system must take appropriate action and contact a Whatcom County-licensed O&M provider according to the direction and satisfaction of the local health officer:

- Sewage system failure**, as defined in WAC 246-272A-0010;
- A history of long-term, continuous, and increasing saturation** within the drainfield.
- Alarm condition.** If the control panel alarm is activated, open the processing and dosing tank lids and inspect the effluent levels. If the effluent is high in the tanks, the following conditions may be occurring triggering the High-Level Alarm float:
  - The flow into the tank is exceeding the peak daily design flow;
  - Groundwater is leaking into the tank, through cracks in the tank, plumbing connections, or risers;

If the effluent is low in the tanks, the following conditions may be occurring:

- There is a crack in the tank below the lowest float allowing effluent to leak out of the tank;
- The pump has remained on.

In the event sewage backs up into the home, or other signs of failure appear, contact a maintenance provider immediately.

**SINCE THIS DESIGN DOES NOT INCLUDE A DRAINFIELD RESERVE AREA, FAILURE OF THIS OSS, AS DEFINED IN WAC 246-272A-0010, WILL RESULT IN THE PROPERTY OWNER BEING REQUIRED TO CONNECT TO THE CITY OF BELLINGHAM MUNICIPAL SEWER SYSTEM AT THE PROPERTY OWNER'S EXPENSE, AS REQUIRED PER THE WHATCOM COUNTY HEALTH DEPARTMENT OSS PERMIT CONDITIONS FOR THIS PROPOSED OSS.**

AQUEOUS SOLUTIONS ENGINEERING, PLLC  
P.O. BOX 1635  
BELLINGHAM, WA 98227  
Phone: (360) 318-4704  
E-mail: mike.moren75@gmail.com



TITLE: OPERATIONS & MAINTENANCE	
FOR: DAN & ASHLEY WELCH 2930 BIRCHWOOD AVE., BELLINGHAM, WA 98225	
WHATCOM COUNTY TAX PARCEL NO.: 380223 488514 0000	
DRAWN BY: M. MOREN	DATE: JULY 16, 2014

14/14

REDESIGN JULY 17, 2014

**APPENDIX B**  
**DESIGN CALCULATIONS**

# REDESIGN JULY 17, 2014

## PRESSURE DRAINFIELD DESIGN CALCULATIONS

SEPTIC SYSTEM DESIGN FOR:  
SITE ADDRESS:  
COUNTY:  
CALCULATIONS BY:  
DATE:

Welch Property - up to a three-bedroom home  
2930 Birchwood Ave.  
Whatcom, WA  
Mike Moren, P.E.  
6/14/2013

### DESIGN CRITERIA

TYPE OF SYSTEM:  
PEAK DESIGN FLOW:  
AVE. DAILY FLOW:

#### Single-Family Residence

180 gal/day (up to 3 bedrooms)  
100 gal/day (greywater only plus urine)

SOIL TYPE : 3 (import ASTM C-33 sand above native medium sand)  
SEPTIC EFFLUENT QUALITY (cBOD<sub>5</sub>/TSS): 125/80 mg/L  
APPLICATION RATE : 0.8 gal/day/sf

GENERAL TOPOGRAPHY OF DRAINFIELD : mildly sloped ranging from 0 to 5%

### REQUIRED DRAINFIELD ABSORPTION AREA

DESIGN VOLUME : 180 gal/day  
REQUIRED ABSORPTION : ( 180 gal/day ) / ( 0.8 ) gal/day/sf = 225 SF  
BED WIDTH: 8 FT  
TOTAL TRENCH LENGTH = 28 FT

USE END MANIFOLD: USE 2 BEDS, 4 LATERALS PER BED, EACH 14 FT. LONG

# REDESIGN JULY 17, 2014

## DRAINFIELD LATERAL DESIGN

### GENERAL DRAINFIELD DESIGN CRITERIA

ORIFICE FLOW =  $12.38 d^{2} \sqrt{h}$  gpm  
 ORIFICE DIA. =  $\frac{1}{8}$ " 0.125 INCH  
 RESIDUAL ORIFICE SQUIRT HEIGHT = 5 FT  
 LATERAL DIA. =  $\frac{3}{4}$ " 0.824 INCH  
 USE ORIFICE SPACING = 2 FT O.C. 24 INCHES O.C.)  
 # ORIFICES PER LATERAL = 7  
 # OF LATERALS PER BED = 4  
 # OF BEDS = 2

$$H(f) = \frac{10.46 L Q(\text{seg})^{1.85}}{C^{1.85} D^{4.87}}$$

H(f) = friction loss (ft)      Q(seg) = flow in pipe (gpm)  
 D = pipe dia. (in)              C = friction factor (150 for  
 L = length of pipe (ft)              PVC pipe)

CHECK TO MAKE SURE THAT THE FLOW IN UPSTREAM ORIFICE (#7) DOES NOT EXCEED THE FLOW IN ORFICE #1 BY MORE THAN 10%.

**TABLE 1**

ORIFICE #	ORIFICE PRESS. (ft)	ORIFICE FLOW (gpm)	FLOW TO ORIFICE (gpm)	SEGMENT H-LOSS (ft)	LATERAL LENGTH	SUM H-LOSS (ft)	% INCREASE IN FLOW
1	5.0000	0.4325	0.4325	0.0011	2	0.0001	0%
2	5.0011	0.4326	0.8651	0.0039	4	0.0040	0%
3	5.0049	0.4328	1.2979	0.0082	6	0.0122	0%
4	5.0131	0.4331	1.7310	0.0140	8	0.0261	0%
5	5.0271	0.4337	2.1647	0.0211	10	0.0473	0%
6	5.0482	0.4346	2.5993	0.0296	12	0.0769	0%
7	5.0779	0.4359	3.0352	0.0395	14	0.1164	1%
8	5.1173	0.4376	3.4728	0.0506	16	0.1670	1%
9	5.1680	0.4397	3.9125	0.0631	18	0.2301	2%
10	5.2311	0.4424	4.3550	0.0770	20	0.3071	2%
11	5.3081	0.4457	4.8006	0.0922	22	0.3993	3%
12	5.4003	0.4495	5.2501	0.1088	24	0.5081	4%
13	5.5090	0.4540	5.7042	0.1268	26	0.6349	5%
14	5.6359	0.4592	6.1634	0.1464	28	0.7812	6%
15	5.7822	0.4651	6.6285	0.1674	30	0.9487	8%
16	5.9496	0.4718	7.1004	0.1902	32	1.1388	9%
17	6.1398	0.4793	7.5797	0.2146	34	1.3534	11%
18	6.3544	0.4876	8.0673	0.2408	36	1.5942	13%
19	6.5952	0.4968	8.5641	0.2690	38	1.8632	15%
20	6.8641	0.5068	9.0709	0.2991	40	2.1623	17%
21	7.1633	0.5177	9.5886	0.3315	42	2.4938	20%
22	7.4948	0.5296	10.1181	0.3662	44	2.8599	22%

FLOW RATE PER LATERAL:	3.04	GPM
FLOW RATE PER BED:	12.2	GPM
FLOW RATE PER DRAINFIELD:	24.4	GPM

← size pump for this flow

# REDESIGN JULY 17, 2014

## DRAINFIELD DOSING

### Assume:

180 gpd design flow (peak day)  
5 doses per day  
2 beds per dose

Therefore, there are 5 doses per peak day, approximately once every 4 hours, 48 minutes.

Gallons per dose = $180/5 =$	36	gal/dose
Specified Dosing Tank Volume per Inch =	5.75	gal/inch
Dose Drawdown for Specified Dosing Tank =	6.3	inches
Approx. Pump Rate at Operating Head =	24.4	gpm
Approx. Pump Run Time per Dose =	1.5	min
Approx. Pump Run Time per Dose =	1 min, 30 sec	
Cycle Time Between Dose Events for Peak Day =	288	min
Timer OFF time per Cycle =	286.5	min
Timer OFF time per Cycle =	4 hr, 46.5 min	

# Pump Selection for a Pressurized System REDESIGN JULY 17, 2014

Welch OSS

## Parameters

Discharge Assembly Size	1.25	inches
Transport Length	240	feet
Transport Pipe Class	40	
Transport Line Size	1.25	inches
Distributing Valve Model	None	
Max Elevation Lift	0	feet
Manifold Length	6	feet
Manifold Pipe Class	40	
Manifold Pipe Size	1.00	inches
Number of Laterals per Cell	8	
Lateral Length	13	feet
Lateral Pipe Class	40	
Lateral Pipe Size	0.50	inches
Orifice Size	1/8	inches
Orifice Spacing	2	feet
Residual Head	5	feet
Flow Meter	None	inches
'Add-on' Friction Losses	5	feet

## Calculations

Minimum Flow Rate per Orifice	0.43	gpm
Number of Orifices per Zone	56	
Total Flow Rate per Zone	24.5	gpm
Number of Laterals per Zone	8	
% Flow Differential 1st/Last Orifice	3.0	%
Transport Velocity	5.3	fps

## Frictional Head Losses

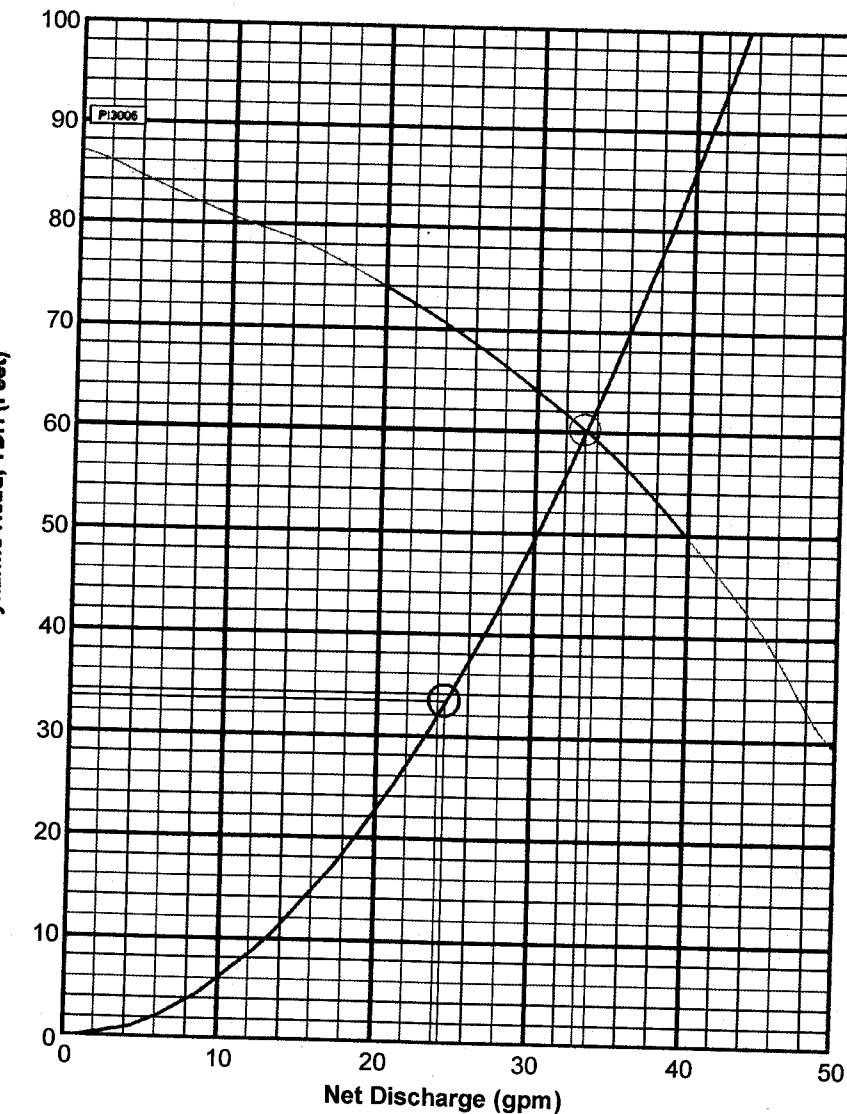
Loss through Discharge	4.2	feet
Loss in Transport	18.2	feet
Loss through Valve	0.0	feet
Loss in Manifold	0.5	feet
Loss in Laterals	0.5	feet
Loss through Flowmeter	0.0	feet
'Add-on' Friction Losses	5.0	feet

## Pipe Volumes

Vol of Transport Line	18.6	gals
Vol of Manifold	0.3	gals
Vol of Laterals per Zone	1.6	gals
Total Volume	20.6	gals

## Size Pump For

Design Flow Rate	24.5	gpm
Total Dynamic Head	33.4	feet



## PumpData

PI3005 High Head Effluent Pump  
30 GPM  
1/2HP, 115 1Ø

## Legend

System Curve:	—
Pump Curve:	—
Pump Optimal Range:	—
Curve Intersection:	○
Design Point:	○



Orenco Systems  
Incorporated

Changing the Way the  
World Does Wastewater



REDESIGN JULY 17, 2014

## APPENDIX C

LETTER FROM SUSTAINABLE  
CONNECTIONS REGARDING THE  
WELCH HOUSE GREEN BUILDING  
DEMONSTRATION PROJECT

REDESIGN JULY 17, 2014



Sustainable Connections Green Building & Smart Growth Program  
Rose Lathrop- Program Manager  
1701 Ellis St. Suite 221  
Bellingham, WA 98225  
Phone: 360.647.7093  
Fax: 360.594.4373  
[www.sustainableconnections.org/greenbuilding](http://www.sustainableconnections.org/greenbuilding)  
[rose@sconnect.org](mailto:rose@sconnect.org)

March 21, 2013

To Whom It May Concern:

The Sustainable Connections Green Building and Smart Growth Program's mission is to promote healthy, durable, energy efficient and environmentally responsible homes, neighborhoods and workplaces through education, technical assistance and advocacy. Since its' inception Sustainable Connections has worked with communities, utilities, private and public organizations, and individuals to realize green building and low impact development projects and policies that provide a number of economic benefits, including reduced operating costs, increased return on investment, increased productivity and human health, enhanced image and marketability.

In partnership with local government, Sustainable Connections Green Building & policy programs have helped to advance green building support for incentives across Whatcom County. One important focus is to streamline green building policy and reduce barriers associated with permitting sustainable building concepts, design strategies and projects that promote efficient construction techniques.

Advanced Materials and Methods (AMM's) were developed jointly by the City of Bellingham Building Department, Public Works and Sustainable Connections to encourage innovative policy and provide clear guidance on permitting requirements for common green building techniques. This effort has been extremely successful in providing information on pathways to permitting sustainable projects yet examples of projects using the AMM's are difficult to find, document or promote.

It is with pleasure that I announce a partnership between Sustainable Connections and [bundle], LLC in the development of a case study house that will provide tangible examples of numerous green building strategies within the list of AMM's. The case study house will provide an opportunity to promote green building practices, systems and products in real time through workshops prior to, during and following construction. This will allow contractors and designers the opportunity to not only read about the application of green strategies but see how these strategies are applied in the field.

Additionally, these workshops will be a marketing opportunity for financiers, designers, contractors, installers and product suppliers. In an effort to expand the local green building market information about the design, materials and products will be publicly available alongside the businesses that applied and installed these products.

**Strong Community • Healthy Environment • Meaningful Employment • Buying Local First**  
[www.SustainableConnections.org](http://www.SustainableConnections.org) • 360 647-7093 • 1701 Ellis St., Ste 220 • Bellingham, WA 98225

# REDESIGN JULY 17, 2014

There have been many quality green development projects within Bellingham and Whatcom County, yet most pick and choose singular green strategies. The case study house will be an example of how numerous strategies can be combined into a cohesive project. These strategies will include rainwater catchment for potable water, greywater reuse for irrigation and onsite infiltration, composting toilets, energy efficiency through building envelope design, stormwater control through green roofs, solar hot water, heat recovery ventilation and a solar photovoltaic array.

We are excited to work with [bundle], LLC to bring this living laboratory to Whatcom County. [bundle] is a new design firm as of February 2013, founded by Dan Welch. His experience was developed working for HKP architects on numerous green building projects around Whatcom County including BTC's new Campus Center and the BTC Hatchery in Maritime Heritage Park. We are excited to have the opportunity to work with [bundle] as they expand their business and bring quality green building projects to Northwest Washington.

Sincerely,



Rose Lathrop  
Sustainable Connections Green Building & Smart Growth Program Director

REDESIGN JULY 17, 2014

**APPENDIX D**

**SUN-MAR EXCEL  
COMPOSTING TOILET  
INFORMATION**

## PRODUCTS

- SELF-CONTAINED
- CENTRAL FLUSH
- CENTRAL DRY
- ACCESSORIES
- QUESTION PROCESS
- MODEL SELECTOR
- PRODUCT LIST

Call Toll Free: 1-888-341-0782

## SELF-CONTAINED: EXCEL

### EXCEL

\$1845.00 USD \*

[Find a Dealer](#) ▶



**Features**  
Electric  
High Capacity

**Color**  
White or Bone

**Composting Capacity**  
3-5 Residential  
6-8 Weekend and Vacation Use

#### Related Products

- » EXCEL
- » EXCEL NE
- » EXCEL AC/DC
- » SPACESAVER
- » SUN-MAR MOBILE
- » COMPACT

[product info](#) | [specs](#) | [rough-in diagram](#) | [testimonials](#)

## MORE INFO

**Standard 41**  
This system is Certified and Listed by NSF. [Click here for NSF's official Standard 41 listings.](#)

\* Pricing is suggested list price only. [Dealers](#) may sell for less.

For Canadian prices visit our [dealer locator](#), or [e-mail us](#).

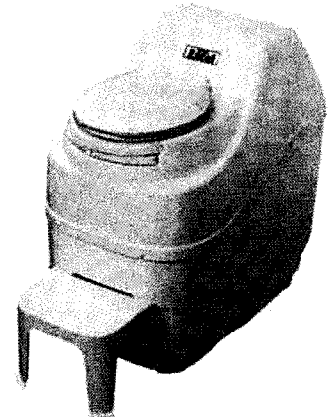
The Excel is the best-selling unit in North America and for good reason. It is a high capacity Bio-drum toilet that is very simple to operate, features well proven technology and is extremely reliable. The Excel was the first ever self-contained composting toilet to be certified by the National Sanitation Foundation (NSF). So, when you purchase an Excel, you are literally purchasing a composting toilet that sets the standard.

The Excel has enough capacity that it can be used just about anywhere; in residences, cottages and even in light commercial applications.

To simulate residential use the Excel was tested by the National Sanitation Foundation (NSF) at maximum capacity for 6 continuous months, during which the Excel produced no odour and produced a clean, safe compost. Only Sun-Mar self-contained units are listed for residential and cottage use by NSF, whose Standard #41 is the toughest composting performance standard in the world.

The 2" vent is attached at the top back of the Excel and can be installed invisibly by running it through the wall and up the outside wall. For comfort the Excel has a sturdy detachable footrest which can be removed to pull out the finishing drawer.

In normal use the Excel can normally evaporate all liquids, however a 1/4" emergency drain is fitted at the rear and this should be connected if the unit is to be used residentially or heavily, or if prolonged power outages are expected.



### Capacity

Listed capacities refer to the amount of people, on average, using the unit per day. Do not pick a unit that is below your capacity.

Residential/Continuous (Adults/Families)	3 adults or families of 5
Seasonal/Vacation (Adults/Families)	6 adults or families of 8

### Electricals

Electricals must be connected while the unit is in AC use for proper operation

Maximum Amps (With Heater On)	2.4
Fan Watts (Required or Optional Hookup)	35 Required
Heater Watts (When Thermostat switches it on)	250
Average Power Use in Watts (Heater on 1/2 time)	150

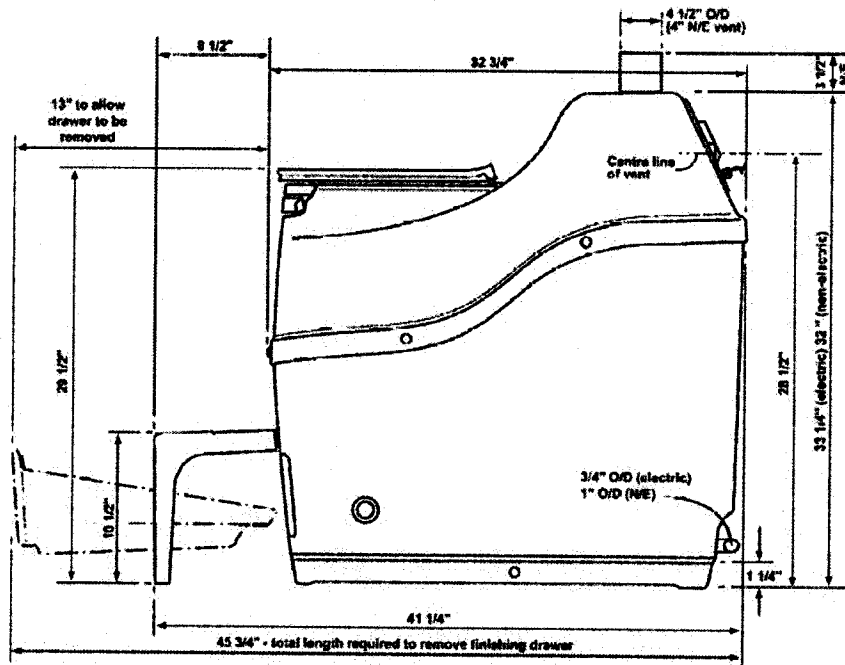
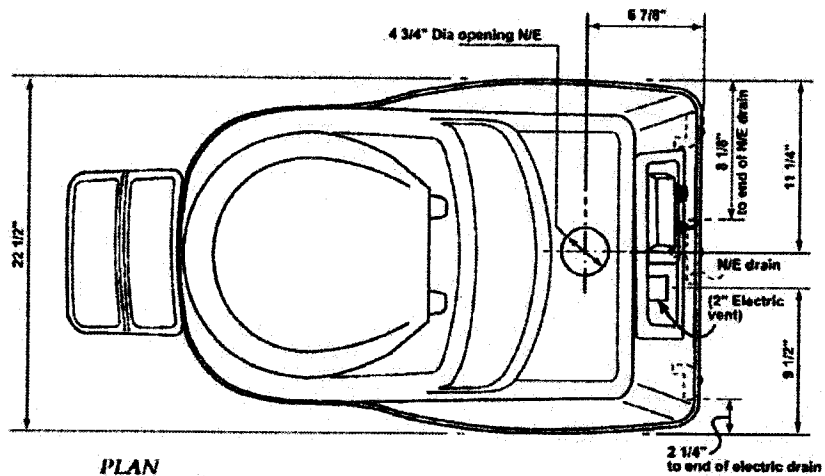
### Vent & Drains

Vent Pipe	2" PVC Thinwall
Drains (Required or Optional Hookup)	1" Drain, Optional for Seasonal/Vac use, Required for Residential/Heavy Use

# REDESIGN JULY 17, 2014

## Weights (Lbs.) & Dimensions

Product Weight/Shipping Weight	60/100
Shipping Carton Dimensions (W by L by H)	28" by 36" by 36"
Depth Required to Remove Drawer	48"
Vent outlet center distance from right side	10"
Height to center of vent	28 3/8"
Unit Height/Width/Depth	32" by 22 1/2" by 33"



## TECHNOLOGY

- HOW COMPOSTING WORKS
- OUR LEADING DESIGN
- FAQ
- ENVIRONMENTAL BENEFITS
- USE & MAINTENANCE

Call Toll Free: 1-888-341-0782

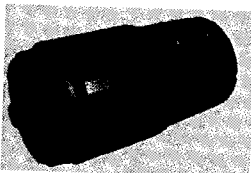
## BIO-DRUM



1. Waste Inlet Port
2. Waste Inlet Door
3. Screen
4. Front Support Bearing
5. Drum Lock Catch
6. Direct Drive Gear
7. Top Air Vent



Compact Drum



Centrex 2000 Drum



## OUR LEADING DESIGN: THE DRUM

### THE COMPOSTING CHAMBER

#### Sun-Mar's Unique Bio-Drum

The ideal way to compost waste would offer operational simplicity, and an environment where there is warmth, moisture, organic material, and oxygen. Sun-Mar creates this ideal environment in the patented Bio-drum.

The unique Sun-Mar Bio-drum ensures aerobic microbes flourish and work much more quickly to break down waste and convert it back to earth.

#### Operational Simplicity

Waste and peat mix bulking material enter through the waste inlet port at the top of the drum. To mix and aerate, rotate the drum periodically, simply by turning the handle on the front of self-contained units or on the side of central units. During rotation the inlet door closes automatically keeping the compost in the drum.

To empty compost from the Bio-drum simply release the drum locker and rotate the drum backwards. Now, the inlet port in the Bio-Drum opens automatically and compost drops directly into the compost finishing drawer.

After rotating, the Bio-drum locks itself in a top dead center position ready to receive new material.

### ADVANTAGES OF THE SUN-MAR BIO-DRUM

#### Supplying Oxygen

Sun-Mar's unique Bio-Drum design is the easiest and best possible way to thoroughly and completely mix and oxygenate the whole compost.

Rotate the drum, and the entire compost pile is tumbled and infused with oxygen. Oxygen is one key ingredient which allows aerobic bacteria to break down waste quickly and without odor.

#### Controlling Moisture

Moisture control, the other basic requirement for good composting, is one of the outstanding benefits offered only by Sun-Mar's Bio-drum.

Below 40% moisture content, composting slows and eventually stops completely. By not applying direct heat to the compost, Sun-Mar ensures that it does not dry out. In addition, the tumbling action during periodic mixing distributes moisture evenly throughout the compost.

At above 60% moisture content, liquid starts to drive out the oxygen in the compost, and the compost becomes increasingly anaerobic, - like a septic system. Sun-Mar's unique Bio-drum optimizes composting speeds by automatically draining any excess liquid through a screen at the bottom of the drum directly into the evaporation chamber.

#### Maintaining Warmth

The microbes generate their own heat as they work. This warmth is held in the compost by the mass of material inside the drum, supported by indirect heat from the base heater (in electric units). By avoiding direct heat, Sun-Mar ensures that composting will not slow down as the material gets dried out.

### The Ideal Environment For Aerobic Bacteria

Uneven distribution of oxygen and moisture allows anaerobic bacteria to take over. These microbes produce bad odors and do not allow the waste to break down quickly.

- FIRST CHAMBER - COMPOSTING
- SECOND CHAMBER - EVAPORATION
- THIRD CHAMBER - FINISHING

# REDESIGN JULY 17, 2014

Centrex 3000 Drum

The superior oxygenation and moisture control provided by the Bio-drum provides the ideal environment for aerobic bacteria to odorlessly break down organic material. They quickly convert organic material into water and carbon dioxide, and leave behind simple salts which are ideal for uptake by plants.

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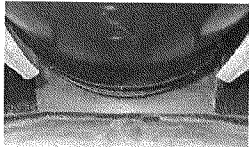


### TECHNOLOGY

- HOW COMPOSTING WORKS
- OUR LEADING DESIGN
- FAQ
- ENVIRONMENTAL BENEFITS
- USE & MAINTENANCE

Call Toll Free: 1-888-341-0782

### EVAPORATION CHAMBER



### OUR LEADING DESIGN: EVAPORATION CHAMBER

Compost must be kept moist but not saturated. Excess liquid from the drum strains through a stainless mesh screen into the evaporation chamber. The ideal environment for evaporating any excess liquid is a large surface area combined with heat and moving air. Sun-Mar meets these criteria in the evaporating chamber.

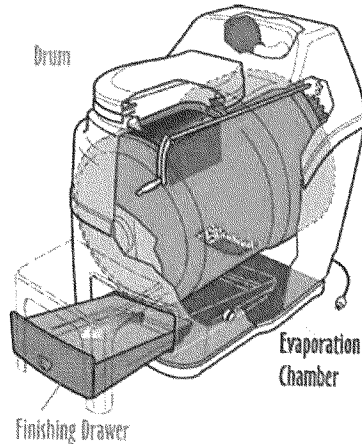
Any liquid not absorbed by the compost in the drum drains through the screen directly into the evaporating chamber.

On all central units the liquid falls first onto an evaporating tray and then to the main evaporating surface. The tray not only helps oxygenate this liquid, it also traps any peat mix debris, and almost doubles the evaporating surface. Evaporating trays can be removed and cleaned if necessary, through the door opening on Centrex 1000 and 2000 units, and through the drawer access port on Centrex 3000 units.

For optimum results evaporation is assisted on 110 Volt electric models by a thermostatically controlled heating element. Sealed in a compartment underneath the evaporating chamber, the heater warms the floor of the evaporating chamber without drying out the compost.

In non-electric units, although some liquid is evaporated by passive venting, the overflow drains must always be connected.

- FIRST CHAMBER - COMPOSTING
- SECOND CHAMBER - EVAPORATION
- THIRD CHAMBER - FINISHING

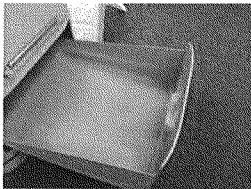


### TECHNOLOGY

- HOW COMPOSTING WORKS
- OUR LEADING DESIGN
- FAQ
- ENVIRONMENTAL BENEFITS
- USE & MAINTENANCE

Call Toll Free: 1-888-341-0782

### FINISHING DRAWER



### OUR LEADING DESIGN: FINISHING DRAWER

#### Advantages of a Separate Compost Finishing Drawer

- composting can be completed in the drawer without contamination by fresh waste.
- compost in the drawer is gradually dried until ready for removal
- finished compost can be simply and safely removed

The finishing drawer serves two functions: to receive the compost in an easily accessible isolated container, and complete the composting and sanitation processes.

- FIRST CHAMBER - COMPOSTING
- SECOND CHAMBER - EVAPORATION
- THIRD CHAMBER - FINISHING

#### All Units Except CENTREX 3000 Series

- compost drops directly into the finishing drawer when the drum is rotated backwards.
- composting is completed in the drawer, where it is isolated from fresh waste and possible contamination.
- while in the drawer, the compost is surrounded by a stream of drying air, and gradually dries prior to removal.
- the pull out finishing drawer is removed by hand (no tools or screws are needed), and the sanitized compost may be emptied whenever more compost is to be extracted from the drum.
- for seasonal units, several drawers may be removed in the spring, reducing the compost level in the drum to 6-8" to make room for next year's operation.

#### CENTREX 3000 Series Units Only

- there are two compost finishing drawers in the centrex 3000 series units. both are easily removed by hand and are interchangeable.
- the first drawer is inside the collection housing at the side of the unit. this is where the finished compost automatically falls after leaving the second section of the bio-drum.
- the second drawer is located inside the unit. moving compost from the first drawer to this second station allows the composting cycle to be extended if necessary. this can help ensure the compost is safe to handle.
- for seasonal units, the second section of the drum can be emptied in the spring by rotating the drum backwards and dropping compost into the second drawer.

# Sun-Mar

## INSTALLATION

- CENTRAL SYSTEM
- SELF-CONTAINED

Call Toll Free: 1-888-341-0782

## SELF-CONTAINED

### Vent Stacks

The main task is the installation of the vent stack, which is included with all units. The vent kits included in the shipping carton are sufficient for installation in most single story buildings. If more is needed they are normally easy to find. All vent pipes are thinwall PVC. For more vent stack installation information, [click here](#).

### Electrical

All electric units are supplied with a power cord and plug which connects to a standard (3) pin 115 Volt outlet and powers both the fan and heating element. 12 Volt fans for non-electric models can be installed in-line with the stack, and connected to a battery which draws from an alternate source of energy, such as a solar panel.

It is recommended that all units be installed on a GFI (Ground Fault Interrupt) circuit to protect your unit from power surges.

### Drains

Electric units include ½" emergency safety drains. These should be connected if heavy use, residential use or power outages are anticipated. NE (Non-electric), AC/DC, SPACESAVER and Sun-Mar Mobile units are all fitted with 1" drains, which should be connected to an approved drain pit, container, or other facility. [Click here](#) for more information on handling excess liquid.

### What's In The Box

[Click here](#) to see what parts are included with your Sun-Mar.

### Winter Use

SUN-MAR units serve as a reliable year-round facility when prepared for continuous or periodic use during the cold winter months. If you use your cabin only once in a while in the winter, the unit may be used as a holding tank during this time. If your SUN-MAR will be in use every weekend in the winter, or in a residence, the temperature must be kept above 55° F at all times to keep the compost going. [Click here](#) for more information on winter use.

### Rough-In Dimensions

[Click here](#) for rough-in dimensions of all self-contained composting toilets.

### 12 Volt Fan

[Click Here](#) for information on the 12 Volt fan for Non-Electric & AC/DC units.

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# Sun-Mar

## INSTALLATION

- CENTRAL SYSTEM
- SELF-CONTAINED

Call Toll Free: 1-888-341-0782

## DETAILS

### Detailed Vent Stack Installation Instructions

#### Electric Unit (2" and 3") Piping Installation

Piping can be installed up the inside wall; through the wall at a slight angle and up the outside wall. The choice depends on ease of installation, visibility, and (especially if the toilet is to be used consistently through a cold winter), the necessity of insulating all exposed vent pipe.

Piping and fittings are of standard 2" PVC thin wall tubing. Additional pipe or fittings are easily available should you need them, from a building supply dealer. If you cannot find them near your location, they are available in 30" lengths directly through us.

i) Minimize the number of sharp angles as each reduces vent efficiency. If it is necessary to have angles in the vent pipe, it is recommended that 45 degree angles are used whenever possible. (90 degree elbows may be used as long as no horizontal vent results - pipe may be bracketed at a slight upwards angle to prevent this)

ii) Do not lead the vent pipe downward or horizontally at any point. This may lead to the vent pipe being blocked by condensate which would cause a urine smell in your bathroom.

## SELF-CONTAINED: VENT STACK

One of the main tasks is the installation of the vent stack, which is included with all units.

The vent kits included in the shipping carton are sufficient for installation in most single story buildings. If more is needed they are normally easy to find. All vent pipes are thinwall PVC.

- electric units with 2" stacks should have the minimum number of bends, should use 45° elbows where possible, and should not have bends totaling more than 360&deg.
- 3" spacesaver/sun-mar mobile vents and especially 4" non-electric vent stacks should be installed as straight as possible. If 45° elbows are needed in a 4" vent stack then a 12 volt fan should be included in the installation to assist airflow.
- merging a sun-mar vent with other existing vents risks interference and is not advised.
- the diffuser included with all units is a simple but effective device originally patented by sun-mar principals to aid updraft, resist winter freeze-up, and protect the vent from downdraft and weather.
- as shown in the drawings they should be installed 2-3 feet above the peak of the roof for best performance. this prevents downdraft.
- vent joints within the bathroom should be siliconed, vent joints outside should be glued with cpvc glue.
- it is very important that self-contained model vent systems do not contain any horizontal runs or downward slopes on the pipe.
- see the winter use section for additional tips on protecting your vent stack in the winter

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### Leading the Vent Through The Roof (All Units)

As shown in the installation, the vent stack should end about 20" above the peak of the roof so that it is less subject to downdraft. Where the piping is taken through the roof, an appropriate roof flashing may be required to seal the installation.

If you have a Sun-Mar Mobile unit, you may terminate the vent above the deck/roof with an appropriate vent cap, available from any marine/RV store.

### The Diffuser (All Units Except Sun-Mar Mobile)

The diffuser provided with the unit is a simple device to be installed at the top of the vent stack with the larger pipe protruding above the smaller. The diffuser design encourages updraft, and discourages wind and weather from going down the vent stack. Unlike wind turbines, diffusers are less likely to freeze up in winter, and are more effective in calm weather.

The Sun-Mar Mobile units are not furnished with a diffuser, and an appropriate vent cap must be purchased by the owner for these units.

## Detailed Vent Stack Installation Instructions

### Electric Unit (2" and 3") Piping Installation

Piping can be installed up the inside wall; through the wall at a slight angle and up the outside wall. The choice depends on ease of installation, visibility, and (especially if the toilet is to be used consistently through a cold winter), the necessity of insulating all exposed vent pipe.

Piping and fittings are of standard 2" PVC thin wall tubing. Additional pipe or fittings are easily available should you need them, from a building supply dealer. If you cannot find them near your location, they are available in 30" lengths directly through us.

- minimize the number of sharp angles as each reduces vent efficiency. if it is necessary to have angles in the vent pipe, it is recommended that 45 degree angles are used whenever possible. (90 degree elbows may be used as long as no horizontal vent results - pipe may be bracketed at a slight upwards angle to prevent this)
- do not lead the vent pipe downward or horizontally at any point. this may lead to the vent pipe being blocked by condensate which would cause a urine smell in your bathroom.

# REDESIGN JULY 17, 2014

iii) All connectors in the vent pipe should be sealed. Use silicone for the connection of the vent stack to the toilet in case the toilet has to be moved or you have to access the fan. PVC cement may be used in the rest of the stack installation if desired.

iv) All exposed vent pipe should be insulated with the foam insulation supplied with the toilet. This is especially important for winter or residential use.

## **Non-Electric Unit (4") Piping Installation**

Piping can be installed up the inside wall; through the wall at a slight angle and up the outside wall (with this configuration a 12 volt fan is necessary). The choice depends on ease of installation, visibility, and (especially if the toilet is to be used consistently through a cold winter), the necessity of insulating all exposed vent pipe.

Piping and fittings are of standard 4" PVC thin wall tubing. Additional pipe or fittings are easily available should you need them, from a building supply dealer. If you cannot find them near your location, they are available in 30" lengths directly through us.

i) The vent stack should be installed as near to vertical as possible.

ii) Silicone caulking should be used for the connection of the vent stack to the toilet because at some time the toilet may have to be moved or you may wish to install a 12 volt fan in the vent stack.

iii) The Sun-Mar 12 Volt fan is fitted inside a 10" length of 4" vent pipe for easy installation, should it be needed. It is installed by either cutting out a section of the vent immediately above the composting unit, or by raising the vent stack off of the composting unit and inserting the fan section. The fan can be used with a solar panel and 12 volt battery, or by purchasing a 12 volt adapter from your local

- iii. all connectors in the vent pipe should be sealed. use silicone for the connection of the vent stack to the toilet in case the toilet has to be moved or you have to access the fan. pvc cement may be used in the rest of the stack installation if desired.
- iv. all exposed vent pipe should be insulated with the foam insulation supplied with the toilet. this is especially important for winter or residential use.

## **Non-Electric Unit (4") Piping Installation**

Piping can be installed up the inside wall; through the wall at a slight angle and up the outside wall (with this configuration a 12 volt fan is necessary). The choice depends on ease of installation, visibility, and (especially if the toilet is to be used consistently through a cold winter), the necessity of insulating all exposed vent pipe.

Piping and fittings are of standard 4" PVC thin wall tubing. Additional pipe or fittings are easily available should you need them, from a building supply dealer. If you cannot find them near your location, they are available in 30" lengths directly through us.

- i. the vent stack should be installed as near to vertical as possible.
- ii. silicone caulking should be used for the connection of the vent stack to the toilet because at some time the toilet may have to be moved or you may wish to install a 12 volt fan in the vent stack.
- iii. the sun-mar 12 volt fan is fitted inside a 10" length of 4" vent pipe for easy installation, should it be needed. it is installed by either cutting out a section of the vent immediately above the composting unit, or by raising the vent stack off of the composting unit and inserting the fan section. the fan can be used with a solar panel and 12 volt battery, or by purchasing a 12 volt adapter from your local hardware store and simply plugging it into the wall.
- iv. if a 12 volt fan is installed it should operate continuously, since otherwise it forms a partial blockage in the vent stack. to install, you can either use pvc connectors or a rubberized connector.
- v. all connectors in the vent pipe should be sealed.

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hardware store and simply plugging it into the wall.

iv) If a 12 Volt fan is installed it should operate continuously, since otherwise it forms a partial blockage in the vent stack. To install, you can either use PVC connectors or a rubberized connector.

v) All connectors in the vent pipe should be sealed.

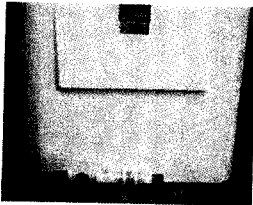
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## INSTALLATION

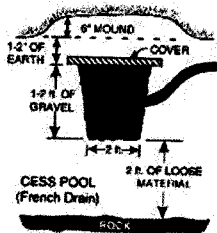
- CENTRAL SYSTEM
- SELF-CONTAINED

Call Toll Free: 1-888-341-0782

## GRAPHICS



The 1" Drain hose provided with all central units, the Spacesaver, and the Excel-NE clamps on with a stainless steel hose clamp, also provided with purchase.



## SELF-CONTAINED: DRAIN

The electric EXCEL, COMPACT, CENTREX 2000 A/F and Centrex 3000 A/F will evaporate all liquids, depending on use and climate (ie use over-capacity and extremely humid weather). However, other than the CENTREX 2000 A/F and 3000 A/F, where it is optional, all Central units, the Excel-NE, the Sun-Mar Mobile, and the SPACESAVER should have the overflow security drain connected.

Even though we expect the Excel, Compact, and Centrex 2000/3000 AF to evaporate all liquids in most situations, we always recommend that the overflow drain be connected if the units are being used residentially, or the units will be seeing heavy use for a short period of time (ie party, large family visits). This drain should always be connected as a security measure.

A 10 Foot 1" drain hose and stainless steel hose clamp is supplied with all Central units, non-electric units, the SpaceSaver, and all Sun-Mar Mobile units. Collect and/or treat excess liquid in an approved facility such as a recycling bed, old septic system, holding tank or drain pit.

To make a recycling bed to evaporate and transpire the liquid without touching the environment, simply dig a bed 18" deep, and line it with plastic sheet. Bed size - normally 3-25 square feet - varies with geographic area and season. Fill it with 6" of gravel then 12" of sand and plant with grass and shrubs. [Click here](#) to open and/or download a simple guide to building your own.

**Facilities for excess liquid should be installed in accordance with local regulations.** In many areas, this is about 1 ft. deep and 2 ft. in diameter. Place sturdy cover (plastic, tin or wood) and a 6" mound of earth over the drain to prevent soil and surface water from settling into the gravel. See the diagram at right.

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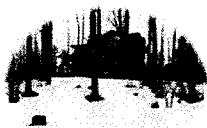
# Sun-Mar

## INSTALLATION

- CENTRAL SYSTEM
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Call Toll Free: 1-888-341-0782

## GRAPHICS



## SELF-CONTAINED: WINTER USE

Sun-Mar units serve as a reliable year-round facility when prepared for continuous or periodic use during the cold winter months. All units are made of fiberglass and marine grade stainless steel; so even if the compost freezes in the drum, sub-zero temperatures will cause no damage.

### Limited Use

For limited use (i.e. only a couple of weekends a month at most) in cold temperatures, the unit can be used simply as a holding tank. For this, sufficient space must be available in the Bio-drum and the drum should not be rotated if it contains frozen compost. Electric units should be plugged in when in use, so that the fan eliminates all odors even though no composting is taking place. If you have an Excel-NE or an AC/DC that you are using primarily in DC mode, you should install a 12 Volt fan to assist airflow during use in the winter months.

This advice is applicable to all planning on using the unit once a month or so in winter. If you are planning on using the unit more frequently during the winter months, please follow the advice in the section below.

### Extended Winter Use

For continuous or extended use in winter (i.e. every weekend, or residential use), the composting unit will have to be kept warm (at least 55°-60° F) so the composting activity does not stop.

- insulate all piping in unheated areas to avoid ice blockage including vent stacks (on all units), and waste inlet and drain piping where appropriate.
- while the composting unit is not in use, energy costs can be reduced by installing a speed control on the fan so that very little cold air is being pulled in and the heater is operating less frequently. this speed control is available from our parts department.
- keep self-contained electric units plugged in if they are in a cold place. if a self-contained unit is being operated in an unheated space, consider putting a blanket over the unit to keep the unit insulated and further reduce heating costs. please note that this will not be enough to bring the unit up to a proper composting temperature.
- if you are planning on installing a unit in a climate with extreme temperatures (ie alaska or northern canada), consider installing a 3" pipe around the insulated 2" pipe to add an extra measure of installation. many of our customers in these areas also use heat tape or self-regulated heat cable along the length of the vent to keep ice from blocking the vent in the winter months. contact us for additional advice if planning to install a unit under these circumstances.

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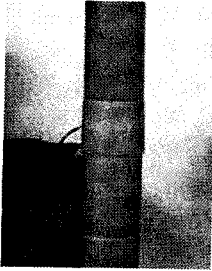


## INSTALLATION

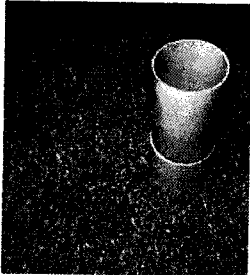
- CENTRAL SYSTEM
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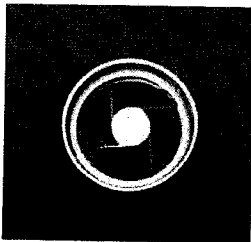
## GRAPHICS



12 Volt Fan Installed In Vent Stack



12 Volt Fan - Red Wire Positive, Blue Wire Negative



Interior View of the 12 Volt Fan

## SELF-CONTAINED: 12 VOLT FAN INFORMATION

### What is the 12 Volt Fan?

The 12 Volt Fan is meant to accelerate airflow in all non-electric units. It comes pre-installed in an 11" piece of 4" diameter vent pipe so that it will fit inline in your vent stack. It also protects against downdraft and increases the evaporative performance of your non-electric unit by about 10 to 15% (still not enough to evaporate all liquids on an NE).

Its purchase is optional with an Excel NE, a Centrex 2000 NE, or a Centrex 1000 NE.

### In Which Situations would I need a 12 Volt Fan?

- if you have to put any bends in the vent stack (sun-mar recommends no more than two 45 elbows, even with a 12 volt fan installed).
- if your cottage is subject to downdraft.

### In Which Situations Would Sun-Mar recommend a 12 Volt Fan?

- if the unit is being used residentially
- if you expect heavy seasonal use

### In Which Situations Would Sun-Mar Not Recommend a 12 Volt Fan?

If you cannot run the fan continuously, it will act as a blockage in the vent stack. If you need to get around this, you can install it in a "bypass vent" off of the main stack.

If you live in a coastal area that is rich in salt air - you may want to consider purchasing a more expensive, but more durable fan from Nicro; these fans are used in marine applications and may be purchased from marine supply stores. Our fans will stand up to most weather conditions, but do not do well in salt air.

### Which units come with the 12 Volt Fan?

Excel AC/DC	1.4 Watt 12 Volt Fan
Centrex 2000 AF NE	2.4 Watt 12 Volt Fan
Centrex 2000 AF AC/DC	2.4 Watt 12 Volt Fan
Centrex 3000 AF NE	2.4 Watt 12 Volt Fan
Centrex 3000 NE	2.4 Watt 12 Volt Fan
Centrex 3000 AF AC/DC	2.4 Watt 12 Volt Fan
Centrex 3000 AC/DC	2.4 Watt 12 Volt Fan
Centrex 2000 AC/DC	1.4 Watt 12 Volt Fan
Centrex 1000 AC/DC	1.4 Watt 12 Volt Fan

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## **Is Installation of the 12 Volt Fan required on the above models?**

### **AF (Air Flow) NE models:**

These models require the installation of the 12 Volt fan to ensure that air is being drawn down the Sun-Mar dry toilet in the bathroom.

### **AC/DC models:**

Installation of the 12 Volt Fan is only required on these models where both vent stacks have been installed, or any of the other situations exist where Sun-Mar recommends its installation.

### **Centrex 3000 NE:**

While installation of the vent fan is not required on this model, it is highly recommended for assistance with airflow, or any of the other situations exist where Sun-Mar recommends its installation.

## **How Do I Install the 12 Volt Fan?**

Choose a section of your vent where you will easily be able to access the fan, and connect it to the battery. Cut a suitably sized section of vent stack and insert the fan into the stack, ensuring that the piece is positioned correctly so that the fan is blowing upwards (coupling will be at the bottom). Caulk both seams with silicone for the best airflow.

## **Why can't I just use a computer fan?**

Our fans are protected from moisture and weather, except in the case of air that is rich in salt (see above). While they may look like computer fans, they aren't.

## **How Do I Power the Fan?**

### **With DC Power:**

Purchase a solar panel appropriate to the wattage of your fan (5 Watt for the 1.4 watt fan, 10 watts or above for the 2.4 watt fan). You will also require a 12 Volt battery (Sun-Mar suggests a deep cycle marine battery for best results). Connect the wires on the fan (red wire positive, blue negative) to the appropriate terminals on the battery, and the appropriate wires on the solar panel to the battery. The battery will store the charge from the solar panel, ensuring continuous operation of the fan even at night or cloudy days.

### **With AC Power:**

Purchase a 12 Volt AC Adapter from any electronics store. Cut off the female plug. Attach the positive wire to the red wire, the negative wire to the blue wire, and secure both with small wire connectors (marrettes). Plug into wall.

## **What Different Voltages and Watts are these fans Available In?**

### **12 Volt 1.4 Watt Fan**

This is the fan which is shipped when you order a 12 Volt Fan. It will do for most situations, and has the lowest draw.

### **12 Volt 2.4 Watt Fan**

This fan increases the airflow level and is necessary for situations where there may be competing drafts, which is true in the case of the AF NE models and the AC/DC, dual-vented models.

### **24 Volt 3.3 Watt Fan**

For those with 24 Volt systems.

## TECHNOLOGY

- HOW COMPOSTING WORKS
- OUR LEADING DESIGN
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- ENVIRONMENTAL BENEFITS
- USE & MAINTENANCE

Call Toll Free: 1-888-341-0782

## INSTRUCTIONS

These instructions are meant for initial startup of the composting system. As we used to say almost 20 years ago, it's just like baking a cake - you just have to add the ingredients and stir! Please note - normal toilet paper is part of the mix - it is a carbon source and you can use as much as you do with a regular toilet. No special toilet paper or cutdown in usage is required!

Begin operation by carrying out the startup procedure described below, and then continue with the "Ongoing Toilet Maintenance" routine. It normally takes six weeks before a compost is properly established. You will know that this has happened when:

Compost volume increases more slowly

Compost turns black and becomes loam-like

Toilet paper decomposes within a few day

## USE & MAINTENANCE: INITIAL SETUP

Action	Description	Why?
ADD	3-4 gallons of peat mix (half the 30 litre/8 gallon bag provided) to the drum.	Provides Carbon base and initial mass for compost.
ADD	1/2 Microbe Mix packet at startup, other 1/2 in two weeks (or on next visit if in cottage use).	Adds necessary microbes which will break down the compost.
SPRINKLE	About 1/2 gallon of warm water into the drum.	Moistens carbon base
PLUG IN	Power cord on unit to get fan and heating element working (electric models only).	The unit is ready for use
SPRAY	"Compost Quick" enzymes into drum before and after mixing. Coat the evaporation chamber with it before using the unit.	Speeds start up of compost by acting as a catalyst to assist bacteria  Prevents possibility of start-up odor in the evaporation chamber
RAKE	Loose peat moss from the <u>evaporation chamber</u> until the compost is established, which takes approximately 6 weeks.	Until the compost is active, some peat mix may fall through the screen or drum door into the evaporating chamber.

- INITIAL SETUP
- ONGOING MAINTENANCE
- ANNUAL SYSTEM STARTUP

# Sun-Mar

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## PROCEDURE

This procedure is designed to keep the compost:

- moist, but not too wet
- well aerated & mixed
- well balanced and aerobic

## USE & MAINTENANCE: ONGOING MAINTENANCE

### Add..

1 cupful (or 2 handfuls) of Sun-Mar Compost Sure (or 50/50 mixture of peat moss and non-cedar wood shavings) to the Bio-Drum after every bowel movement. This usually represents one cupful per person per day of use.

If you have a central unit, peat mix only needs to be added when you do your rotations at the end of the weekend (cottage use) or once every 2nd day (residential/weekly use).

### Why?

- maintains the carbon/nitrogen balance
- absorbs liquid
- helps oxygen penetrate for aerobic composting

### Turn Handle...

to rotate the drum 4-6 complete revolutions, three times a week when in use, or, if used only at weekends, only on departure.

### Why?

- mixes and oxygenates the compost

### Unplug...

the unit if you are leaving for a period of more than a few days. If you are leaving one weekend and coming back the next, you may unplug the unit.

Consider installing a timer to shut the unit off after 48 hours to evaporate excess liquid. If you are leaving for a period of more than few days, or the compost appears dry, add approximately 1/2 gallon of warm water before leaving to keep the compost moist.

### Why?

- unplugging unit will conserve power and keep compost from drying.
- addition of water helps keep the compost moist

### Empty...

some compost into the finishing drawer when the drum is 1/2 to 2/3 full. It is 2/3 full when the compost reaches a level about 2-3 inches below the drum door when the door is open.

To empty some compost into the drawer, pull the drum locker button and rotate the handle counter-clockwise (to turn the drum clockwise). Turn at the same speed you would normally do for mixing.

If necessary, use the rake to level the compost in the drawer. If there is not enough compost in the drawer, turn the drum backwards (clockwise) again 1 rotation.

Leave the compost in the finishing drawer to finish for 3-4 weeks or until you next need to remove compost from the drum.

**If your unit is used seasonally and is not used heavily, you may not have to remove any compost at all during the season. If so, follow "Annual Startup".**

### Why?

- moves some compost to the next stage for finishing
- ensures that the drum does not get too full
- provides extra time for composting to be completed.

- INITIAL SETUP
- ONGOING MAINTENANCE
- ANNUAL SYSTEM STARTUP

### TECHNOLOGY

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Call Toll Free: 1-888-341-0782

### FAQ

#### *How much odor comes from a composting toilet?*

None. Air is being continuously drawn in to the unit and up the vent stack, creating a partial vacuum in the unit. In addition, the composting drum fosters a good aerobic compost which produces no odors.

#### *How often do you empty it?*

Never completely. You typically empty some of the compost out of the drum once per year for cottage use, once every few months for residential use. In cases of continuous use, you may extract some compost more often. This always sits in the drawer to cure before being removed - you are never handling any fresh waste when the unit is properly operated.

#### *Do I add any chemicals?*

No. The only thing that is added is peat moss mixed with wood shavings, (60% wood shavings, 40% peat moss, or Sun-Mar's Compost Sure peat mix with hemp). Chemicals are, in fact, dangerous to the composting process and should never be added at all.

#### *What happens in the winter?*

Nothing. The compost remains in the drum and freezes, so no composting is taking place. The elements will NOT damage the system during the winter months. In fact, waste can be added in limited quantities during the winter for use as a holding tank, if you are only planning to use the unit about once a month.

#### *Can it be used all winter?*

Yes. If the area where the composting unit is heated to a minimum 55 degrees Fahrenheit throughout the winter, then composting will occur.

#### *How much hydro do they use?*

About 150 Watts. The electric units require hydro to power a fan (30 Watts continuous) and a heating element that is thermostatically controlled. The average draw is about 150 Watts, or the equivalent of a lightbulb. Larger models may have larger power requirements.

#### *What if no electricity is available?*

No problem. Each Sun-Mar toilet is available in a non-electric version.

#### *I have a generator that runs part of the time. Can I use an electric unit?*

No. A non-electric unit is recommended or a unit that has both electric and non-electric capabilities (AC/DC unit).

#### *How do you clean it?*

You only have to clean the bowl (in a central system) or the bowl liner (self-contained unit) as you would a regular bowl, except without the use of chemicals. Recommended cleaners are Sun-

- INITIAL SETUP
- ONGOING MAINTENANCE
- ANNUAL SYSTEM STARTUP

**FOR MORE  
INFORMATION  
ON SUN-MAR  
GARDEN  
COMPOSTERS  
CLICK HERE**

# REDESIGN JULY 17, 2014

Mar Compost Quick or hot water that is mixed with baking soda or vinegar.

## ***Does the Fiberglass used in your composting toilets smell?***

Does the fiberglass used to make the body of your car smell? No. Off gassing from the fiberglass production process does produce an odor, but it is gone by the time that the toilet is built and boxed.

## ***What kind of plastics do you use in your production?***

We use high quality, recyclable, cold-resistant plastics. Sun-Mar engineers use the best materials for each part of the design. We find that this produces a better product than using one material throughout.

## ***Where are your toilets built?***

At our plant in Burlington, Ontario, Canada. Please feel free to come and see us anytime during business hours.

## ***Why do you have so many systems?***

To meet every need possible. If you find unit selection complex, use our automatic model selector or follow our simple question process.

## ***How Do You Get the Most Capacity out of a Composting Toilet System?***

Different sizes of drums. Common sense tells us that more people means more waste, and for more waste we need a bigger composting vessel. Sun- Mar is the only company that offers a larger solution for a larger problem.

## ***Why Don't you sell your Toilets directly?***

We do! If you do not have a dealer in your area, feel free to order through us or one of our mail-order/internet dealers. Either way you will receive access to excellent free after-sales support directly from us.

## ***Why is a local Dealer Better?***

We find that users want to see, feel, and touch the product before buying it. This way, you can get to know the Sun-Mar products more thoroughly before you purchase. We combine the well-trained service of our dealers with our excellent product knowledge to back them up if you have any questions that they can't answer – this results in you being as well-informed as possible, as we believe in educating rather than selling so that you make the best decision for your situation.

## ***Why are you saying that you have the only Residential and Cottage use systems certified and listed under NSF (National Sanitation Foundation) Standard 41?***

The facts are right here on NSF's website. We have the only Residential and Cottage use composting toilet systems certified and listed under NSF Standard 41. If you have any questions please contact NSF directly.

## ***Do you charge collect shipping charges?***

When you buy through a dealer, you may even pay no shipping charges. Most of our dealers will be happy to give you freight costs up front. When you are buying from us, we usually get you a

# REDESIGN JULY 17, 2014

freight quote before shipment that you approve before the unit ships. These amounts vary depending on where you live, but usually don't go too far north of 100.00.

## ***Do you have a toll free number that I can talk to a person at?***

1-888-341-0782. Available during office hours. Please call us if you have any questions at all that we can help you with.

## ***Why does no-one else use a drum inside a composting toilet?***

They can't. Many of our drum design features are patented.

## ***Do animals harm the system?***

No. The compost is not something that is attractive to animals. Some people do build an enclosure to ensure curious animals or children don't tamper with the units.

## ***What is the warranty?***

All units carry a full 5 year replacement warranty on the fiberglass tank and a comprehensive 3 year replacement warranty on all other parts.

## ***What parts wear out?***

Like brakes or tires on a car, certain parts eventually need to be replaced. On Sun-Mar toilets, the fan and the thermostat usually fail after a number of years. In both cases the parts are inexpensive and are easily accessible for you to repair.

## ***Is the Fan Noisy?***

The fan on our AC models is just as noticeable as an oscillating room fan in terms of noise level. If you are concerned about fan noise being a problem, you can purchase a fan speed control with your unit that will allow you to turn down the fan speed, and therefore the noise, whenever you like.

You may have heard from users of older Sun-Mar units (pre-1998) that their fans were noisy. They were noisier than the current model, as the fan was from a different manufacturer and of an entirely different design. Just another example of how we are always improving your composting toilet experience.

## ***On a central system, how far away from the toilet bowl can the composting unit be located?***

Up to 15 feet is usually safe. We have encountered cases that have had longer distances, but in every case we recommend that you carefully follow installation instructions. It is very important that you carefully measure the slope of the pipe in any case.

## ***How many toilets can I hook up to a central system?***

You may connect up to 3 toilets to any one system. The amount of toilets is not as important as the number of people using the system.

## ***Can you throw the paper in the toilet?***

Yes. The paper is a source of carbon for the compost. You do not need to buy special toilet paper to use in our system, as a properly operating compost will break down regular toilet paper in a short period of time. Of course single ply will break down faster, but it is

# REDESIGN JULY 17, 2014

not necessary - and anybody who tells you it is probably trying to sell you fancy expensive toilet paper!

## ***Should males still urinate outside or in the outhouse?***

No. In fact, the liquid is beneficial to the composting process.

## ***How Do I Dispose of my Kitchen and Bathwater Waste <Greywater>?***

This is an answer that changes with each installation. There are two things to consider. The first, and most important, is what you are legally allowed to do. If you contact your local Department of Health, or building inspector, they should be able to tell you exactly what is legal to do in your area.

Here are a couple of not-for-profit organizations that can provide more information on proper greywater treatment:

National Small Flows Clearinghouse (US)  
<http://www.nesc.wvu.edu/wastewater.cfm/>

Centre for Sustainable Watersheds (Canada)  
<http://www.watersheds.ca>

## **Additional Information**

### **Technical Article: On-Site Recycling of Domestic Sewage in Florida**

*A do-it-yourself guide for effluent treatment with evapo-transpiration*



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APPENDIX E

NOT USED

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APPENDIX F

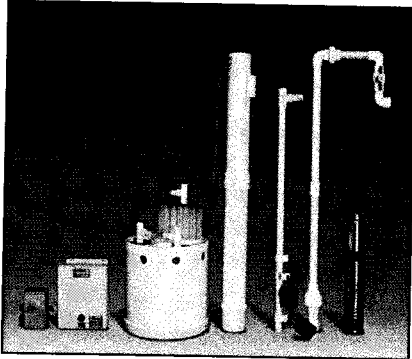
ORENCO<sup>®</sup> BIOTUBE<sup>®</sup> EASYPAK<sup>™</sup>  
PUMP PACKAGE

# Introducing Biotube® EasyPak™

  
Oreco Systems  
800-348-9843

## Complete, Ready-to-Install Pump Package in a Box

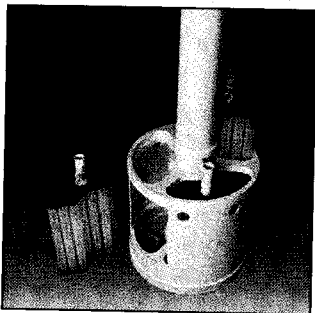
### Simplifies Design and Installation



Oreco's new Biotube® EasyPak™ is the first pump package designed specifically for use in pump tanks for residential septic systems. **No more "pump on a block."** No more parts and pieces. Everything you need, in a single

box, ready-to-install, ready to drop into a pump tank. With EasyPak, you get faster installs, fewer installation errors, fewer call-backs. **At a comparable price** to a low-head "pump on a block."

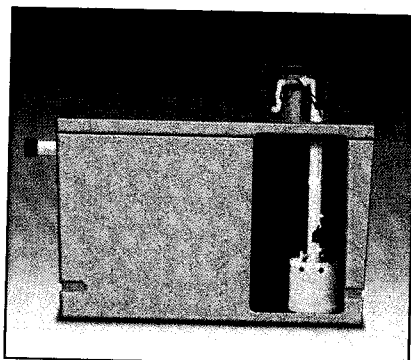
### A Better Product at a Comparable Cost



With EasyPak, your customers get protection for a drainfield that's worth thousands of dollars and may, in fact, be irreplaceable. That's because EasyPak includes three built-in Biotube® filter cartridges that prevent solids from clogging drainfields or other downstream components. EasyPak

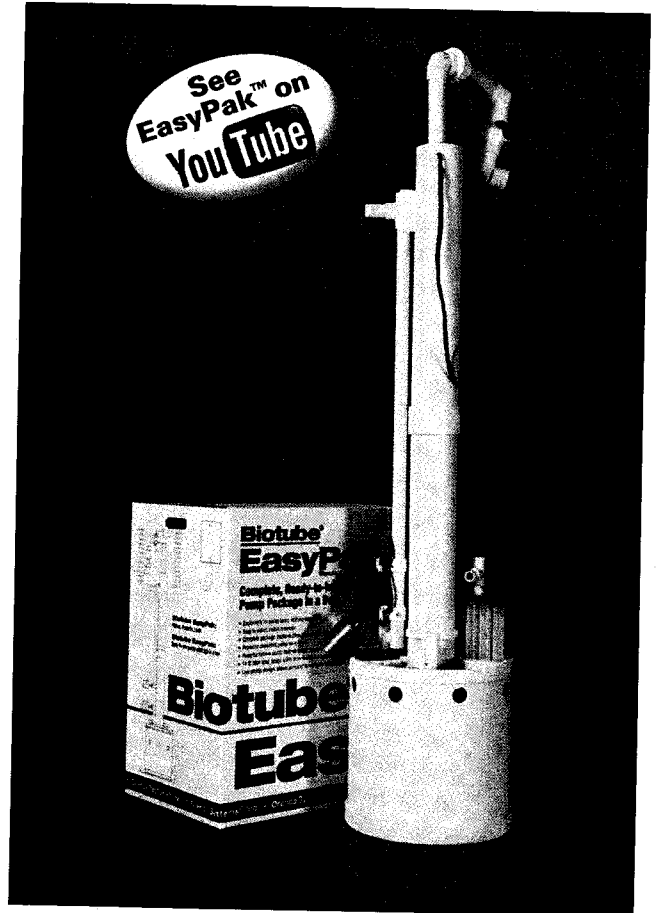
also includes a long-lasting, high-performing 4" turbine pump. **All EasyPak pump packages include a 5-year warranty on materials and workmanship from the date of manufacture.**

### Standard Packages and Ordering Codes



Demand-dose and timed-dose packages are available.

Note that all EasyPak vaults are a low-profile design – just 15" high – which **allows pumping to nearly the bottom of the tank.** An industry-first for filtering pump vaults.



### Free EasyPak Design Aid CD-Rom

Our EasyPak Design Aid CD-Rom includes everything you'll need to design, specify, install, and promote EasyPak. It also includes our brand new EasyPak Select™ software program to help you choose the correct system for the application. EasyPak Select automatically calculates the correct pump flow rate and total dynamic head for your customer's system.

**To order your free EasyPak Design Aid CD-ROM, call Oreco at 800-348-9843. Or you can download everything on the CD by visiting oreco.com.**

*Continued on back*

# Biotube® EasyPak™ (continued)

## Package Selection

All EasyPak pump packages are available in both demand-dose and timed-dose applications. There are two basic packages, based on dose method and flow rate:

1. **Demand-dose** — The typical package for demand-dose systems is the BEP10DD.

The BEP10DD accommodates flows up to 10 gpm (15 gpm without ¼-in flow control) and can be used to pump from a dosing tank to a gravity drainfield (distribution box, hydrosplitter, etc.). BEP20DD, BEP30DD and BEP50DD systems are available for demand-dose applications that require flows greater than 15 gpm.

2. **Timed-dose** — The typical package for timed-dose systems is the BEP30TDD.

The BEP30TDD accommodates flows up to 40 gpm and can be used for pumping from a dosing tank to a final dispersal area (pressurized drainfields, sand filter, etc.). BEP10TDD systems are available for timed-dose applications with flows of 10 gpm or less, such as drip irrigation. BEP50TDD systems are available for timed-dose applications that require flows of 40 gpm or more, such as large, pressurized drainfields.

Demand Dosing			Timed Dosing		
Model Code	Discharge	Maximum Flow Rate	Model Code	Discharge	Maximum Flow Rate
BEP10DD	Standard	15 GPM	BEP10TDD	Standard	15 GPM
BEP10DD-DB	Drainback	15 GPM	BEP10TDD-DB	Drainback	15 GPM
BEP10DD-CW	Cold Weather	15 GPM	BEP10TDD-CW	Cold Weather	15 GPM
BEP20DD	Standard	25 GPM	BEP20TDD	Standard	25 GPM
BEP20DD-DB	Drainback	25 GPM	BEP20TDD-DB	Drainback	25 GPM
BEP20DD-CW	Cold Weather	25 GPM	BEP20TDD-CW	Cold Weather	25 GPM
BEP30DD	Standard	40 GPM	BEP30TDD	Standard	40 GPM
BEP30DD-DB	Drainback	40 GPM	BEP30TDD-DB	Drainback	40 GPM
BEP30DD-CW	Cold Weather	40 GPM	BEP30TDD-CW	Cold Weather	40 GPM
BEP50DD	Standard	65 GPM	BEP50TDD	Standard	65 GPM
BEP50DD-DB	Drainback	65 GPM	BEP50TDD-DB	Drainback	65 GPM
BEP50DD-CW	Cold Weather	65 GPM	BEP50TDD-CW	Cold Weather	65 GPM

## Nomenclature

BEP

Discharge assembly:  
Blank = Standard  
DB = Drainback  
CW = Cold weather

Panel:  
DD = Demand dosing  
TDA = Timed dosing, analog  
TDD = Timed dosing, digital

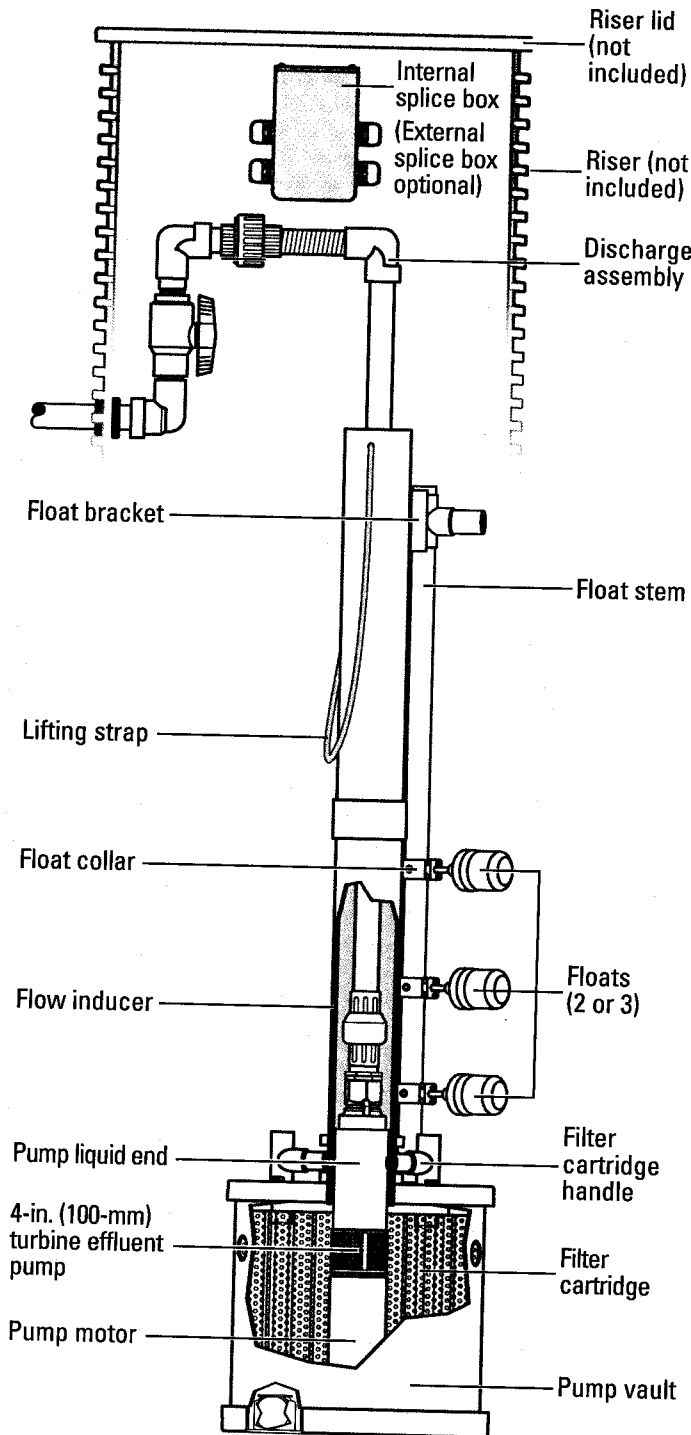
Pump flow rate (nominal):  
10 = 10 gpm (0.6 L/sec) with ¼-in. (6-mm) flow control  
20 = 20 gpm (1.3 L/sec)  
30 = 30 gpm (1.9 L/sec)  
50 = 50 gpm (3.2 L/sec)

Biotube EasyPak™ pump vault, 15-inch vault

# Biotube® EasyPak™ Pump Package



## 60-Hz Series Pump Packages



**Biotube EasyPak® pump package components.**  
(Control panel not shown: see p. 4.)

### General

Orenco's Biotube® EasyPak™ Pump Package is the first complete pump package specifically for filtering and pumping effluent from pump tanks. The EasyPak pump package makes it easy to select and install the correct pump package for the pump tank. (U.S. Patents #4,439,323 and #5,492,635. Additional U.S. and international patents pending.)

This document provides detailed information on the EasyPak pump vault, effluent filter cartridges, 4-in. (100-mm) 60-Hz turbine effluent pump, and control panel. For more information on other EasyPak components, see the following Orenco technical documents:

- *Float Switch Assemblies* (NTD-MF-MF-1)
- *Discharge Assemblies* (NTD-HV-HV-1)
- *Splice Boxes* (NTD-SB-SB-1)
- *External Splice Box* (NTD-SBEX-1)

### Applications

The Biotube EasyPak pump package is designed to filter and pump effluent from a pump tank to gravity or pressurized dispersal.

The unique low profile, submersible design of the pump vault makes it well suited to applications where large reserve volumes are required, or when pumping from near the bottom of the tank.

Complete packages for on-demand dosing or timed dosing at 10, 30, and 50 gpm (0.6, 1.9, and 3.2 L/sec) and 50 Hz or 60 Hz are available.

### Standard Models

BEP10DD, BEP10DDCW, BEP30TDD, BEP30TDDCW, BEP50TDD, BEP50TDDCW

### Nomenclature

BEP

Discharge assembly:  
Blank = Standard  
DB = Drainback  
CW = Cold weather

Panel:  
DD = Demand dosing  
TDA = Timed dosing, analog  
TDD = Timed dosing, digital

Pump flow rate (nominal):  
10 = 10 gpm (0.6 L/sec) with ¼-in. (6-mm) flow control  
30 = 30 gpm (1.9 L/sec)  
50 = 50 gpm (3.2 L/sec)

Biotube EasyPak™ pump vault, 15-inch (380-mm) vault

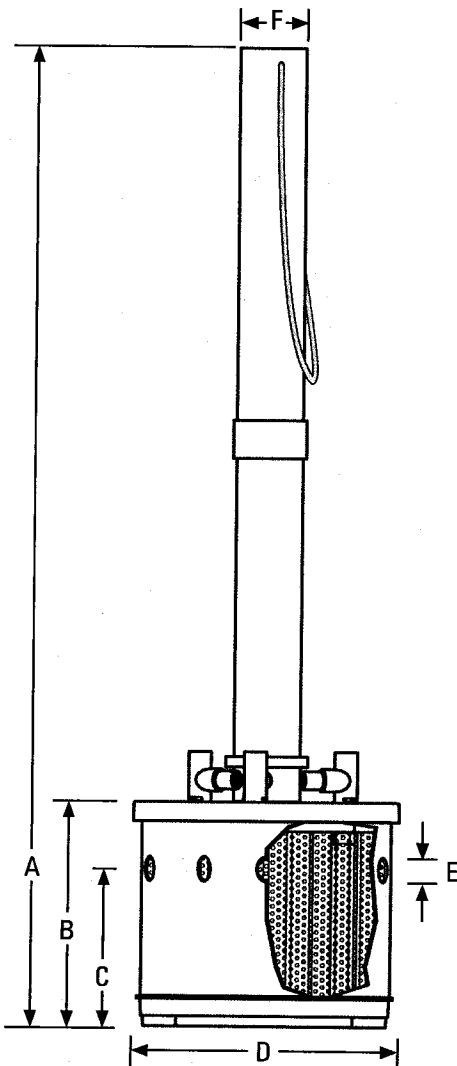
# Biotube® EasyPak™ Pump Package (continued)

## EasyPak™ Pump Vault

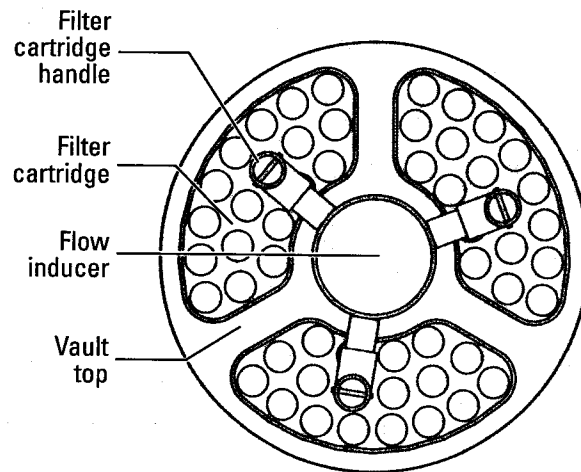
Materials of Construction	
Vault body	PVC
Vault top	ABS
Vault base	Fiberglass
Flow inducer	PVC
Lifting strap	Hollow-braided poly
Dimensions, in. (mm)	
A - Overall height (adjustable)	64 (1625)
B - Vault height	15 (380)
C - Inlet hole center height	12 (305)
D - Vault diameter	15.75 (400)
E - Inlet hole diameter (8 total)	1.38 (35)
F - Flow inducer diameter, nominal	4 (100)

## Biotube® Filter Cartridge

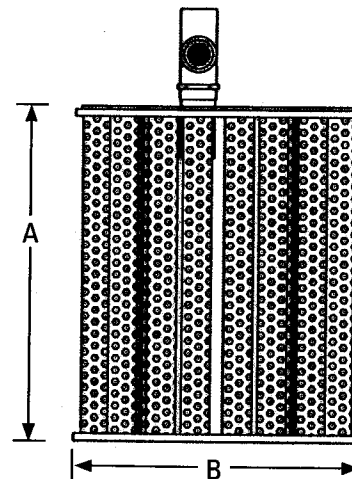
Materials of Construction	
Filter tubes	Polypropylene
Cartridge end plates	Polyurethane
Handle	PVC
Dimensions, in. (mm)	
A - Cartridge height	12 (305)
B - Cartridge width	10.3 (262)
Performance	
Number of filter cartridges	3
Biotube® mesh opening	0.125 in. (3 mm)
Total filter flow area	4.5 ft <sup>2</sup> (0.4m <sup>2</sup> )
Total filter surface area	14 ft <sup>2</sup> (1.3m <sup>2</sup> )
Maximum flow rate	75 gpm (4.7 L/sec)



EasyPak® pump vault



Filter cartridges in vault, top view



Biotube® filter cartridge, front view

# Biotube® EasyPak™ Pump Package (continued)

## 4-in. (100-mm) Turbine Effluent Pumps

EasyPak™ Turbine Effluent Pumps are constructed of lightweight, corrosion-resistant stainless steel and engineered plastics.

Power cords for EasyPak turbine effluent pumps are 10-ft (3.1 m) 16/3 Type SOOW 600-V motor cable, suitable for Class I, Division 1 and Division 2 applications (not compatible with Franklin Electric Super Stainless motors).

### Materials of Construction

Discharge:	Glass-filled polypropylene (10- and 30-gpm) Stainless steel (50-gpm)
Discharge bearing:	Engineered thermoplastic (PEEK)
Diffusers:	Glass-filled PPO (Noryl GFN3)
Impellers:	Celcon® acetal copolymer (10-gpm) Noryl GFN3 (30- and 50-gpm)
Intake screens:	Polyethylene
Suction connection:	Glass-filled polypropylene (10-gpm) Stainless steel (30- and 50-gpm)
Drive shaft:	Stainless steel, 300 series
Coupling:	Sintered stainless steel, 300 series
Shell:	Stainless steel, 300 series
Motor:	Filled with lubricating coolant. Includes thermal overload protection.

### Specifications

Nominal flow (gpm)	Length in. (mm)	Weight lb (kg)	Discharge in., nominal*	Impellers
10	22.0 (559)	23.0 (10.4)	1.25	6
30	20.5 (508)	21.0 (9.5)	1.25	3
50	19.5 (495)	24 (10.9)	2.00	2

### Performance

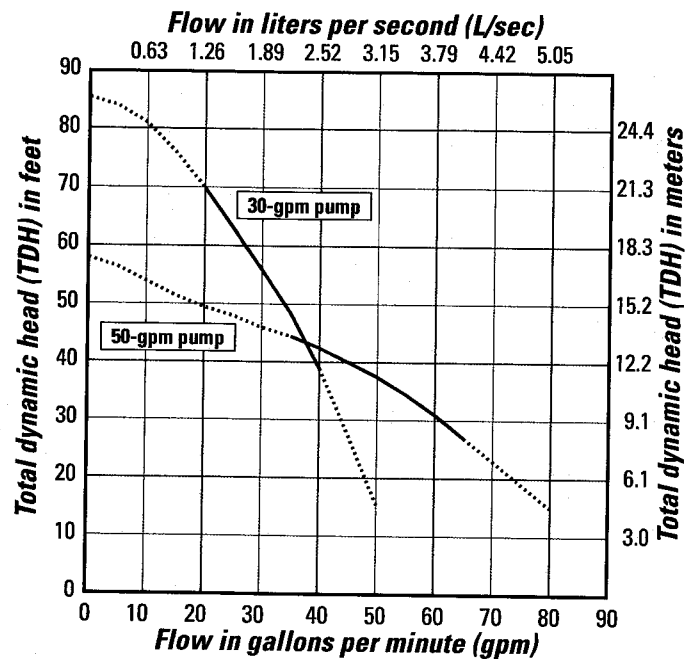
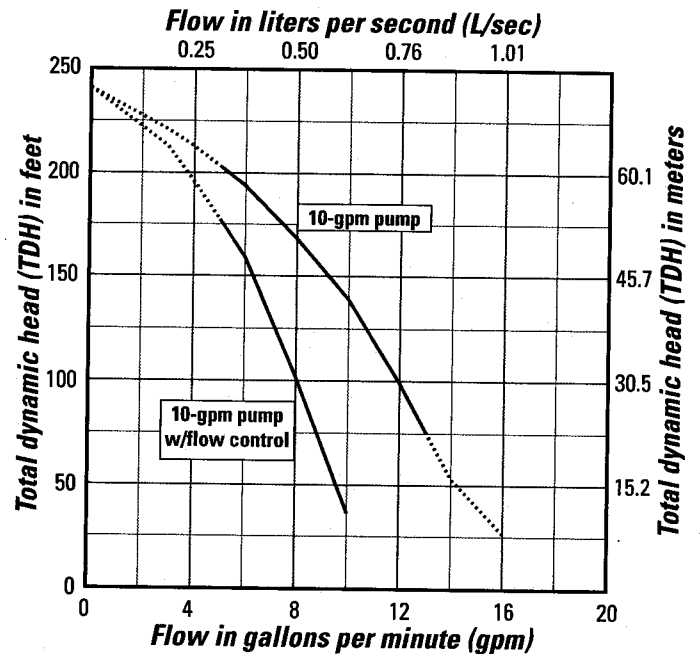
Nominal flow (gpm)	Horsepower (kW)	Design flow amps	Rated cycles per day	Minimum liquid level, in. (mm)**
10	0.5 (0.37)	12.4	300	16 (406)
30	0.5 (0.37)	11.9	300	20 (559)
50	0.5 (0.37)	12.1	300	24 (610)

\* Discharge is female NPT threaded, U.S. nominal size, to accommodate Orenco® discharge hose and valve assemblies. Consult your Orenco Distributor about fittings to connect discharge assemblies to metric-sized piping.

\*\* Minimum liquid level is for single pumps when installed in an Orenco Biotube® EasyPak™ Pump Vault.

## Pump Curves

Pump curves, such as those shown here, can help you determine the best pump for your system. Pump curves show the relationship between flow (gpm) and pressure (TDH), providing a graphical representation of a pump's optimal performance range. Pumps perform best at their *nominal flow rate*, measured in gpm.



# Biotube® EasyPak™ (continued)

## Control Panel (Demand Dose)

Orengo's EasyPak® demand dose control panels are specifically engineered for the EasyPak pump package and are ideal for applications such as demand dosing from a pump tank into a conventional gravity drainfield.

### Materials of Construction

Enclosure	UV-resistant fiberglass, UL Type 4X
Hinges	Stainless steel

### Dimensions, in. (mm)

A - Height	11.5 (290)
B - Width	9.5 (240)
C - Depth	5.4 (135)

### Specifications

Panel ratings	120 V, 3/4 hp (0.56 kW), 14 A, single phase, 60 Hz
1. Motor-start contactor	16 FLA, 1 hp (0.75 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA)
2. Circuit breakers	120 V, 10 A, OFF/ON switch, Single pole
3. Toggle switch	Single-pole, double-throw HOA switch, 20 A
4. Audio alarm	95 dB at 24 in. (600 mm), warble-tone sound, UL Type 4X
5. Audio alarm silence relay	120 V, automatic reset, DIN rail mount
6. Visual alarm	7/8-in. (22-mm) diameter red lens, "Push-to-silence", 120 V LED, UL Type 4X

## Control Panel (Timed Dose)

Orengo's EasyPak timed dose control panels are specifically engineered for the EasyPak pump package and are ideal for applications such as timed dosing from a pump tank into a pressurized drainfield or mound. Analog or digital timers are available.

### Materials of Construction

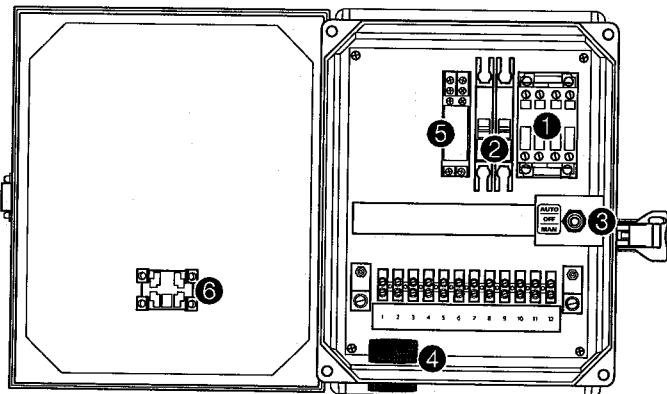
Enclosure	UV-resistant fiberglass, UL Type 4X
Hinges	Stainless steel

### Dimensions, in. (mm)

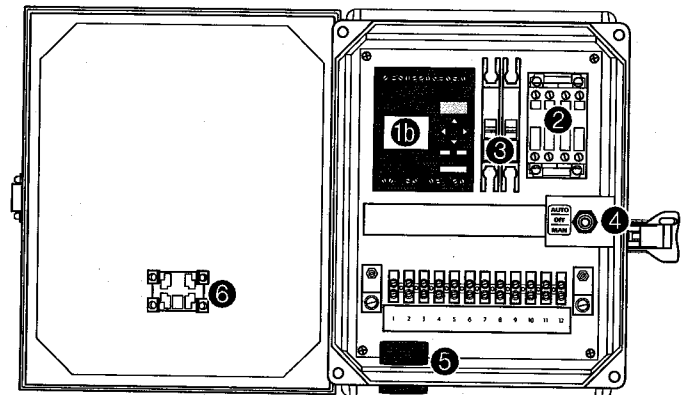
A - Height	11.5 (290)
B - Width	9.5 (240)
C - Depth	5.4 (135)

### Specifications

Panel ratings	120 V, 3/4 hp (0.56 kW), 14 A, single phase, 60 Hz
Dual-mode	Programmable for timed- or demand-dosing (digital timed-dosing panels only)
1a. Analog timer	120 V, repeat cycle from 0.05 seconds to 30 hours. Separate variable controls for OFF and ON time periods
1b. Digital timer	120-V programmable logic unit with built-in LCD screen and programming keys. Provides control functions and timing for panel operation
2. Motor-start contactor	16 FLA, 1 hp (0.75 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA)
3. Circuit breakers	120 V, 10 A, OFF/ON switch. Single pole 120 V
4. Toggle Switch	Single-pole, double-throw HOA switch, 20 A
5. Audio alarm	95 dB at 24 in. (600 mm), warble-tone sound, UL Type 4X
6. Visual alarm	7/8-in. (22-mm) diameter red lens, "Push-to-silence", 120 V LED, UL Type 4X



Control panel, demand-dose



Control panel, timed-dose (digital timer model shown)



# Biotube® EasyPak™ Pump Package

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## Installation and Maintenance Instructions

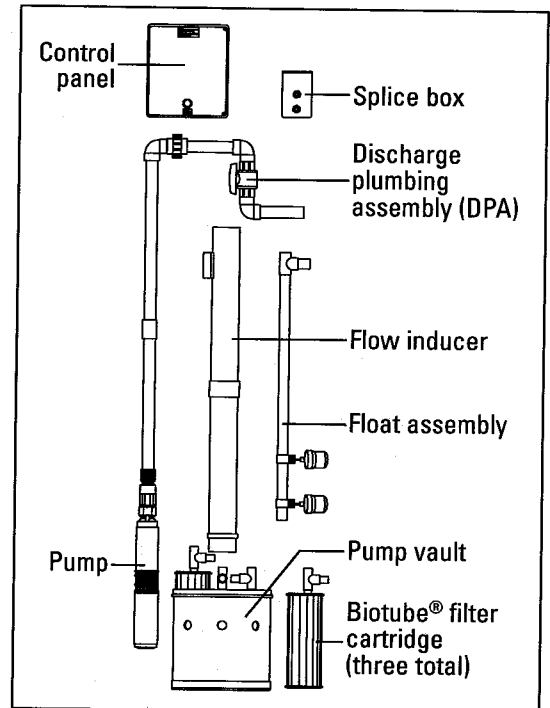
### Before You Begin

This document covers assembling and installing the Biotube® EasyPak™ Pump Package,\* as well as instructions for annual maintenance. For instructions on installing and wiring your splice box, see the Orencia® document *Splice Boxes: Installation, Operation, and Maintenance Instructions Model SB\_* (EIN-SB-SB-1). For instructions on installing and wiring your control panel, see the Orencia document *Panel Installation* (EIN-CP-GEN-1). Read and understand all of these instructions before you install your EasyPak kit.

### Installation Instructions

Before starting your installation, make sure that the EasyPak package you have matches your system's needs. Open the EasyPak box and check the contents of the box for compatibility with your system. Make sure you have the correct adapter for your discharge plumbing assembly-to-discharge-line connection. Also check that the pump included with your EasyPak package meets the head and flow requirements for your system.

You'll need to know the float heights specified for your system. If these are not specified on the system plans, contact the system's designer.



Biotube® EasyPak™ kit components

#### Step 1: Prep the Vault Assembly

**NOTE:** You will need PVC cement for these steps.

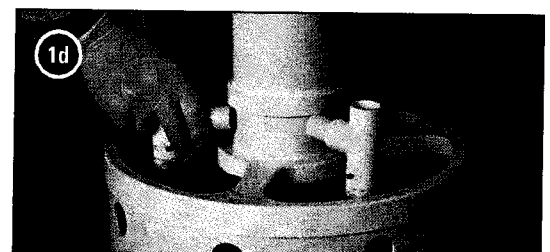
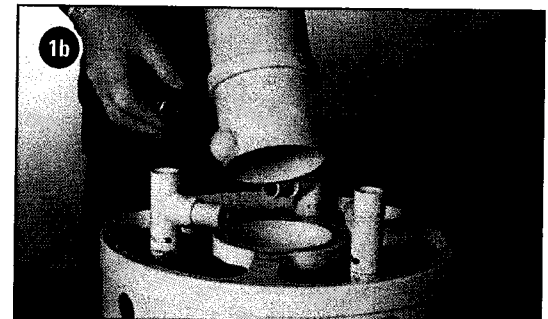
**Step 1a:** Rotate the cartridge handles on the filter cartridges away from the center hole.

**WARNING: DO NOT apply primer to the vault cap. The cap is ABS, and primer will weaken the joint.**

**Step 1b:** Glue the bottom of the flow inducer (the end with the retaining ring) into the center hole of the vault cap.

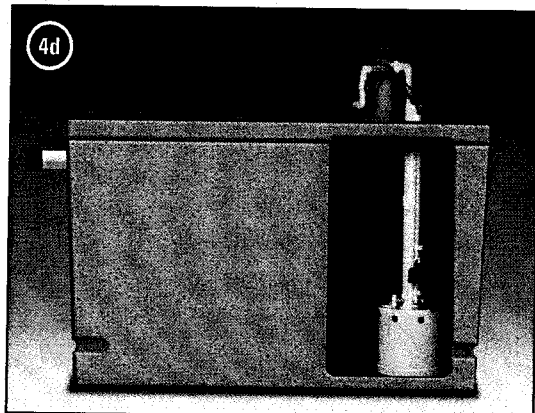
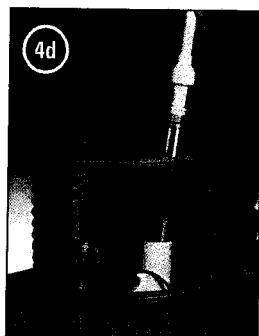
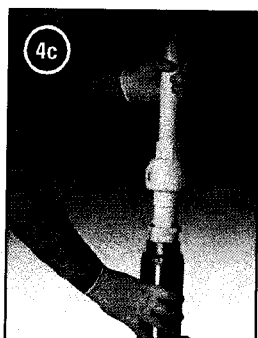
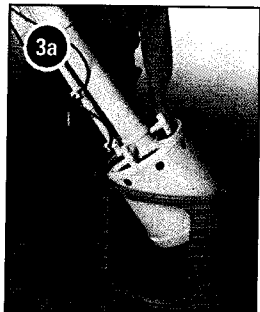
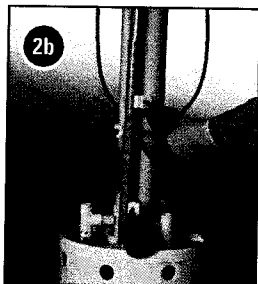
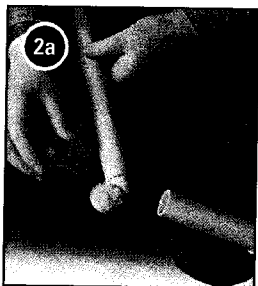
**Step 1c:** Glue the upper and lower halves of the flow inducer together. Position the upper half so the float assembly, when installed, will not interfere with removal of the filter cartridges.

**Step 1d:** Rotate the cartridge handles to their secured position, facing inwards.



\* Biotube® EasyPak™ U.S. Patents #4,439,323 and #5,492,635. Other patents pending.

## Installation and Maintenance Instructions (continued)



### Step 2: Prep the Float Assembly

*NOTE: You will need PVC cement for these steps.*

**Step 2a:** Glue the upper and lower halves of the float assembly.

**Step 2b:** Clip the float assembly into the float bracket on the flow inducer, and adjust the float levels.

### Step 3: Install the Vault Assembly

**CAUTION: Do not let the float cords fall into the tank when you install the vault assembly.**

**Step 3a:** Make sure the filter cartridge handles are secured against the flow inducer. Then use the lifting strap to gently lower the vault assembly into the tank. To help sink the vault, run clear water into the vault as you lower it.

**Step 3b:** Coil the float cords and secure them out of the way in the riser.

### Step 4: Prep and Install the Discharge Plumbing Assembly (DPA)

**CAUTION: Do not lift the pump by the cord. Doing so can damage the pump.**

*NOTE: Be sure to make any adjustments to the DPA (lengthening or shortening, if necessary) before installing the pump/DPA assembly. You will need PVC cement, Teflon® tape or paste, and pipe lubricant for these steps.*

*NOTE: In order to assure proper clearance and accessibility, 2" DPAs must exit the access riser at 90° from the splice box when an internal splice box is used.*

**Step 4a:** Glue the straight sections of the DPA together.

**Step 4b:** Apply Teflon paste or tape to the threads on the bottom of the DPA, and screw it into the top of the pump.

**Step 4c:** Connect the DPA pieces together at the union.

**Step 4d:** Lower the pump/DPA assembly into the vault assembly. Coil the pump cord and secure it in the riser. Lubricate the DPA discharge nipple and the riser discharge grommet, and run the nipple through the grommet.

**CAUTION: If electrical connections are not immediately made, be sure that the pump and float cords are secured in the riser, not hanging in the tank, to prevent water from wicking up the cords and damaging components.**

### Step 5: Install the Splice Box

For information on installing the splice box, see *Splice Boxes: Installation, Operation, and Maintenance Instructions Model SB\_ (EIN-SB-SB-1)*.\*

### Step 6: Install and Wire the Control Panel

For information on installing and wiring the control panel, see *Panel Installation (EIN-CP-GEN-1)*.\*

\* These documents are included with the components to which they refer. You can also download them from Orenco's Document Library at [www.orenco.com](http://www.orenco.com).

# Installation and Maintenance Instructions (continued)

## Maintenance Instructions

The EasyPak™ Pump Package should be inspected whenever the septic tank is pumped or the system is serviced, to make sure it's functioning properly and to clean the Biotube® filter cartridges.

### Step 1: Remove the Float Tree, Pump/DPA, and Vault Assembly

*NOTE: Place components on a waterproof plastic tarp during servicing.*

**Step 1a:** Unbolt the lid from the pump tank and the septic tank. Set the lids and bolts aside.

**WARNING: Failure to turn off power can result in injury and death!**

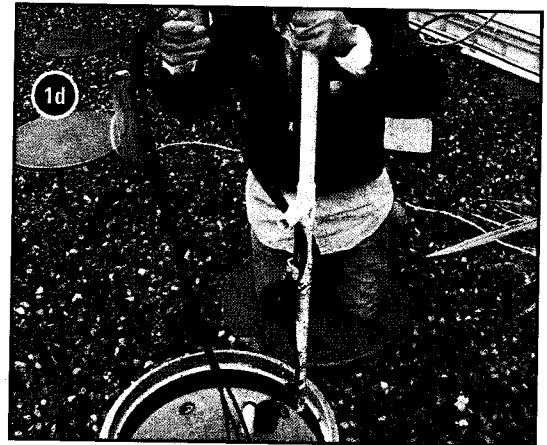
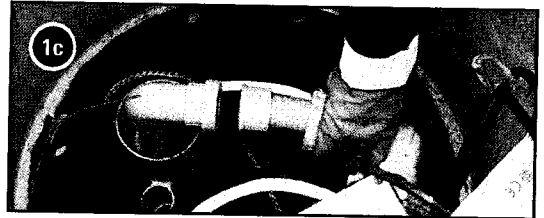
**Step 1b:** Turn off system power at the control panel by flipping the control and pump circuit breakers to the "OFF" position.

**CAUTION: Do not lift the pump by the power cord.**

**Step 1c:** Close the ball valve, and unscrew the union on the DPA. Remove the pump/DPA assembly from the vault.

**Step 1d:** Remove the float assembly from the flow inducer.

**Step 1e:** Remove the vault from the tank by the lifting strap. The vault is heavy. Use proper lifting techniques and equipment when lifting the vault.



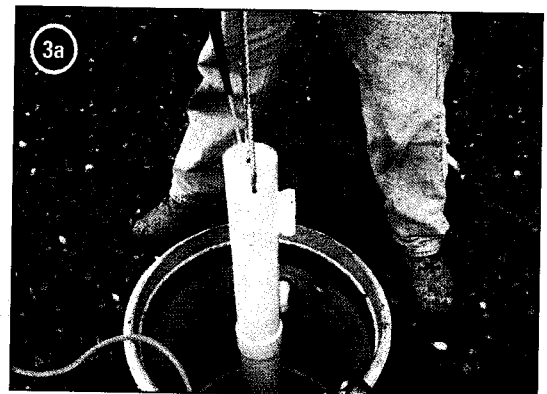
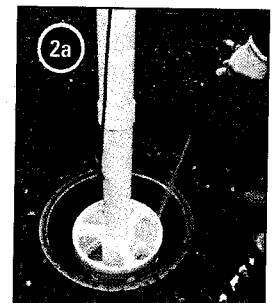
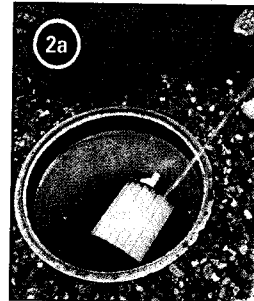
### Step 2: Clean the Components and Splice Box

**Step 2a:** Remove the filter cartridges from the vault assembly. Wash the buildup on the cartridges into the septic tank. Wash any buildup on the inside of the vault assembly into the septic tank as well.

*Note: An Orenco riser grate (shown) provides a handy surface for cleaning components.*

**Step 2b:** Remove and clean the outer screen on the pump. Inspect the inner screen on the pump, and wash it off if needed. Immediately reinstall the outer screen on the pump when finished.

**Step 2c:** Unfasten the splice box lid and check it for water. Remove any standing water from the splice box with a turkey baster or sponge. Replace the splice box lid and screw it back down.



### Step 3: Reinstall the Vault Assembly, Float Tree, and Pump/DPA

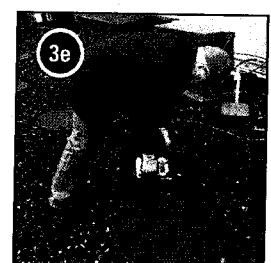
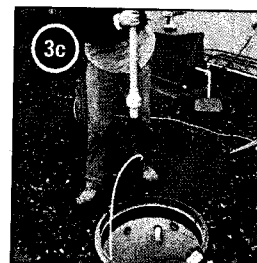
**Step 3a:** Place the filter cartridges back in the vault assembly and secure them; then lower the vault into the tank. To help sink the vault, run clear water into the vault as you lower it to the tank bottom.

**Step 3b:** Reconnect the float tree to the float tree bracket.

**Step 3c:** Lower the pump/DPA assembly into the vault, reconnect the union on the DPA, and open the ball valve on the DPA.

**Step 3d:** Flip the control and pump circuit breakers back to the "ON" position.

**Step 3e:** Bolt down the pump tank lid and septic tank lid when you are finished.



### Step 4: Record Inspection and Maintenance Activity

Record your inspection results and any maintenance activity.



REDESIGN JULY 17, 2014

**APPENDIX G**

**WATER-TIGHTNESS  
CERTIFICATION  
OF SEWAGE TANKS FORM  
(BLANK)**

REDESIGN JULY 17, 2014

**APPENDIX I**

**ASSESSOR'S INFO ON NEW TAX  
PARCEL NUMBER**

PROPERTY 50167  
 Legal Description  
 BENNETT HILL LOT 64-BLK 4

R RES 12/15/2009

OWNER ID%: DANTHIA E & DOUGLAS L LOEWEL  
 429286- 2932 BIRCHWOOD AVE  
 100.00% BELLINGHAM, WA 98226-1448

TAX AREA: 0100

PROVEMENTS AND MARKET VALUE = 18800  
 ROYALTY LOSS =  
 ROZETTABLE = 18800

Ref ID1: 380223488400  
 380223488490000

117864

Daniel A & Ashley M  
 Welch

SITUS 3923 BIRCHWOOD AVE BELLINGHAM, WA 2920

UTILITIES  
 TOPOGRAPHY  
 ROAD ACCESS  
 ZONING  
 NEXT REASON  
 REMARKS

LAST APPR. MG  
 LAST APPR. YR  
 LAST INSP. DATE  
 NEXT INSP. DATE

SILK PURSE SHORT PLAT LOT 2 AS RECAF 2120000323

Assessor's Contact:  
 Tim Kennedy  
 Ext: 50378

ISSUED PERMIT TO REPAIR STAIRS PERMITS

SAVED PRICE GRANTOR DEED INFO  
 04/02/2010 295,000 MICHAEL R ABBE //  
 04/29/2002 130,000 JOHN D & SALLY MC //

Description	Area	Volume	Year	Value	Ratio	Code	Notes
A MA Main Area 1	912.0	100	81.02	09828	1928	AVG	74,703 89% 120%
B Porch 1 Porch Enclosed	132.0	100	50.52	01928	1928	AVG	5,537 89% 120%
C STOR ADDNS-Storage Bldg	864.0	100	81.02	01928	2003	AVG	9,704 100% 75% 120%
D Porch 1 Porch Wood	46.0	100	43.78	01928	1928	AVG	1,441 89% 120%
1 1STY GARAGE-STORAGE-NEV. REMODEL YEAR:2003	1,956.0	(5-1928)	HomeSite: N	81,365	(Flat Value)	Living Area: 914	

Item	Description	Quantity	Unit	Value
1	RES 2 BDRM	1112	3	SPECIAL 1112N LOT
				80,000 1.00 0.84 F
				74,200
				74,200
				18800

21711

PROPERTY 50167  
 Legal Description  
 BENNETT HILL LOT 54 BLK 1

RES 12/15/2009  
 OWNER ID#:  
 479286  
 100.00%

CYNTHIA E & DOUGLAS L LOEWEN  
 2932 BIRCHWOOD AVE  
 BELLINGHAM, WA 98225-1448

TAX AREA: 0100

IMPROVEMENTS  
 LAND MARKET + 5641  
 MARKET VALUE =  
 PRODUCTIVITY LOSS - 1296  
 SUBTOTAL =  
 FROZEN  
 TAXABLE = 2966

ACRES: 0.41  
 APPR VAL METHOD: Cost

481484

Ref ID: 38023488499-  
 380234884990000

SITUS 2932 BIRCHWOOD AVE BELLINGHAM, WA

UTILITIES  
 TOPOGRAPHY  
 ROAD ACCESS  
 ZONING  
 NEXT REASON

LAST APPR. MG  
 LAST APPR. YR  
 LAST INSP. DATE 05/11/2009  
 NEXT INSP. DATE

ZONE1

SILK PURSE SHORT PLAT LOT 1 AS REC AF 2120803323



Tim Kennedy  
 Ext: 50378

ISSUED PERMITS PERMITS ARE NOT PERMITTED

SALE PRICE GRANTOR  
 04/02/2010 295,000 MICHAEL RABBE //  
 04/29/2002 130,000 JOHN D & SALLY MC //

LINE	DESCRIPTION	UNIT	PRICE	AREA	PERCENT	AVG	PERCENT	AVG	PERCENT	AVG	PERCENT	AVG	PERCENT	AVG	PERCENT	AVG	PERCENT	AVG	PERCENT			
1	1 STY FAIR++		81.02	0 1928	1928	AVG	74,703	69%	120%	0.83	74,703	69%	120%	0.83	74,703	69%	120%	0.83	74,703	69%	120%	
B	Main Area 1		50.52	0 1928	1928	AVG	5,537	69%	120%	0.83	5,537	69%	120%	0.83	5,537	69%	120%	0.83	5,537	69%	120%	
C	Porch 1 Enclosed		13.73	0 1928	2003	AVG	9,704	100%	75%	0.90	9,704	100%	75%	0.90	9,704	100%	75%	0.90	9,704	100%	75%	
D	STOR ADDNS-Storage Bldg		43.78	0 1928	1928	AVG	1,441	69%	120%	0.83	1,441	69%	120%	0.83	1,441	69%	120%	0.83	1,441	69%	120%	
1	1 STY		1,955.0	(E1828)	Homeotic	N	91,385	(Flat Vels)	Living Area:	912	91,385	(Flat Vels)	Living Area:	912	91,385	(Flat Vels)	Living Area:	912	91,385	(Flat Vels)	Living Area:	912
GARAGE+STORAGE-NEV. REMODEL YEAR:2003																						

LINE	DESCRIPTION	UNIT	PRICE	AREA	PERCENT	AVG	PERCENT	AVG	PERCENT	AVG	PERCENT	AVG	PERCENT	AVG	PERCENT	AVG	PERCENT	AVG	PERCENT			
1	RES 2 BDRM		1112	3	SPECIAL	1112 N	LOT	6000	80,000	1.00	0.94	F	25,200	25,200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

56400



REDESIGN JULY 17, 2014

**APPENDIX J**

**EASEMENT AREA DESCRIPTION  
AND EXHIBIT**

# REDESIGN JULY 17, 2014



1313 E. MAPLE ST. #201  
BELLINGHAM, WA 98225  
PHONE: (360) 671-8200  
FAX: (360) 738-9367  
www.ayersconsulting.com

## EASEMENT AREA DESCRIPTION

Douglas and Cynthia Loewen

August 16, 2012

Beginning at the Southeast Corner of Lot 2, "Silk Purse Short Plat", in a portion of the Northeast Quarter of said Section 23, Township 38 North, Range 2 East, W.M. and the true point of beginning for this easement area:

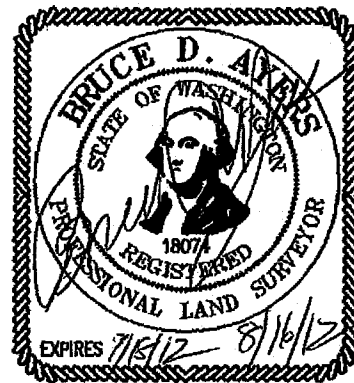
Thence South  $89^{\circ}57'55''$  West, for a distance of 30.00 feet to the Southwest corner of said Lot 2; Thence North  $00^{\circ}00'36''$  West, for a distance of 257.21 feet to the Northeast Corner of Lot 1 of said "Silk Purse Short Plat"; Thence extending the North line of said Lot 1 North  $89^{\circ}57'55''$  East for a distance of 30.00 feet to a point on the east line of said Lot 2; Thence along said East line South  $00^{\circ}00'36''$  East for a distance of 257.21 feet to the point of beginning.

Containing 7,716 Square Feet more or less.

**TOGETHER WITH AND SUBJECT TO** all other Conditions and Stipulations, General and Specific Exceptions, as well as Easements, Covenants, Rights and Restrictions of record.

**BASIS OF BEARING:** Lots 1 and 2 "Silk Purse Short Plat".

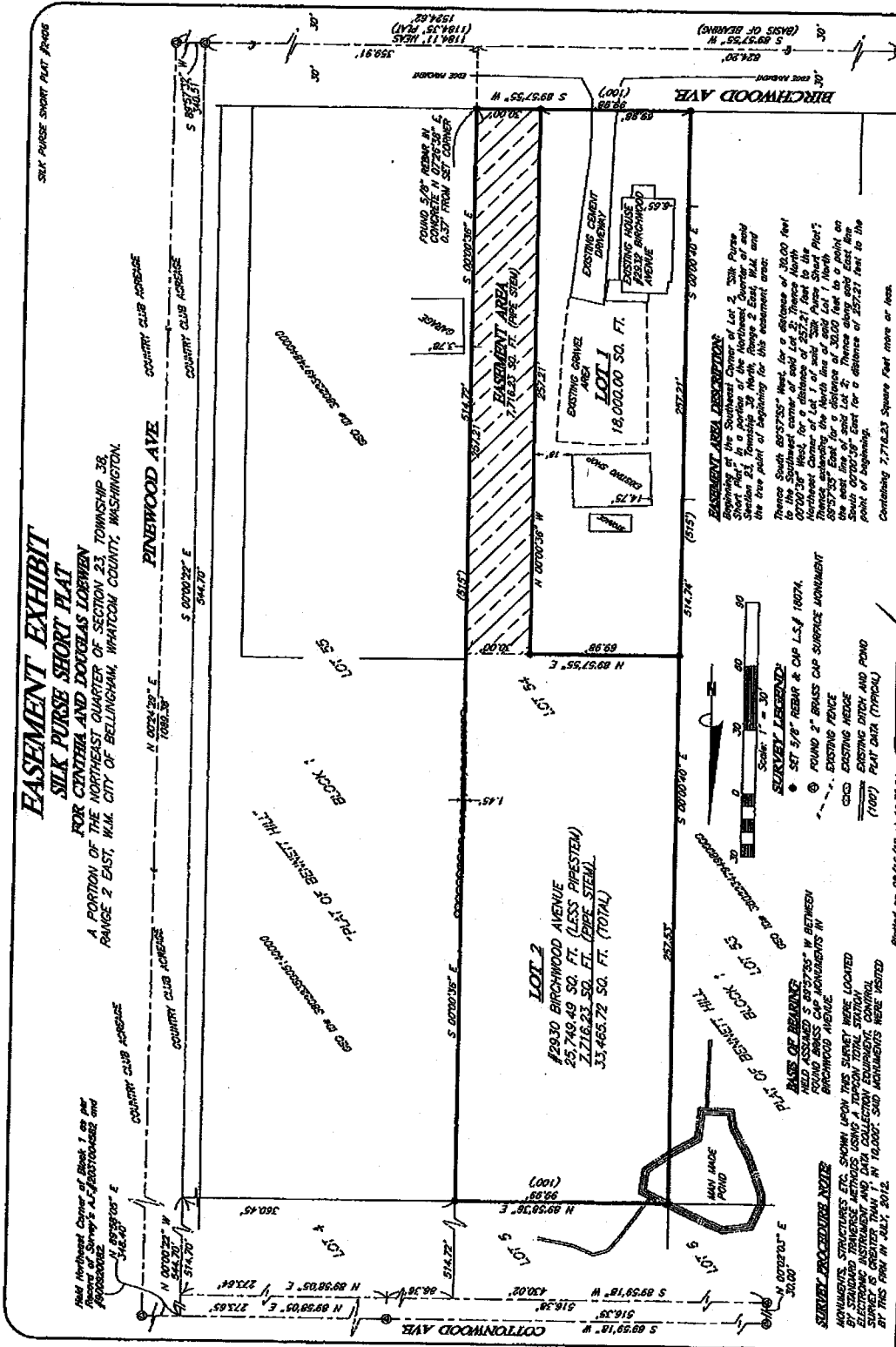
**AUTHOR'S NOTE:** The above easement descriptions were prepared at the specific request of the client. The above descriptions are not intended to be complete as to all easements, restrictions and reservations of record that may exist for the subject parcel.



# REDESIGN JULY 17, 2014

## EASEMENT EXHIBIT

**SILK PURSE SHORT PLAT**  
 FOR CYNTHIA AND DOUGLAS LOEWEY  
 A PORTION OF THE NORTHEAST QUARTER OF SECTION 23,  
 TOWNSHIP 38, RANGE 2 EAST, W.M. CITY OF BELLINGHAM,  
 WHATCOM COUNTY, WASHINGTON.



**SURVEYORS CERTIFICATE**  
 THE MAP CURRENTLY REPRESENTS A SURVEY MADE BY ME  
 AND DOUGLAS LOEWEY IN AUGUST 2012.

*Eric Stehl*  
 ERIC STEHL, SURVEYOR  
 1000 1/2 AVENUE, SUITE 100  
 BELLINGHAM, WA 98225  
 PH: 360-871-8800 FAX: 360-798-0887

**AYER'S CONSULTING, LLC**  
 1000 1/2 AVENUE, SUITE 100  
 BELLINGHAM, WA 98225  
 PH: 360-871-8800 FAX: 360-798-0887

**EASEMENT EXHIBIT**  
 SILK PURSE SHORT PLAT  
 FOR CYNTHIA AND DOUGLAS LOEWEY  
 A PORTION OF THE NORTHEAST QUARTER OF SECTION 23  
 TOWNSHIP 38, RANGE 2 EAST, W.M. CITY OF BELLINGHAM,  
 WHATCOM COUNTY, WASHINGTON.

DRAWN: D.L.A. DATE: 08/06/12 SCALE: N.T.S.  
 C.M.D.: S.J.A. SHEET: 2 OF 2 JOB NO. 11016

### Manufacturers of Registered Category 3 Proprietary On-site Treatment Products

Manufacturer/Contact Information	Product Name/Model	Rated Capacity (persons or uses/day)	Treatment Process
<p>Sun-Mar Corporation                      5370 South Service Road                      Burlington, Ontario, Canada                      L7L 5L1</p> <p>Tel: (800) 461-2461                      Tel: (905) 332-1314                      Fax: (905) 332-1315                      E-mail: <a href="mailto:compost@sun-mar.com">compost@sun-mar.com</a>                      Web: <a href="http://www.sun-mar.com">http://www.sun-mar.com</a></p>	<p>Sun-Mar Composting Toilet                      Excel                      Centrex 2000 A/F                      Centrex 2000 A/F AC/DC                      Centrex 3000 A/F                      Centrex 3000 A/F AC/DC                      Compact                      Spacesaver                      Sun-Mar Mobile                      Excel NE</p>	<p>3-person residential                      4-person residential                      3-person residential                      5-person residential                      4-person-residential                      1-person residential                      1-person residential                      1-person residential                      2-person residential</p>	<p>Composting Toilet</p>

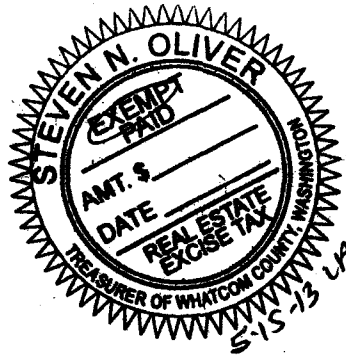


2130502115

Page: 1 of 4  
5/15/2013 11:17 AM  
AMEA \$75.00  
Whatcom County, WA

Request of: WHATCOM LAND TITLE

After Recording Return To:  
Timothy C. Potts  
220 W. Champion Street, # 200  
Bellingham, WA 98225



W-115797  
4pgs.

### AMENDMENT OF EASEMENT

THIS AMENDMENT OF EASEMENT is dated this 14<sup>th</sup> day of May 2013 by Douglas L. Loewen and Cynthia E. Camlin, husband and wife (collectively the "Owners"), who are the owners of both the Benefited and Burdened Property depicted and described in Attached Exhibits A.

#### RECITALS

- A. Each of Lot 1 (the "Benefited Lot") and Lot 2 (the "Burdened Lot") are legally described in attached Exhibit A, and depicted on attached Exhibit B. Each of Lots 1 and 2 benefit from an access and utilities area depicted on Exhibit B (the "Original Easement Area") that is legally described in Exhibit A. This easement also burdens Lot 2.
- B. The "Easement Exhibit", a copy of which is Exhibit B, created the subject easement (the "Original Easement") and was recorded on September 19, 2012 under Whatcom County Auditor's File # 2120902143, a copy of which is shown on attached Exhibit B.
- C. The Original Easement is thirty (30) feet wide. The Owners wish to reduce it to a fifteen (15) foot wide easement by removing the outside fifteen (15) feet from the Easement Area.
- D. This "Amendment of Easement" (the "Amended Easement") is being executed and recorded to convert the Original Easement area to a fifteen foot wide easement area.

#### AMENDMENT

By their signatures below, the undersigned Owners of both of the Burdened and Benefited Lots hereby amend the Original Easement as follows:

**Redesign**

8/1/2014 - Mmm

**Amendment of Easement (page 2 of 2 excluding exhibits):**

- 1) The Easement Area as adjusted and in effect upon recording of this Amendment to Easement is described on Attached Exhibit B. (the "Amended Easement Area").
- 2) The fifteen (15) foot wide portion of the Original Easement area not described in Section 1 immediately above is hereby removed from and is no longer burdened by the subject easement.
  
- 3) All other provisions of the Original Easement, other than its width beyond fifteen (15) feet, shall continue in full force and effect hereafter.

OWNERS:

*Douglas L. Loewen*  
Douglas L. Loewen

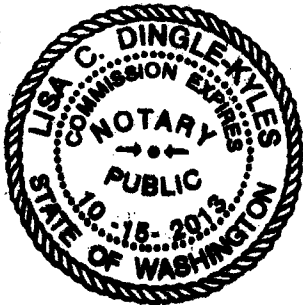
*Cynthia E. Camlin*  
Cynthia E. Camlin

STATE OF WASHINGTON            )  
                                                  )  
COUNTY OF WHATCOM         )    ss.

On this 15<sup>th</sup> day of May, 2013, before my a Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared Douglas L. Loewen and Cynthia E. Camlin to me known to be the individuals who executed the foregoing instrument for themselves individually, and acknowledged the said instrument to be the free and voluntary act and deed of said individuals, for the uses and purposes therein mentioned, and on oath stated that they were authorized to execute the said instrument for themselves.

WITNESS my hand and official seal hereto affixed the day and year first written above.

SEAL:



*Lisa C Dingle-Kyles*  
Print Name: *Lisa C Dingle-Kyles*  
Notary in and for the State of Washington  
Residing at: *Bellingham*  
My commission expires: *10-15-13*

**Redesign**

*8/1/2014 - MAM*

Exhibit A

**EASEMENT AREA DESCRIPTION** (Removing Easterly 15'  
of a 30' Easement)

The Westerly Fifteen (15) Feet of the Following Described Area:

Beginning at the Southeast Corner of Lot 2, "Silk Purse Short Plat", in a portion of the Northeast Quarter of said Section 23, Township 38 North, Range 2 East, W.M. and the true point of beginning for this easement area:

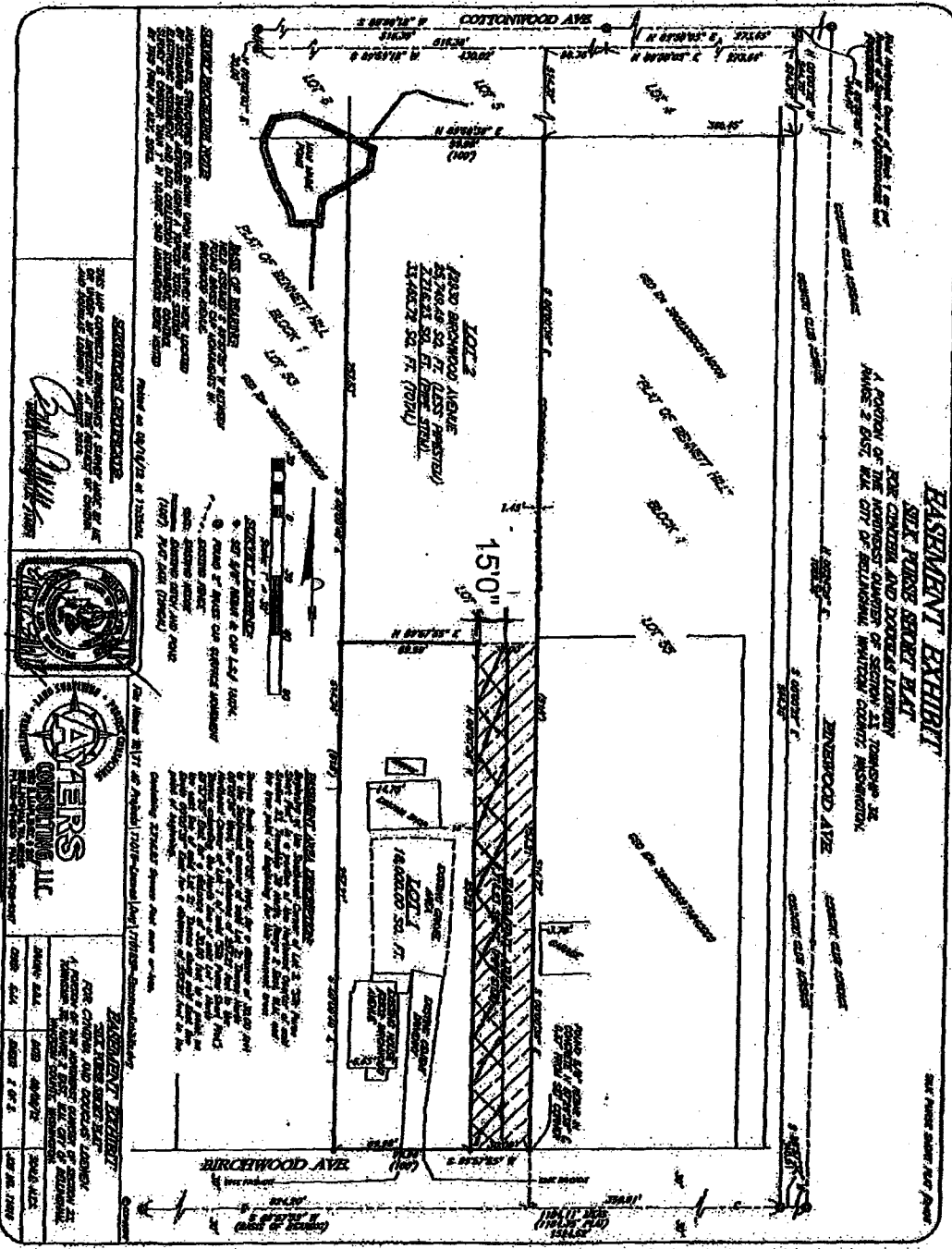
Thence South  $89^{\circ}57'55''$  West, for a distance of 30.00 feet to the Southwest corner of said Lot 2; Thence North  $00^{\circ}00'36''$  West, for a distance of 257.21 feet to the Northeast Corner of Lot 1 of said "Silk Purse Short Plat"; Thence extending the North line of said Lot 1 North  $89^{\circ}57'55''$  East for a distance of 30.00 feet to a point on the east line of said Lot 2; Thence along said East line South  $00^{\circ}00'36''$  East for a distance of 257.21 feet to the point of beginning.

Containing 3858 Square Feet More or Less

Redesign

8/1/2014 MMY

Exhibit B



Amended Easement Area

Redesign  
8/1/2014 MMS

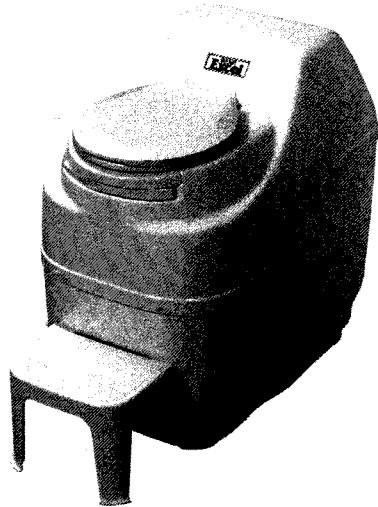


# Sun-Mar

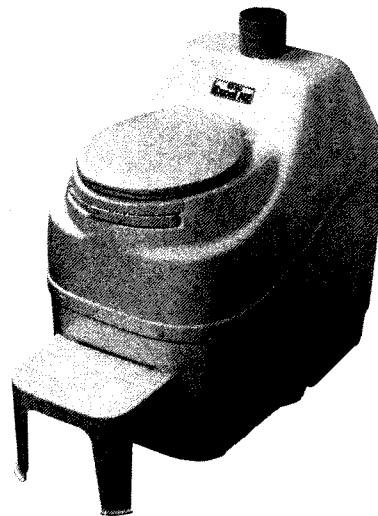
*Global Composting Experts*

Serial No. \_\_\_\_\_

## EXCEL OWNER'S MANUAL



**EXCEL**



**EXCEL NE**



Certified to NSF/ANSI Standard 41

Standard 41

Certified for liquid containment,  
odours, and solid end products in both res-  
idential and cottage use

### **RATED CAPACITY**

#### **Residential & Continuous Use**

EXCEL 2 Adults or a family of 3 or

EXCLE NE Units; 3 Adults or families of 5

#### **Weekend & Vacation Use**

EXCEL 6 Adults or families of 8 or

EXCEL NE Units; 5 Adults or families of 7

**Models for which the manual applies:**

CSEL-01001	Excel Bone 115w
CSEL-01001W	Excel White 115w
CSEL-01001-230	Excel Bone 230w
CSEL-01001W-230	Excel White 230w
CSNL-01101B	Excel NE Bone
CSNL-01101W	Excel NE White



Metal tools will damage the toilet.

# OWNER'S MANUAL

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<b>How Composting Works</b>	<b>2</b>	<b>Spring Time Start Up</b>	<b>12</b>
The Excel	3	<b>Winter Use</b>	<b>12</b>
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<b>Ongoing Toilet Maintenance</b>	<b>11</b>	<b>Excel Specifications</b>	<b>21</b>

## **HOW COMPOSTING WORKS**

Composting is the natural process of decomposition that can be helped along by providing the ideal conditions to help your composting toilet work at peak performance. The ideal conditions for decomposition to occur depend on several factors: oxygen, temperature, moisture content, and the carbon/nitrogen ratio.

### **Oxygen**

Oxygen is very important in composting. Your compost should be aerated in order to encourage aerobic bacteria growth. Aerobic bacteria are bacteria that grow and live in the presence of oxygen and are very efficient in breaking down waste. To aerate the compost and encourage the growth of these bacteria, the compost drum should be turned three times per week (6 complete turns of the drum).

### **Temperature**

Temperature is another important consideration when composting. Optimal composting temperatures range between 70-100 ° F (21-38 ° C). If the compost becomes too cold (below 55 ° F or 13 ° C), decomposition will slow significantly or stop completely. If you are in an area that experiences temperatures below 55 ° F (13 ° C) additional heat is required if the composting toilet will be used continually or frequently. If used for intermittent cottage application (3 - 4 weekends throughout the cold season) no additional heat is required. The unit will function as a holding tank until the temperature warms up.

### **Moisture**

Moisture is necessary to achieve a good compost. Your compost should always be damp, like your garden after you have watered it. This moisture allows the bacteria to travel around in the compost so that they can speed decomposition by digesting the waste. If the compost is too dry, the bacteria cannot survive and decomposition will slow or cease. When adding water to the compost, you are aiming for a damp compost, not saturated. Too much liquid in the compost limits the amount of oxygen that aerobic bacteria require to survive. If normal urination is not enough to maintain the correct moisture level in the compost, we encourage you to add additional water to the drum.

### **Carbon/Nitrogen Ratio**

Almost all organic material will compost. The proper bulking material and human waste should be added to the composting toilet. In order to maintain a good balance between carbon-rich materials (SUN-MAR Compost Sure Green) and nitrogen-rich human waste only.

## The EXCEL

The key to the success of the EXCEL lies in its three chamber design. Each of the three chambers; patented Bio-drum, compost finishing drawer, and evaporation chamber, have their own independent environments for optimum efficiency.

The EXCEL electric version has a thermostatically controlled heater and fan assembly to help evaporate liquid and should be used where there is a constant electrical supply. The EXCEL NE (non-electric) version is for use where there is no continuous electric supply. The EXCEL NE has no fan or heater. Odorless operation is achieved by a 4" vent which acts like a chimney creating a partial vacuum within the unit.

### The patented Bio-Drum

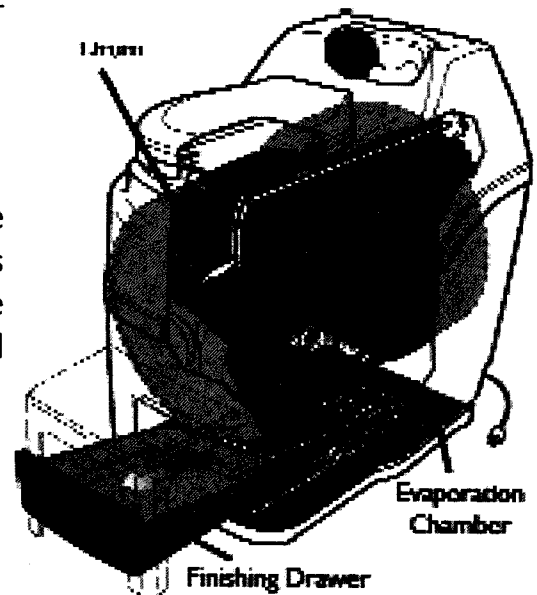
Unique to Sun-Mar, the patented bio-drum provides the necessary mass to maintain good compost and allows easy aeration of the compost by simply turning the drum. Excess liquid will exit through a screen in the bottom of the drum into the evaporation chamber. Mixing the Bio-drum is accomplished by rotating the handle in a clock-wise direction. Compost is removed from the drum by pulling out the white drum lock button (under the footrest) and rotating the handle in a counter clock-wise direction.

### The Compost Finishing Drawer

The compost finishing drawer sits in an opening under the footrest. Compost in the drawer is isolated from mixing with new waste while resting for 4 weeks so that it can finish composting.

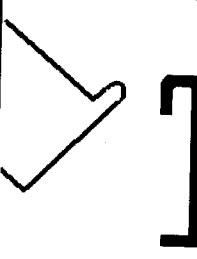
### The Evaporation Chamber

The evaporation chamber is the floor of the unit under the compost finishing drawer. This is the area where any excess liquid will gather for evaporation. A safety drain exits from the back of the composting toilet which will drain over-flow liquid that is not evaporated to an approved facility.



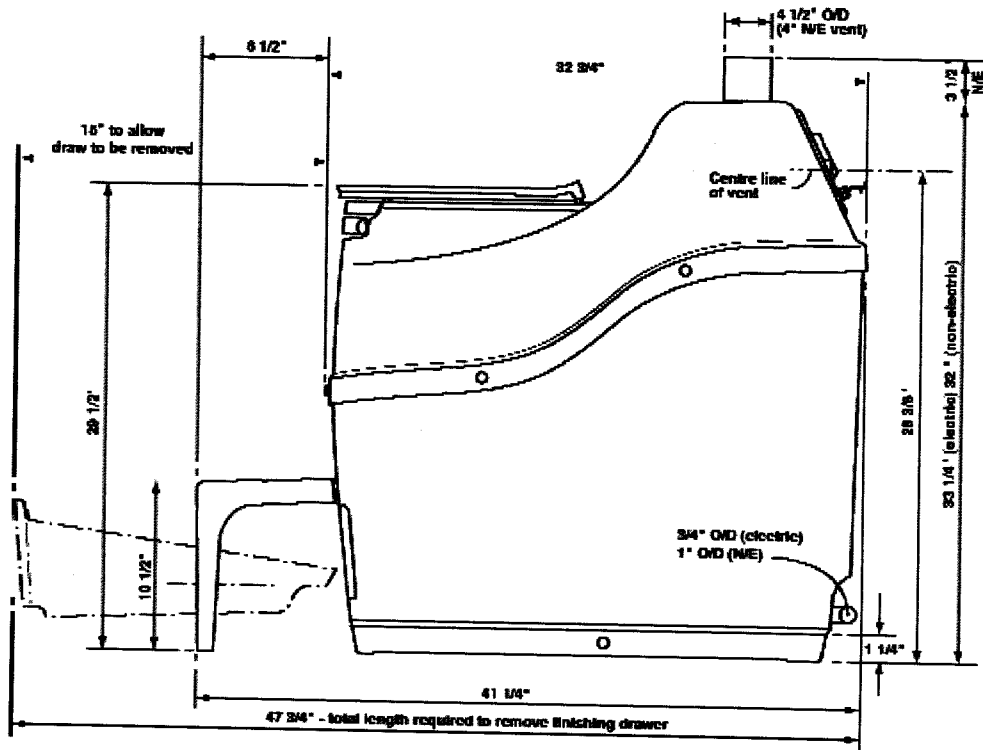
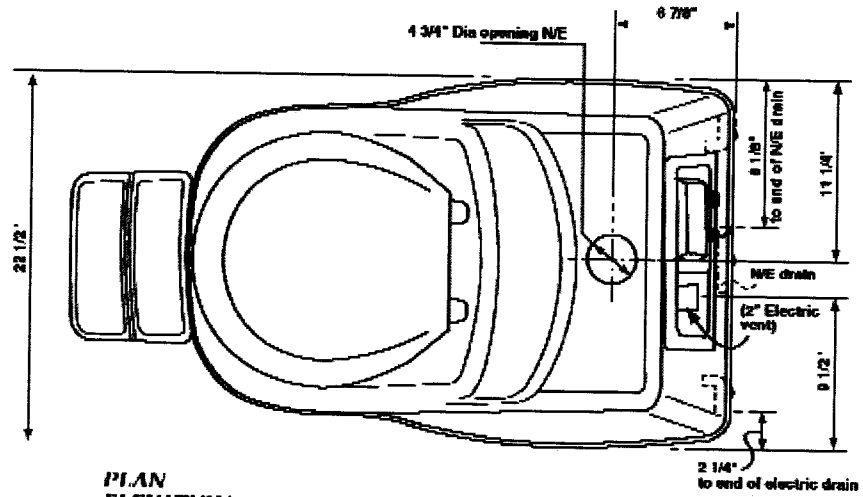
## Inspection

We recommend an inspection of the EXCEL prior to installation and to make sure you have received all of the parts required as listed below.

<p><b>Inspecting the unit for damage</b></p>	<p><b>i) If there is any visible damage to the carton-</b> The contents of the carton should be inspected before signing the bill of lading. Damaged units should be refused. Call Sun-Mar immediately.</p> <p><b>ii) If the shipper has left-</b> Report the damage immediately to the transport company and call Sun-Mar.</p> <p><b>iii) Soon after delivery, remove the EXCEL carefully from the carton-</b> If there is hidden damage, or for any service Questions, contact Sun-Mar to determine the best course of action.</p>	
<p><b>What's in the Box</b></p>	<p>1- Owners Manual 1- Warranty Card 1- Excel Hardware Kit 1- Footrest 1- 1" x 8'4" Drain Hose (NE) 1- Compost Sure Green</p>	<p>1- 1 1/2" Roof Flashing (Electric)    1- 4" Roof Flashing (NE) 1- Bowl Liner    1- 6" Diffusor (NE) 1- Rake    3- 4"x31" Vent Pipes (NE) 1- 2" Pipe Insulation (Electric) 1- 4" Diffusor (Electric) 4- 2"x31" Vent pipe (electric)</p>
<p><b>Familiarise Yourself with the EXCEL</b></p>	<p>i) Turn the drum handle clockwise to rotate the patented Bio-Drum for mixing and aeration. (The drum rotates counter-clockwise and the drum door closes). <b>This is how you will rotate the drum during regular operation.</b></p> <p>ii) Pull the drum locker button, (located under the footrest) and turn the handle counter-clockwise to simulate removal of compost. <b>This is how you will remove compost during regular operation.</b></p> <p>iii) Plug the unit's electrical cord (Electric) into a standard three-prong electrical outlet, and feel the air movement from the vent outlet at the front of the unit to ensure the vent system is working properly.</p> <p>iv) Pull out the compost finishing drawers at the bottom right of the unit. After the unit has been plugged in for ten minutes, place a hand on the floor of the evaporating chamber (the area under the finishing drawer) to check it is warm to the touch, and that the heater is working properly.</p>	
<p><b>Attaching and Detaching the footrest</b></p>	<p>The footrest attaches to the unit with the metal track above the finishing drawer opening. To attach the footrest, incline the footrest at a 45 degree angle to the floor as shown. Insert the round top edge of the track on the footrest into the round top edge of the metal track on the unit and then lower the footrest to the floor. <b>Note: Footrest must be correctly attached before stepping on it.</b></p>	

# Installation

## EXCEL and EXCEL NE ROUGH IN DIMENSIONS



SIDE

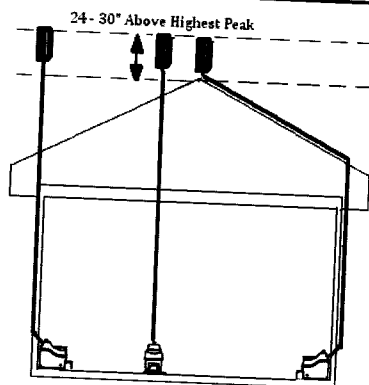
## EXCEL Electric Installation

### Space Required and other Installation Considerations

- 1) Compost will be removed from the finishing drawer. Ensure that there is at least 15" in front of the EXCEL so that the drawer may be removed from the unit.
- 2) Install the unit in a location where the safety drain can be connected if required. This drain exits from the back of the unit and must slope downward at all points.
- 3) Install in a location where the vent pipe can be attached as per the instructions listed below.
- 4) Install in a location that is not air tight.
- 5) Ensure that there is a three-pronged plug with a GFI (ground fault interrupter) installed within 5 feet of the unit.
- 6) Ensure the EXCEL is protected from precipitation.

### Vent Pipe Location

- 1) If running a vent through a wall, it should be done at a 45° angle to prevent condensation from accumulating in the vent pipe, causing a constriction. **THERE SHOULD BE NO HORIZONTAL SECTIONS OF VENT.** Venting should be installed vertically.
- 2) All vent pipe that is exposed to the outside or in a non-heated space should be insulated if using the unit during cold weather.
- 3) **INSTALL VENT SO THAT IT TERMINATES 24" - 30" ABOVE HIGHEST PEAK OF THE ROOF.**
- 4) If you will be installing venting on a steeply pitched roof where snow shear may occur; Install a heavier pipe through the roof and feed the enclosed vent through the heavier pipe. Seal between the pipes with expandable foam or other such water-tight substance. The heavier pipe should be able to withstand the weight of sliding snow.
- 5) If there is more than 36" of vent needed above the roof line to reach 24-30" above the highest peak of the roof (diffuser included in measurement), use guy wires to secure the vent above the roof.
- 6) Limit bends in the vent stack to no more than 4 that have a combined total of 180°.
- 7) The vent must be installed separately from ALL other household vents. Venting cannot be merged with other venting. Doing so will prevent the unit from operating odorlessly.
- 8) All connectors in the vent pipe should be sealed. **Use silicone caulking to seal the connection between the vent and the fan.** PVC cement may be used all other vent connections.
- 9) The diffuser should be glued vertically on to the top of the vent pipe. This assembly helps draw air up the vent pipe.



Possible venting configurations for the 2" electric vent pipe.

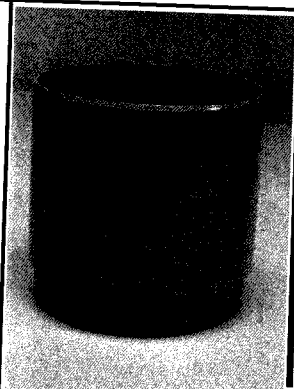
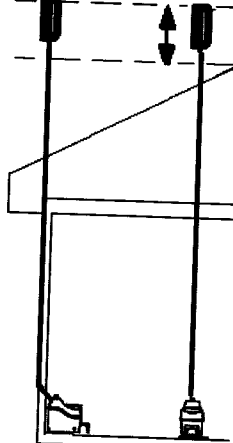


<p><b>Leading the vent through the roof</b></p>	<p>As shown in the installation, the vent stack should end about 30" above the peak of the roof so that it is less subject to downdraft. Where the pipe is taken through the roof, the roof flashing provided should be used to seal the installation. Insert the vent into the bell of the roof flashing and slide the roof flashing down until it lays evenly on the roof. Slip the upper edge or the roof flashing flange under the shingles. Outline the flashing on the roof. Raise the roof flashing and apply silicone sealant or roofing tar inside the outline. Slide the flashing back into place and firmly press onto the sealant. The flashing is properly placed when the top part of the roof flashing flange is tucked under the shingles and the lower portion is sealed on top of the shingles so that water sheds easily. Secure the flashing with corrosion resistant nails at each corner and along the sides. Any exposed nails should be sealed with silicone caulking.</p> <p>If you are in an area where snow shear is a danger, you may wish to install a heavier pipe around the vent pipe where it exits from the roof. If you do choose to do this, ensure that you seal the area between the pipes with a waterproof substance to prevent leaks.</p>	
<p><b>The Diffuser</b></p>	<p>The diffuser provided with the unit is a simple device to be installed at the top of the vent stack with the larger pipe protruding above the smaller. To install, simply glue the diffuser vertically on the topmost section of vent pipe. The diffuser design encourages updraft, and discourages wind and weather from going down the vent stack. We do not recommend installing anything else on the top of the vent as it could impede the venting. Unlike wind turbines, diffusers are less likely to freeze in winter, and are more effective in calm weather.</p>	
<p><b>Drain Installation</b></p>	<p>The safety drain should be connected as it will be required.</p> <ul style="list-style-type: none"> <li>- Remove the orange cap from one side of the overflow drain assembly.</li> <li>- Place a 1" hose clamp over the end of the drain hose that will be connected to the overflow drain assembly.</li> <li>- Push the drain hose over the ribbed end of the over-flow drain and clam with the 1" SS hose clamp.</li> <li>- Connect the 1" hose to an approved drainage facility.</li> </ul>	
<p><b>Handling Effluent</b></p>	<p>The following are possible options to take care of the liquid :</p> <ul style="list-style-type: none"> <li>- Feed into a lined pit filled with gravel and sand. Such a recycling bed also ensures a closed loop system.</li> <li>- Feed into a small cesspit or "french drain".</li> <li>- Plumb into an existing septic or holding tank line.</li> </ul> <p>Installation should be in accordance with applicable local regulations.</p>	
<p><b>Electrical Considerations</b></p>	<p>A ground fault interrupter (GFI) circuit is recommended for any unit installed in an environment where it will be exposed to moisture. This may be installed directly on the wall socket or at the circuit breaker. If you are in an area where you experience power fluctuations, you may wish to install a surge protector.</p>	

## EXCEL NE Installation

<p><b>Space Required and other Installation Considerations</b></p>	<ol style="list-style-type: none"> <li>1) Compost will be removed from the finishing drawer. Ensure that there is at least 15" in front of the EXCEL NE so that the drawer may be removed from the unit.</li> <li>2) Install the unit in a location where the safety drain can be connected. This drain exits from the back of the unit and must slope downward at all points. <b>THE DRAIN IS REQUIRED PRIOR TO OPERATION.</b></li> <li>3) Install in a location where the vent pipe can be attached as per the instructions listed below.</li> <li>4) Install in a location that is not air tight.</li> <li>5) Competing appliances (ie. wood stove) may need a air intake installed from the outdoors. The EXCEL NE has a passive vent. Competing appliances draw alot of air and may cause your composting toilet vent to draw air into the building rather than venting to the outside. A 12 volt fan will be required.</li> <li>6) Bends in the vent, installation near hills or overhanging trees may cause downdraft. A 12 volt fan may be required.</li> </ol>
<p><b>Vent Pipe Location</b></p>	<ol style="list-style-type: none"> <li>1) All vent should be vertically installed.</li> <li>2) Limit bends in the vent stack to no more than 2 - 45 ° bends. <b>THERE SHOULD BE NO HORIZONTAL SECTIONS OF VENT.</b></li> <li>3) <b>INSTALL VENT SO THAT IT TERMINATES 24" - 30" ABOVE HIGHEST PEAK OF THE ROOF.</b> If the vent is being installed on a steeply pitched roof where snow shear may occur; Install a heavier pipe through the roof and feed the enclosed vent through the heavier pipe. Seal between the pipes with expanding foam or other such water-tight material. The heavier pipe should be able to withstand the weight of sliding snow.</li> <li>4) If there is more than 36" of vent needed above the roof line to reach 24-30" above the highest peak of the roof (diffusor included in measurement), use guy wires to secure the vent above the roof.</li> <li>5) The vent must be installed separately from ALL other household vents. Venting cannot be merged with other venting. Doing so will prevent the unit from operating odorlessly.</li> <li>6) All connectors in the vent pipe should be sealed. <b>Use silicone caulking to seal the connections.</b></li> <li>7) The diffusor should be glued vertically on to the top of the vent pipe. This assembly helps draw air up the vent pipe.</li> </ol>
<p><b>Inlet Coupling</b></p>	<p>Place the vent inlet coupling into the hole for the 4" vent so that the 1" of smaller diameter pipe is protruding into the hole in the top of the unit. This is the first piece of the venting. Once you have finished assembling the vent, you should run a bead of silicone around the inlet coupling to prevent odor from escaping.</p>

24 - 30" Above Highest Peak



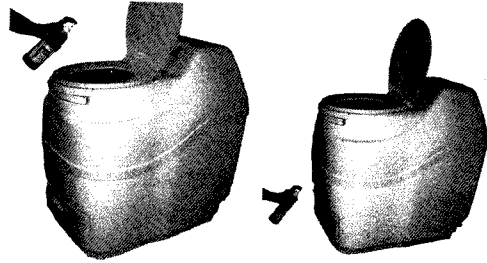
<p><b>Leading the vent through the roof</b></p>	<p>As shown in the installation, the vent stack should end about 30" above the peak of the roof so that it is less subject to down-draft. Where the pipe is taken through the roof, the roof flashing provided should be used to seal the installation. Insert the vent into the bell of the roof flashing and slide the roof flashing down until it lays evenly on the roof. Slip the upper edge or the roof flashing flange under the shingles. Outline the flashing on the roof. Raise the roof flashing and apply silicone sealant or roofing tar inside the outline. Slide the flashing back into place and firmly press onto the sealant. The flashing is properly placed when the top part of the roof flashing flange is tucked under the shingles and the lower portion is sealed on top of the shingles so that water sheds easily. Secure the flashing with corrosion resistant nails at each corner and along the sides. Any exposed nails should be sealed with silicone caulking.</p> <p>If you are in an area where snow shear is a danger, you may wish to install a heavier pipe around the vent pipe where it exits from the roof. If you do choose to do this, ensure that you seal the area between the pipes with a waterproof substance to prevent leaks.</p>	
<p><b>The Diffusor</b></p>	<p>The diffusor provided with the unit is a simple device to be installed at the top of the vent stack with the larger pipe protruding above the smaller. To install, simply glue the diffusor vertically on the topmost section of vent pipe. The diffusor design encourages updraft, and discourages wind and weather from going down the vent stack. We do not recommend installing anything else on the top of the vent as it could impede the venting. Unlike wind turbines, diffusors are less likely to freeze in winter, and are more effective in calm weather.</p>	
<p><b>Drain Installation</b></p>	<p>The safety drain should be connected as it will be required.</p> <ul style="list-style-type: none"> <li>- Remove the orange cap from one side of the overflow drain assembly.</li> <li>- Place a 1" hose clamp over the end of the drain hose that will be connected to the overflow drain assembly.</li> <li>- Push the drain hose over the ribbed end of the over-flow drain and clam with the 1" SS hose clamp</li> <li>- Connect the 1" hose to an approved drainage facility.</li> </ul>	
<p><b>Handling Effluent</b></p>	<p>The following are possible options to take care of the liquid :</p> <ul style="list-style-type: none"> <li>- Feed into a lined pit filled with gravel and sand. Such a recycling bed also ensures a closed loop system.</li> <li>- Feed into a small cesspit or "french drain".</li> <li>- Plumb into an existing septic or holding tank line.</li> </ul> <p>Installation should be in accordance with applicable local regulations.</p>	<p>All installations should conform to local regulations</p>

## Start Up and Use

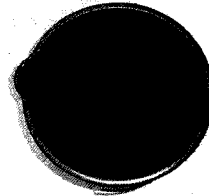
*Initially, when starting up your EXCEL, follow these steps. These steps are only used when starting up your EXCEL for the first time or when you have emptied the drum and need to re-start the compost.*

After installation is completed do the following:

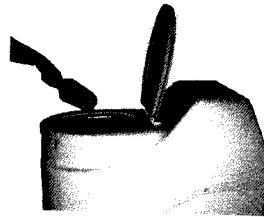
**Step 1 :** Spray Compost Quick: Remove the finishing drawer and spray the whole inner floor of the unit under the finishing drawer. Spray Compost Quick into the patented Bio-drum and the inside of the finishing drawer.



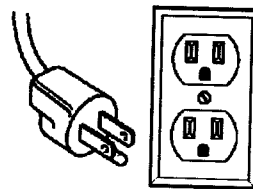
**Step 2:** Pour one half bag of Compost Sure Green into a bucket and add 2 quarts of warm water. Add 1/2 of the Microbe Mix packet to the bucket. Allow the Compost Sure Green to absorb the water (about an hour).



**Step 3:** Scoop the Compost Sure Green mixture into the patented Bio-Drum through the access door on the EXCEL. Rotate the drum to mix.



**Step 4:** If the unit is electric, plug it in to a three prong electrical outlet. The fan will run continuously 24 hours per day while the unit is being used. The opening in the drum must remain open under the waste pipe. The EXCEL is now ready for use.



When you first start up the EXCEL, it will take approximately 6 weeks at optimum temperatures (70-90 ° F) before you will have sufficient quantities of microbes in the drum to actually achieve a good compost. During this time, the contents of the patented Bio-Drum start out as Compost Sure Green and waste. Over the first 6 weeks, you will notice that the compost will hold moisture and will become more uniformly dark in colour.

During the first 6 weeks, you may notice that some Compost Sure Green has fallen through the drum screen onto the evaporation chamber to the left of the finishing drawer. This should be raked out and removed with the rake tool provided with the unit.

## Ongoing Toilet Maintenance

Once your EXCEL is installed and you have gone through the initial start-up procedure, follows the steps outlined below to keep your composting toilet working optimally.

Add one cup of Compost Sure Green per person per day of use	Even if you only use the toilet for urination then at least one cup of Compost Sure Green should be added per person per day of use. Add the Compost Sure Green through the hole under the toilet seat on the EXCEL.
Spray Compost Quick on the surface of the compost	Every second day before turning the handle, spray 3-4 sprays of Compost Quick on the surface of the compost. Compost Quick is an enzyme that will speed up the composting process.
Turn the handle clockwise every second day to mix the compost	Turn the handle in a clockwise direction to mix and aerate the compost. When mixing, ensure that the drum rotates 6 complete revolutions (36 turns of the handle).
Make sure that the opening in the drum is centered under the waste pipe.	The hole in the drum must be open under the toilet seat, ready to receive waste.
Every two weeks	Add one scoop of Microbe Mix to the patented bio-drum to 'recharge' the pile. This will help to ensure your microbe colony stays constant and healthy.
Every three months	Rake the evaporation chamber: Remove the finishing drawer. Rake any solid debris from the floor of the unit under the drawer (evaporation chamber), paying extra attention to the two back corners of the unit as this is where debris may accumulate. Remove the solid debris.
Twice per year	Clean the drum screen. Spray the drum screen with Compost Quick and let sit for 15 minutes (this will help to loosen the debris if the screen is not too encrusted). Scrub the screen vigorously with the wire brush. If brushing the screen does not clear it and liquid is still not draining through the screen, you may have to resort to having to use a screwdriver or nail to puncture each hole in the drum screen.
Periodic maintenance	Remove compost from the drum. When the drum is half full (even with the middle of the drum hub at the front of the drum) it is time to remove compost. To remove compost from the drum: 1) Remove the footrest. 2) Pull the drum lock button located below the footrest on the EXCEL. 3) While holding out the white drum lock button, turn the handle in a counter-clockwise direction for one complete revolution of the drum. the seat.

### **CAUTION**

1. Do **NOT** add or clean the toilet bowl liner with chemicals. Chemicals will kill the bacteria. **INSTEAD**, clean the bowl liner with Compost Quick.
2. Do **NOT** add plastic, glass, metal, cleaning fluids, cigarettes. Add only waste and bulking material.
3. Kitchen or garden waste are **NOT** recommended.
4. Do **NOT** add baby wipes, diapers or feminine paper as they will not compost.

## Seasonal Use and Spring time Start Up

### Empty Compost from Last Season

Before your first use of the unit, extract compost from the drum by releasing the drum locker (located on the handle side of the unit), then rotate the handle counter-clockwise giving the drum one complete revolution only. Compost from the drum will drop into the finishing drawer. Empty the drawer and repeat this procedure until most of the compost is removed, leave 4-6 inches of compost. This will be your "starter base" for the coming season.

### Rake

Remove the finishing drawer completely and use the rake tool to rake any loose material from the floor of the unit. Pay careful attention to the left two corners of the unit (near the safety drain) to ensure that your drains do not get clogged.

### Add Water & Microbe Mix

Add some warm water to the remaining compost, enough to ensure that it is quite moist. Also, add some Sun-Mar Microbe Mix (two of scoops) to give the compost pile a "kick-start" and rotate the drum several times to mix.

If your composting toilet is electric, plug it in and use for another season.

## Winter Use

### No Winter Use

Just add water. Lots of water. Soak the compost in the drum to prevent it from drying out before Spring. Make sure to unplug the unit if electric. If you have a non-electric unit, it may be a good idea to place something over the diffuser to prevent animals (who are looking for a home at this time of year) from getting in.

### Occasional Winter Use

If the unit will be used for 3-4 weekends throughout the winter season then it is considered occasional use. All of the same considerations should be taken with these units to winterize them. When the temperature dips below 55 ° F (13 ° C), composting activity will decrease dramatically. These units do not need to be kept warm and will act only as a holding tank during the winter months until they warm up enough in the spring to begin composting again. During the winter, the compost will freeze into a solid mass so the drum should not be turned as it may damage the composting toilet. With this in mind, it is a good idea to remove enough compost before it gets too cold to make room in the drum for winter use.

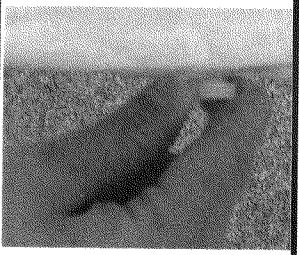
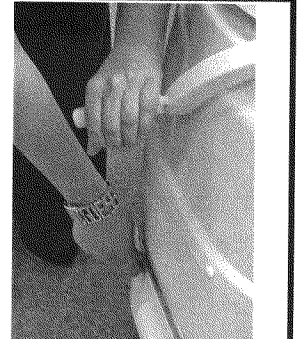


### Heavy or Residential Winter Use

These units should be kept in a heated area and all winterization tips should be followed, including the following:

1. Vent Pipe - electric models; All 2" vent pipe should be insulated if they are exposed to the outside or in an unheated area. If you are in an area that experiences extreme winter conditions, we recommend that heat tape should be applied to the exposed vent pipe to prevent ice blockages.
2. Safety Drain - all models; We recommend that the safety drain should be installed and insulated above the frost line. There will be less evaporation in the winter so this will help with any excess liquid. If possible, heat tape can be applied to the safety drain to prevent ice blockage.
3. Keep it warm; If the composting toilet is used frequently in the winter then the composting part of the unit should be kept in a warm place. Below 55 ° F (13 ° C), composting actions slows dramatically so if it is in a place that falls below this temperature, a source of heat should be provided for the unit so that it can keep up with constant use.

## Removing Compost from the patented Bio-Drum

The level of compost in the Bio-drum should never be more than half full. As a guide, the compost in the drum should be at least 4 inches from the bottom of the drum door. Compost must be removed from the drum by following the steps outlined in this section.

<p><b>Pull the drum lock button</b></p>	<p>Remove the footrest from the front of the toilet. Pull the drum lock button out and hold it out while turning the handle.</p>	<p>The drum lock button is attached to a bar that sits in a molded depression in the drum. When you pull the button, you pull the bar out of the depression which allows you to turn the drum in the opposite direction.</p>	
<p><b>Turn the handle counter-clockwise</b></p>	<p>While holding the drum lock button out, turn the handle counter-clockwise for three revolutions of the handle. Release the drum lock button and continue to turn the handle counter-clockwise until the handle hits a hard stop.</p>	<p>The drum door will stay open allowing compost to fall into the finishing drawer. Fresh and composted material will be deposited into the drawer.</p>	
<p><b>Level the compost in the drawer</b></p>	<p>Open the drawer and use your rake to level the compost.</p>	<p>Levelling the compost will prevent the compost from soiling the patented bio-drum.</p>	
<p><b>Allow the compost to rest</b></p>	<p>Compost should now be allowed to rest in the drawer for 3 - 4 weeks to finish the composting process.</p>	<p>This compost will be isolated from any new waste and should be left in the drawer for a minimum of 4 weeks or longer to finish composting.</p>	

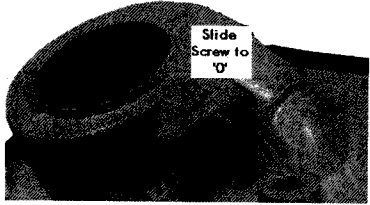
Compost may be removed at any time that you may need more space in the drum and will need to be removed more frequently for heavily used units or where the EXCEL is the primary residential toilet.

## Compost Troubleshooting

Symptom	Cause	Remedial Action	Prevention
<b>Compost Too Wet</b>	Compost porosity is poor.	Change bulking material to Compost Sure Green.	Use Sun-Mar Compost Sure Green
	Drum screen clogged	Spray the drum screen with Compost Quick. Scrub the drum screen with wire brush.	
<b>Waste not Breaking Down at all</b> <i>If this is the case, the drum will fill up quickly</i>	Insufficient moisture in compost	A moisture content of 40-60% is ideal for aerobic microbes to thrive.	Add water to patented bio-drum
	Insufficient Microbes	Add Sun-Mar Microbe Mix .	Be sure to add microbe packet at start up.
	Room Temperature under 55 ° F/13 °C	Install heat source to increase temperature. Temperature should be kept above 55°F/13°C constantly to ensure the composting action does not stop completely.	Install unit in warm area. The warmer the area, the better your compost will be!
<b>Large Lumps in Compost</b>	Compost Too Dry	Add 1/2 to 1 gallon of warm water to compost in order to bring it up to appropriate moisture level. Remove lumps or break them apart.	Use proper bulking material and add warm water if necessary.
<b>Drum Too Full</b>	Compost not emptied into finishing drawer in a timely fashion	Remove compost until drum is only half full or less. Rotate compost thoroughly to aerate, and add compost accelerant(Compost Quick and Microbe Mix) if available.	When drum is 1/2 full, remove some compost to the finishing drawer. Do NOT let drum get above 1/2 full. This will lead to lack of aeration, and anaerobic compost.
	Kitchen/Garden Waste added	We do not recommend adding kitchen or garden scraps.	Do Not add kitchen or garden waste.
<b>Flies Present</b>	-compost too dry -compost anaerobic -kitchen/garden waste added -foreign material added	1. To eliminate flies, you can use any pesticide that is used on your garden. Pesticides used for garden use are not anti-bacterial so are safe to use on your compost. 2. The alternative to using pesticides is to completely clean the toilet out, wash the inside with soap and water <b>IMPORTANT:</b> Application of a pesticide in a SUN-MAR toilet is not a health concern because all SUN-MAR units are vented. If using pesticides, avoid spilling on the outer shell of the compostter.	1. Keep compost moist. In order to determine a good level of moisture, shine a flashlight into the drum. The compost should have a slight gloss or shine. If it does not, add warm water to it until it reaches this consistency. Fungus gnats tend to be attracted to a dry compost, due to the fungus which begins to form on the surface when it dries out. A good, moist compost will not be attractive to flies. 2. Do not add topsoil from the ground, composted matter, or kitchen scraps to the toilet. Flies may be present in, or attracted to these items. 3. Use "Compost Sure Green".



## MECHANICAL TROUBLE SHOOTING

Symptom	Cause	Remedial Action	Prevention
<b>Urine Odour in Washroom</b>	Horizontal runs or downward slopes on vent pipe	Re-install the vent so there are no horizontal or low points where condensation can collect.	Install wall brackets on vent pipe to prevent settling. DO NOT install horizontal runs as liquid will collect and block ventilation, causing odour.
	Fan has failed	Have your serial number ready and call SUN-MAR for a replacement. Instructions are included with the replacement fan.	The fan is a constantly moving part and has a finite service life.
	Downdraft	If you believe that there may be a downdraft outside of the building, it may be a good idea to remove your fan assembly prior to installation and set the fan gate to '0' to prevent urine odor in the bathroom. (electric)  Install a 12 volt fan in vent pipe. (NE)	
	Competing appliances	Wood stoves or furnaces installed in a tightly sealed room with the composting toilet may draw air in causing a vacuum in the room. This will draw air down the vent pipe.	Install an air intake to the competing appliance from the outside.
<b>Occasional Urine Odor Outside</b>	<ol style="list-style-type: none"> <li>1. Vent stack not installed above peak of roof.</li> <li>2. If vent stack is installed above roof line, natural obstructions, such as tall trees, being located in a valley or close to a hill may be causing downdraft.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check that the vent is installed above the peak of the roof. If not, extend the vent. Guide wires may be necessary.</li> <li>2. Add lime to the evaporation chamber - as much as you think necessary. You will have to rake more often if you do this.</li> <li>3. SUN-MAR has a filter box available which will filter the ammonia out of the vented air in a downdraft situation. Call SUN-MAR for details.</li> </ol> <p>Begin following: "Compost Troubleshooting" suggestions.</p>	Downdraft is dependent on wind direction as well as natural obstructions etc. Initially, install the vent above the peak of the roof. If symptoms occur, add lime or a filter box.
<b>Strong Sewage Odor</b>	Compost is anaerobic	1. If it is rattling, it may need to be cleaned or the bearings are worn and the fan needs to be replaced.	Follow "Ongoing Maintenance" and use proper bulking material.
<b>Fan Noisy</b>	Fan damaged in shipping or bearings are beginning to wear.	2. A hum is the normal sound the fan will make.. If you are in a very quiet setting it will be more noticeable. If this is the case, consider purchasing a fan speed control so that the fan may be turned down.	Clean the fan with a small brush and/or compressed air nozzle once a year. To do this, remove the fan assembly by taking off the snap cap covers and unscrewing the screws which hold it in. The entire assembly will then simply slide out. This will prevent wear and lengthen the life of your fan.

Symptom	Cause	Remedial Action	Prevention
<b>Fan Not Working</b>	Debris in fan or mechanical failure.	Remove the fan assembly from the unit and vacuum any dust out of the fan blades. Check the power source. If this does not remedy the problem, have your serial number ready and call SUN-MAR	The fan is a continuously moving part which will eventually have to be changed. Do Not turn on and off daily.
<b>Liquid Build up/ Lack of Evaporation</b>	Increased usage.	The amount of liquid varies substantially between installations. The overflow drain needs to be installed.	Install the overflow drain.
	Climactic conditions	Evaporation rates vary substantially with climatic conditions. Expect faster evaporation rates during warm dry weather.	
	Mineral salts may have accumulated in the evaporation chamber over time, reducing evaporation rates.	To remove these, fill the evaporation chamber with very hot water and 1/3 bottle of "Compost Quick" enzyme liquid. Leave overnight. - Drain all Liquid through the overflow drain by tipping the unit up (make sure overflow is hooked up first)	Rake evaporating chamber vigorously at spring start ups for cottage use, and once every other month for residential use.
<b>Liquid Overflow</b>	Drains Blocked	<ol style="list-style-type: none"> <li>1. Rake peat moss away from the safety drains. This is the "build up" area. If drains are still clogged, proceed to step 3.</li> <li>2. Check drain line for kinks, blockages or upward bends. Remove and flush if blockages present, unkink if bent and ensure that the drain pipe is sloping downward. If your drain pipe is in order, proceed to step 3.</li> <li>3. Use a wire to poke blockage out of the drain assembly. You will notice if this is clogged because you will see a brown spot through the opaque assembly.</li> </ol>	<ol style="list-style-type: none"> <li>1. A clogged drain is not very likely to happen if you rake your evaporating chamber every 3-4 months.</li> <li>2. Use premium 1"ID hose for the drain line. A good hose will be less likely to kink. Use elbows or fittings around bends to prevent kinks.</li> <li>3. Use Compost Sure Green as your bulking material.</li> </ol>

Symptom	Cause	Remedial Action	Prevention
<b>Liquid Overflow (Cont'd)</b>	Overflow drain not hooked up	Connect overflow safety drain	Evaporation will slow during damp weather, make sure drain hose is installed.
	Unit tipped forward	Check and ensure that the unit is level.	
<b>Heating System Not Working</b>	Test to determine whether failure has occurred	Pull finishing drawer out and put your hand in the evaporation chamber (NOT in the liquid). If there is no warmth rising from the floor of the unit, your heating system is not working. It is most commonly the thermostat that has failed. If you notice a lack of evaporation, but there is still warmth in the heating chamber, see "Liquid Build up" for solutions.	A ground fault interrupter circuit is recommended to protect your EXCEL from power surges that could cause your heating system to malfunction.
	Thermostat Failure	Have your serial number ready and call SUN-MAR for a replacement. (Detailed instructions are included with the replacement part)	Your thermostat and fan are the two constantly moving parts on the unit, and so are the most likely to fail. Both are easy to replace.
	Heating Element Failure	If the insulation behind the thermostat access cover is moist or discolored, or heating does not work after the new thermostat has been connected, then the heating element has failed. Have your serial number ready and call SUN-MAR for a replacement. (Detailed instructions are included with the replacement part)	If you ever remove the unit from the bathroom for cleaning, DO NOT use a water hose around the base of the unit
<b>Liquid in Finishing Drawer</b>	Drum Screen Clogged	Rotate drum 180 ° so that the drum screen is on top - you will just be able to see the edge of it if you take out the bowl liner. Scrub drum screen with a wire brush. You may want to hook up your overflow drain beforehand if there is a large liquid buildup in the drum.	
<b>Drum Will Not Turn</b>	Set screw securing handle to shaft has broken	Remove the finishing drawer. The drum screen is located on the bottom of the patented Bio-drum, to the left of the drawer opening. Scrub drum screen with a wire brush.	
	Steel roll-pin securing gear wheel to shaft has broken	Drill out set screw and replace, or have your serial number ready and call SUN-MAR for a handle replacement kit (instructions included).	
<b>Drum Door Not Opening/ Closing Properly</b>	Drum too full	Have your serial number ready and call SUN-MAR for a replacement Small Gear Kit.	Drum should never be more than 1/2 full.
	Hinges Stuck	Spray hinges with Compost Quick. Scrub hinges with toothbrush or other soft nylon bristled brush.	

## **Excel Basic Operating Instructions**

The toilet should be cleaned with hot water or bio-degradable products only to avoid damage to the compost. 'Compost Quick or Baking Soda can be used diluted in hot water.

### **Regular Maintenance**

1. Rotate the drum 6 rotations (36 turns of the handle) every second day while you are there and using the toilet.
2. When finished rotating, fold the handle in under the seat. This will mean that the drum is open and ready to receive waste.
3. After each bowel movement, one cup (250ml) of Compost Sure Green should be added to the unit to cover the bowel movement, whichever is greater. Do Not Turn the drum after each use.

### **Bulking Material**

When you run out of our Compost Sure bulking material, more Compost Sure through your Sun-Mar dealer, on line at [www.sun-mar.com](http://www.sun-mar.com) Do not use 100% peat moss as this will clog your drum screen and drains.




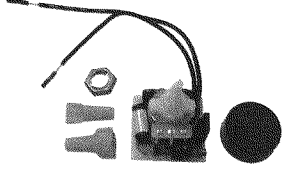
### **Periodic Maintenance**

Rake out evaporation chamber with rake provided (the area below the finishing drawer). Clean the drum screen. Remove the bowl liner and lift the toilet seat. Turn the handle 3 revolutions to bring the drum screen to the top of the drum. Access can be gained by reaching through the hole under the toilet seat. Spray the drum screen with Compost Quick and let sit for 15 minutes (this will help to loosen the debris if the screen is not too encrusted). Scrub the screen vigorously with a wire brush. If brushing the screen does not clear it and liquid is still not draining through the screen, use a screwdriver or nail to puncture each hole in the drum screen.

**Attention:** the EXCEL electric model must remain plugged in to an electrical outlet continuously to function odorlessly. If you will be away from the residence where the composting toilet is installed for longer than three days, the power may be disconnected while the composting toilet lays dormant.

## ACCESSORY ITEMS FOR THE EXCEL

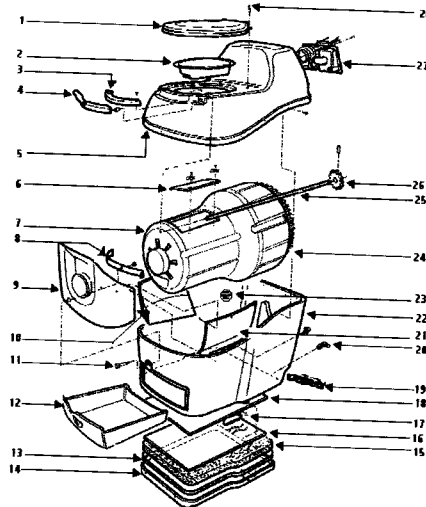
SUN-MAR has developed a number of composting accessory items over the years in response to frequent requests from users. These items may serve to improve composting speeds under some circumstances.

Name	Description	Container
<b>"Compost Quick"</b>	Specially selected natural enzyme solution designed to help the aerobic bacteria convert waste to compost. Also very effective as a cleaner for bowl liners <b>454g(16oz) bottle with spray cap</b>	
<b>"Microbe Mix"</b>	Specially selected dried microbes and enzymes designed to start and accelerate composting in all Sun-Mar composting toilet and toilet systems. Microbe Mix also contains citronella to discourage insects. <b>500g/16 oz. jar with scoop</b>	
<b>"Compost Sure"</b>	Bulking material containing a mix of coarse peat moss, and chopped hemp stalk. Designed to maintain porosity and hold oxygen and moisture in the compost while keeping the compost well supplied with carbon. <b>30 Litre/8 Gallon Bag</b>	
<b>DC Vent Kit</b>	Kit required for conversin of electric units to also operate in non electric or 12 volt mode. For use with EXCEL systems. Includes a 12 volt fan.	
<b>AC Fan Speed Control</b>	Designed for electric units only, the control kit allows users to adjust the speed of the fan. Ideal for installations where the toilet is used in winter applications or in bunkies where the toilet may be in close proximity to sleeping quarters.	

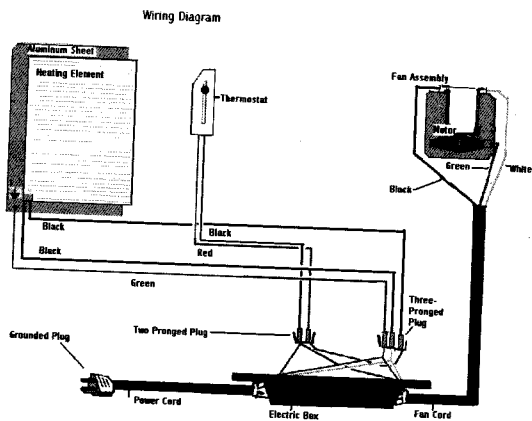
**Note:**

*Use "Compost Sure Green" for optimum results.*

# COMPACT SPECIFICATIONS



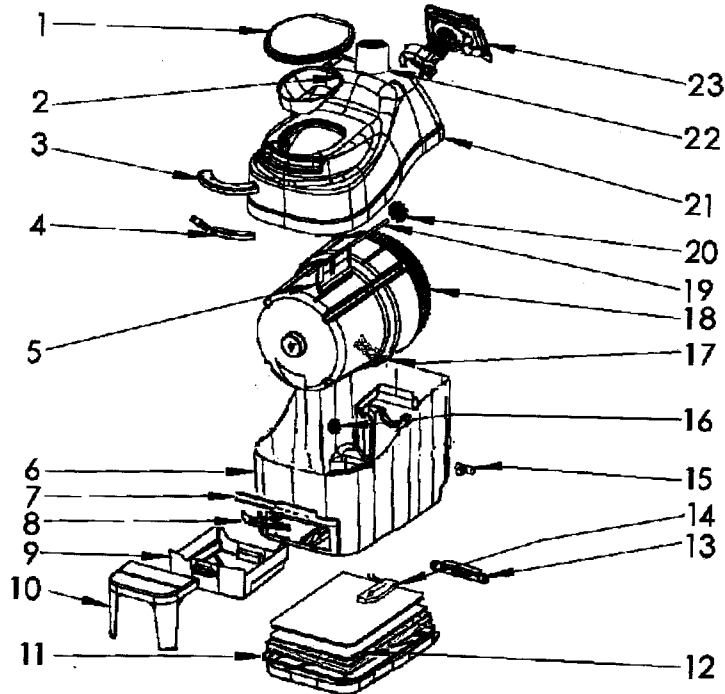
- |    |                 |                            |    |                 |                       |
|----|-----------------|----------------------------|----|-----------------|-----------------------|
| 1  | PP-TOILS-0208CX | Toilet Seat White          | 14 | PF-HEATC-0766XX | Heater Tray Bone      |
| 1  | PP-TOILS-0208DX | Toilet Seat Bone           | 14 | PF-HEATC-0766WX | Heater Tray White     |
| 2  | PP_BOWLL-0246DX | Bowl Liner                 | 15 |                 | Insulation            |
| 3  | PF-FRONC-0750BX | Top Front Cover White      | 16 | PM-ALUMS-0742BX | Aluminum Sheet        |
| 3  | PF-FRONC-0750XX | Top Front Cover Bone       | 17 | AO-THERA-0001AX | Thermostat            |
| 4  | AO-HAND0-0307DX | Handle Kit White           | 18 | AO-HEATE-0002BX | Heating Element       |
| 4  | AO-HAND0-0307CX | Handle Kit Bone            | 19 | AO-ELECB-0001AX | Electric Box          |
| 5  | PP-TOPOC-0767BX | Compact Top White          | 20 | AP-DRAIO-0306XX | Emergency Drain       |
| 5  | PP-TOPOC-0767XX | Compact Top Bone           | 21 | PP-DEFLC-0085BX | Humus Deflector Left  |
| 6  | AO-DRUMD-2004XX | Drum Door                  | 22 | PF-TANKC-0767WX | Compact Tank White    |
| 7  | PP-DRUM0-0796XX | Compact Drum               | 22 | PF-TANKC-0767XX | Compact Tank Bone     |
| 8  | AO-DRUML-0475AX | Drum Locker Release        | 23 | PP-INTAV-0797XX | Air Intake Vent       |
| 9  | PP-BEARP-0758CX | Front Bearing Plate        | 24 | PP-DRUM0-0796XX | Compact Drum          |
| 10 | PP-DEFLC-0085XX | Humus Deflector Left       | 25 | PM-SHAFT-0175AX | Compact Shaft         |
| 11 | PP-SCRE0-0664XX | Drum Locker Release Button | 26 | AO-SMALL-0440XX | Nylon Drive Gear      |
| 12 | PF-DRAWC-0771WX | Compact Drawer White       | 27 | AO-FAN_A0315KX  | Fan & Motor Kit Bone  |
| 12 | PF-DRAWC-0771XX | Compact Drawer Bone        | 27 | AO-FAN_A0315KX  | Fan & Motor Kit White |
| 13 | PP-GASK0-0188CX | Rubber U Channel           | 28 | PP-SCRE0-0580XX | Toilet Seat Screw     |



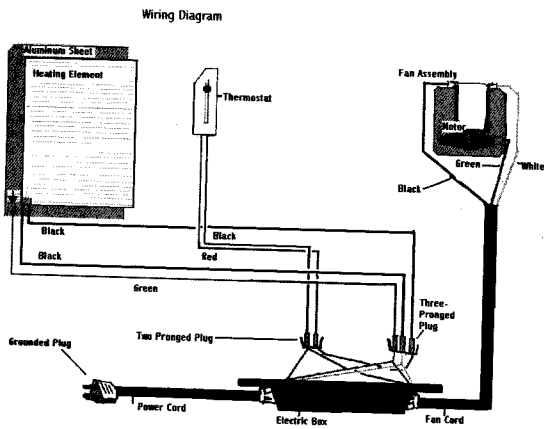
Electrical Specifications	Compact
Maximum Amps	2.0
Fan Watts (Required)	35 req.
Heater Watts (When on)	200
Average Power Use In Watts (Heater on 1/2 time)	125

# EXCEL SPECIFICATIONS

## EXCEL EXPLOSION DIAGRAM & PART NUMBERS



- |                     |                                  |                              |
|---------------------|----------------------------------|------------------------------|
| 1 Toilet Seat       | 9 Finishing Drawer               | 17 Drum Screen               |
| 2 Bowl Liner        | 10 Footrest                      | 18 EXCEL Drum                |
| 3 Front Cover       | 11 EXCEL Heater Tray(Electric)   | 19 EXCEL SS Shaft Assembly   |
| 4 Handle Swivel     | 12 Heating Element(Electric)     | 20 Nylon Drive Gear          |
| 5 Plastic Drum Door | 13 Electric Box (Electric)       | 21 EXCEL Top                 |
| 6 EXCEL Tank        | 14 Thermostat Assembly(Electric) | 22 Fan Assembly(Electric)    |
| 7 Footrest Channel  | 15 Emergency Drain               | 23 4" (100mm)Inlet Pipe (NE) |
| 8 Drum Locker       | 16 Air Intake Vent               |                              |



Electrical Specifications	Excel 115V
Maximum Amps	2.4
Fan Watts (Required)	35 req.
Heater Watts (When on)	260
Average Power Use In Watts (Heater on 1/2 time)	150

PO-MANUO-0603XX

Feb 2011

Rev.D7

## WARRANTY

SUN-MAR Corp. warrants the original purchaser that this toilet is free from defects in material and workmanship under normal house or cottage use. SUN-MAR Corp. will furnish new parts for any part that fails within three years and five years on the fibreglass tank, provided that our inspection shows that such failure is due to defective material or workmanship. Any part supplied by us to replace another part is warranted for the balance of the original warranty period.

This warranty does not cover:

1. Damage resulting from neglect, abuse, accident or alteration; or damage caused by fire, flood, acts of God or any other casualty.
2. Parts and accessories not sold or manufactured by SUN-MAR Corp. or any damage resulting from the use of such items.
3. Damage or failure resulting from failure of the purchaser to follow normal operating procedure outlined in the Owner's Manual or in any other printed instructions.
4. Labour and service charges incurred in the removal and replacement of any parts found defective under the terms of this warranty.
5. All returns to the factory must be made freight prepaid. All shipments from the factory are made F.O.B. the factory.

This warranty is in lieu of all other warranties expressed or implied, and no person is authorized to enlarge our warranty responsibility, which is limited to the terms of this certificate. The Company reserves the right to change, improve or modify its products without obligation to install these improvements on equipment previously manufactured.

# Sun-Mar

Product Info: (905) 332-1314

Fax: (905) 332-1315

Tech. Service: (888) 341-0782 Ext 218

E-mail: [compost@sun-mar.com](mailto:compost@sun-mar.com)

<http://www.sun-mar.com>

600 Main St.  
Tonawanda, N.Y.  
14150-0888 U.S.A.

5370 South Service Rd.  
Burlington, ON  
L7L 5L1 CANADA



## Lee Phipps

---

**From:** dan welch <dan@bundledesignstudio.com>  
**Sent:** Tuesday, October 21, 2014 6:12 AM  
**To:** Lee Phipps; Mike Moren; Adair Orr  
**Subject:** 2930 birchwood. 380223 - 488514

Lee.

We will be starting the septic this morning.

Plan is to dig the drain field and get the sand and drain rock laid by end of day. We also hope to have tank delivered and set late afternoon.

Mike moren will be on site for required inspections.

Dan  
360.296.2657



# Permit Status and Inspections

## Inspection History

**Permit Number:** CMB2013-00141  
**Project Name:** BIRCH CASE STUDY HOUSE  
**Project Number:** PRJ2013-00739  
**Site Address:** 2930 BIRCHWOOD AVE  
**Parcel Number:** 3802234885140000  
**Description:** NEW SINGLE FAMILY RESIDENCE (SPECIAL METHODOLOGY HOUSING: LARGELY OFF-GRID)  
**Status:** Issued

### Application Submitted/Pending

**010 - APPLICATION SUBMITTED**

**SUBMITTED**

**Results**

6/14/2013

*Done By - KIRSTEN HAWNEY, CPT - CITY HALL - BUILDING SERVICES - 360-778-8312*

### Application Accepted

**1002 - QRP APPLICATION ACCEPTED**

**TARGET REVIEW DATE**

**ACTUAL REVIEW DATE**

**Results**

6/21/2013

6/14/2013

Accepted

*Done by - KIRSTEN HAWNEY, CPT - CITY HALL - BUILDING SERVICES - 360-778-8312*

**1002 - QRP APPLICATION ACCEPTED**

**TARGET REVIEW DATE**

**ACTUAL REVIEW DATE**

**Results**

7/24/2013

7/17/2013

Accepted

*Done by - KIRSTEN HAWNEY, CPT - CITY HALL - BUILDING SERVICES - 360-778-8312*

**1002 - QRP APPLICATION ACCEPTED**

**TARGET REVIEW DATE**

**ACTUAL REVIEW DATE**

**Results**

8/01/2013

7/26/2013

Accepted

*7/25/13: Dan Welch made revisions to plans & submitted add'l info per phone call with John Lindh on 7/24/13. KSB*

*Done by - KIM BARKER, CPT - CITY HALL - BUILDING SERVICES - 360-778-8315*

### Reviews/Approval

**100 - BSD REVIEW**

**REVIEW DUE**

**REVIEWED**

**Results**

7/02/2013

7/01/2013

Not Approved/Correction Required

*6-27-13 Putting back on JRL's list "due" Tuesday as that is when the applicant is coming in for a group meeting and the CCL should be completed then/lcp. This project is unique and requires discussion with Building Official. He is out of office this date. JRL will discuss with him on his return.*

*Done by - JOHN LINDH - CITY HALL - BUILDING SERVICES - 360-778-8318*

**100 - BSD REVIEW #2**

**REVIEW DUE**

**REVIEWED**

**Results**

7/24/2013

7/24/2013

Not Approved/Correction Required

*Rec'd partial replacement pgs, response letter, cut sheets, product info, and request for modification to fire code 07/24/2013: Discussed the following with applicant this date: 1) Plans state 2 x12's some locations, 2 x15's others. What's the plan? 2) 2x*

ledger at concrete walls; how to be fastened? 3) piping spec for all systems, 4) design of rainwater roof washer and first flush diverter. NO CCL NEEDED AT THIS TIME. JRL

Done by - JOHN LINDH - CITY HALL - BUILDING SERVICES - 360-778-8318

**100 - BSD REVIEW #3**

REVIEW DUE	REVIEWED	Results
8/07/2013	8/14/2013	Approved (Review Complete and Approved)
<p>8-12-13 JRL to sign off or NACR after speaking to Health today/lcp. 8/6/13: Dan updated drawings and submitted approval from WCHD. KSB 08/13/2013 Discussed potable water system in depth with Kyle Dodd of Health. They will hold jurisdiction on supply of potable water. BSD only concerned with what comes out of treatment and that it be certified as potable. Requires a response from Building Official regarding "no-first- flush." JRL 08/08/2013: Given new "policy" regarding jurisdictional responsibilities, it is necessary to continue discussion with Whatcom County Health. Proper Health Officer is out-of-office until Monday 8/12/2013. Will discuss with him ASAP Monday morning. JRL 08/06/2013: Per Building Official this date, he will require rainwater system to be fully approved by Health Department as producing potable water prior to BSD approval of system. As this is an elemental portion of the building design, this will effectively HOLD the project until that is done. He stated he would contact and discuss with applicant. JRL</p>		

Done by - JOHN LINDH - CITY HALL - BUILDING SERVICES - 360-778-8318

**200 - PLA REVIEW**

REVIEW DUE	REVIEWED	Results
6/21/2013	6/19/2013	Approved (Review Complete and Approved)

Done by - RYAN NELSON - CITY HALL - PLANNING DEPARTMENT - 360-778-8368

**300 - PBW REVIEW**

REVIEW DUE	REVIEWED	Results
6/21/2013	6/21/2013	Not Approved/Correction Required

Done by - STEVEN HARRINGTON - PUBLIC WORKS DEPARTMENT - 360-778-7926

**300 - PBW REVIEW #2**

REVIEW DUE	REVIEWED	Results
7/24/2013	7/24/2013	Approved (Review Complete and Approved)
<p>Rec'd partial replacement pgs,response letter, cut sheets, product info, and request for modification to fire code. There are no connections to city services / utilities.</p>		

Done by - STEVEN HARRINGTON - PUBLIC WORKS DEPARTMENT - 360-778-7926

**340 - STM REVIEW**

TARGET DATE	REVIEWED	Results
6/21/2013	6/25/2013	Not Approved/Correction Required

Done by - JASON PORTER - STORMWATER / PUBLIC WORKS DEPARTMENT - 360-778-7900

**340 - STM REVIEW #2**

TARGET DATE	REVIEWED	Results
7/24/2013	7/25/2013	Approved (Review Complete and Approved)
<p>Rec'd partial replacement pgs,response letter, cut sheets, product info, and request for modification to fire code</p>		

Done by - JASON PORTER - STORMWATER / PUBLIC WORKS DEPARTMENT - 360-778-7900

**400 - FIRE REVIEW**

REVIEW DUE	REVIEWED	Results
6/21/2013	6/24/2013	Not Approved/Correction Required

Done by - JASON NAPIER - FIRE DEPARTMENT - LIFE SAFETY DIVISION - 360-778-8422

**400 - FIRE REVIEW #2**

REVIEW DUE	REVIEWED	Results
7/24/2013	7/19/2013	Approved (Review Complete and Approved)
<p>Rec'd partial replacement pgs,response letter, cut sheets, product info, and request for modification to fire code</p>		

Done by - JASON NAPIER - FIRE DEPARTMENT - LIFE SAFETY DIVISION - 360-778-8422

**920 - CONSOLIDATE CORR. LETTER**

COB TRACK DATE	ACTUAL DATE	Results
1/01/2014	7/01/2013	

Done by - LARA PALMATIER, CPT - CITY HALL - BUILDING SERVICES - 360-778-8321

**920 - CONSOLIDATE CORR. LETTER**

COB TRACK DATE	ACTUAL DATE	Results
1/26/2014	7/26/2013	
<i>letter not sent, status change only, see JRL's notes</i>		
<i>Done by - KIRSTEN HAWNEY, CPT - CITY HALL - BUILDING SERVICES - 360-778-8312</i>		

**920 - CONSOLIDATE CORR. LETTER**

COB TRACK DATE	ACTUAL DATE	Results
7/14/2014	1/14/2014	
<i>bundledesign@gmail.com</i>		
<i>Done by - KIM BARKER, CPT - CITY HALL - BUILDING SERVICES - 360-778-8315</i>		

**920 - CONSOLIDATE CORR. LETTER**

COB TRACK DATE	ACTUAL DATE	Results
7/14/2014	1/14/2014	
<i>Done by - KIRSTEN HAWNEY, CPT - CITY HALL - BUILDING SERVICES - 360-778-8312</i>		

**Pre-Issuance (To Do Issue)**

**300 - MISCELLANEOUS TO DO - SEE NOTE**

SUBMITTED	CONFIRM OK	Results
	8/15/2013	Done
<i>At time permit was made ready, the contractor's WA State Labor and Industries license shows as expired. Please update prior to issuance, or list different contractor with a valid state license. owner requested that permit be changed to owner as contractor. mfc</i>		
<i>Done by - MARY CHISHOLM - CITY HALL - BUILDING SERVICES - 360-778-8308</i>		

**Application Issuance**

**500 - RDY TO ISSUE/APPLICANT NOTIFID**

MADE READY	NOTIFIED	Results
	8/14/2013	Ready to Issue
<i>bundledesign@gmail.com</i>		
<i>Done by - KIM BARKER, CPT - CITY HALL - BUILDING SERVICES - 360-778-8315</i>		

**510 - ISSUE PERMIT**

	ISSUED	Results
	8/15/2013	Permit Issued
<i>Done by - MARY CHISHOLM - CITY HALL - BUILDING SERVICES - 360-778-8308</i>		

**520 - AMEND RDY TO ISSUE/NOTIFIED**

MADE READY	NOTIFIED	Results
	1/29/2014	Amended Ready to Issue/Notified
<i>Fire code modification DENIED. Fees need to be paid to reinstate original permit to issued status.</i>		
<i>Done by - KIM BARKER, CPT - CITY HALL - BUILDING SERVICES - 360-778-8315</i>		

**Various Communication**

**930 - E-MAIL**

	SENT/RCV'D	Results
	7/10/2013	
<i>Applicant provided an email with aerial photography and narrative indicating the pond adjacent to the subject property was artificially created and not regulated under the CAO.</i>		
<i>Done by - RYAN NELSON - CITY HALL - PLANNING DEPARTMENT - 360-778-8368</i>		

**950 - MISCELLANEOUS ACTION**

	ACTION	Results
	9/03/2013	Done
<i>New foundation details using Helix approved at the counter by JET</i>		
<i>Done by - KIRSTEN HAWNEY, CPT - CITY HALL - BUILDING SERVICES - 360-778-8312</i>		

**Amendment**

**006 - AMENDED PLANS ACPT-INSPECT OK**

	<b>ACCEPTED</b>	<b>Results</b>
	1/06/2014	Accepted
<i>Request modification to fire code section 17.20.030 Section 503.2.1 Exception #4 (fire apparatus access road width).</i>		
<i>Done by - KIM BARKER, CPT - CITY HALL - BUILDING SERVICES - 360-778-8315</i>		

**006 - AMENDED PLANS ACPT-INSPECT OK**

	<b>ACCEPTED</b>	<b>Results</b>
	1/21/2014	Accepted
<i>inspections ok per JET</i>		
<i>Done by - KIRSTEN HAWNEY, CPT - CITY HALL - BUILDING SERVICES - 360-778-8312</i>		

**070 - FIRE REVIEW - AMENDED**

<b>REVIEW DUE</b>	<b>REVIEWED</b>	<b>Results</b>
1/13/2014	1/14/2014	Not Approved/Correction Required
<i>Request modification to fire code section 17.20.030 Section 503.2.1 Exception #4 (fire apparatus access road width). received 1/7/14</i>		
<i>Done by - JASON NAPIER - FIRE DEPARTMENT - LIFE SAFETY DIVISION - 360-778-8422</i>		

**070 - FIRE REVIEW - AMENDED**

<b>REVIEW DUE</b>	<b>REVIEWED</b>	<b>Results</b>
1/23/2014	1/28/2014	Approved (Review Complete and Approved)
<i>scaled site plan, still 11x17 - submitted 1/15, logged 1/21. received at fire 1/21 Modification was denied.</i>		
<i>Done by - JASON NAPIER - FIRE DEPARTMENT - LIFE SAFETY DIVISION - 360-778-8422</i>		

**1002 - QRP APPLICATION ACCEPTED**

<b>TARGET REVIEW DATE</b>	<b>ACTUAL REVIEW DATE</b>	<b>Results</b>
1/13/2014	1/06/2014	Accepted
<i>Request modification to fire code section 17.20.030 Section 503.2.1 Exception #4 (fire apparatus access road width).</i>		
<i>Done by - KIM BARKER, CPT - CITY HALL - BUILDING SERVICES - 360-778-8315</i>		

**1002 - QRP APPLICATION ACCEPTED**

<b>TARGET REVIEW DATE</b>	<b>ACTUAL REVIEW DATE</b>	<b>Results</b>
1/23/2014	1/21/2014	Accepted
<i>scaled site plan, still 11x17 - submitted 1/15, logged 1/21</i>		
<i>Done by - KIM BARKER, CPT - CITY HALL - BUILDING SERVICES - 360-778-8315</i>		

**Inspections**

**055 - FOOTING**

<b>FOR</b>	<b>PERFORMED</b>	<b>Results</b>
	9/09/2013	Inspection Passes
<i>Conf#:206046-01- mono pour</i>		
<i>Done by - SEAN ANGELEY - PUBLIC WORKS DEPARTMENT -</i>		

**060 - FOUNDATION WALLS**

<b>FOR</b>	<b>PERFORMED</b>	<b>Results</b>
	9/09/2013	Part of the Inspection Passes
<i>Conf#:206046-02- Mono pour, still need to inspect piers on south side of house.</i>		
<i>Done by - SEAN ANGELEY - PUBLIC WORKS DEPARTMENT -</i>		

**085 - FRAMING**

<b>FOR</b>	<b>PERFORMED</b>	<b>Results</b>
9/26/2013	9/26/2013	Part of the Inspection Passes
<i>Conf#:207425-01-Msg! ANCHOR BOLTS AROUND PERIMETER OK, SHEATHING @ S &amp; N WALLS PARTIALLY SHEATHED NAILING LOOKS GOOD BUT PLYWOOD DOES NOT EXTEND OVER SILL BUT NEEDS TO BE TOE NAILED TO GAIN GOOD PRCHASE INTO SILL.</i>		
<i>Done by - SEAN ANGELEY - PUBLIC WORKS DEPARTMENT -</i>		

**085 - FRAMING**

<b>FOR</b>	<b>PERFORMED</b>	<b>Results</b>
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10/16/2013 10/16/2013 Part of the Inspection Passes  
 Conf#:209413-01-Msg! EXTERIOR SHEATHING @ 2ND FL AND MAIN 85% COMPLETE.  
 Done by - SEAN ANGELEY - PUBLIC WORKS DEPARTMENT -

**085 - FRAMING**

FOR	PERFORMED	Results
12/17/2013	12/17/2013	Inspection Passes

Conf#:214410-01-  
 Done by - KENNETH P DONOVAN - CITY HALL - BUILDING DEPARTMENT - 360-778-8322

**120 - INSULATION**

FOR	PERFORMED	Results
8/14/2014		

Conf#:235803-01-  
 Done by - - -

**250 - PLUMBING GROUNDWORK**

FOR	PERFORMED	Results
6/24/2014	6/24/2014	Part of the Inspection Passes

Conf#:230440-01-Msg! pressure test in floor heat  
 Done by - MARK SNIFFEN - BUILDING SERVICES DIVISION - 360-778-8300

**255 - ROUGH PLUMBING**

FOR	PERFORMED	Results
1/22/2014	1/22/2014	Inspection Passes

Conf#:216708-01- Gray water drains are currently stubbed to indoor garden area. I advised owner that gray water must terminate outside the structure in a location approved by Whatcom County Health Dept. The owner acknowledged that he understood.  
 Done by - JIM TINNER - CITY HALL - BUILDING SERVICES - 360-778-8300

**Extensions / Reinstatments / Status Change**

**146 - EXPIRATION DATE MODIFIED**

CURRENT EXP DATE	COMPLETED	Results
5/19/2014	5/16/2014	Done

Done by - KIRSTEN HAWNEY, CPT - CITY HALL - BUILDING SERVICES - 360-778-8312

**230 - REINSTATE STATUS TO "ISS"**

REINSTATED	Results
6/23/2014	Done

Done by - Kelsey Brender - -

## James Hayes

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**From:** Mike Moren <mike.moren75@gmail.com>  
**Sent:** Thursday, July 24, 2014 2:01 PM  
**To:** James Hayes  
**Cc:** dan welch; Lee Phipps  
**Subject:** RE: Welch OSS, Whatcom Co. Tax Parcel No. 380223 488514 - engineer inspections for home-owner install

James,

As stated at the bottom of Page 11 of the Welch OSS design I, as the design engineer for this proposed home-owner install, will be making the following inspections during construction:

11. THE FOLLOWING IS A LIST OF CONSTRUCTION INSPECTIONS THE ENGINEER/DESIGNER SHALL MAKE AFTER NOTIFICATION FROM THE INSTALLER:
  - 11.A. PRE-CONSTRUCTION MEETING PRIOR TO BEGINNING ANY OSS CONSTRUCTION ACTIVITIES
  - 11.B. SEPTIC/PUMP TANK PLACEMENT AND LEAK TEST
  - 11.C. ACTUAL EXCAVATION OF BOTH DRAINFIELD BEDS AND BACKFILL WITH ASTM-C33 SAND WHERE REQUIRED.
  - 11.D. MANIFOLD AND LATERAL PIPING, FLOW CONTROL VALVE BOX INSTALLATION, AND SQUIRT HEIGHT TEST AS DESCRIBED IN NOTE NUMBER 8 ABOVE AS WELL AS BASELINE SETTINGS (FLOAT SETTINGS AND OPERATION, TIMER OPERATION, PUMP DRAWDOWN, ETC.)
  - 11.E. FINAL COVER OVER TANK, PIPING, AND DRAINFIELD BEDS AND RECORD DRAWING DOCUMENTATION.

Mike Moren, P.E.  
**Aqueous Solutions Engineering**  
P.O. Box 1635  
Bellingham, WA 98227  
Ph: (360) 318-4704

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**From:** James Hayes [<mailto:JHayes@co.whatcom.wa.us>]  
**Sent:** Thursday, July 24, 2014 12:11 PM  
**To:** Mike Moren  
**Subject:** RE: Welch OSS - Health department letter

An e-mail is adequate.



**Public Health**  
Prevent. Promote. Protect.

James Hayes | Environmental Health Specialist | 360-676-6724 ext. 50847  
Whatcom County Health Department  
Leading the community in promoting health and preventing disease  
[jhayes@whatcomcounty.us](mailto:jhayes@whatcomcounty.us) | website: [www.whatcomcounty.us/health](http://www.whatcomcounty.us/health)

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Public Health: Always Working for a Safer and Healthier Whatcom County

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# REDESIGN JULY 17, 2014



Whatcom County Health Department

## **Septic Tank Testing for Water-Tightness**

509 Girard Street  
Bellingham, WA 98225  
Telephone: 360-676-6724  
Fax: 360-676-6771

Sewage tanks must be tested for water-tightness at the project site and witnessed by an individual, such as the project design engineer, designer or installer.

### **Vacuum Testing Steps**

- Seal the empty tank.
- Temporarily seal access openings, risers, and inlet and outlet pipes.
- Introduce negative pressure into the tank and apply a vacuum to 4" (100 mm) of mercury. The tank passes the water-tightness test when the 4" of negative pressure is held for a period of 5 minutes, with no measurable loss of pressure. If the vacuum drops before completion of the 5 minutes, it shall be brought back to 4" of mercury and held for another 5 minutes with no measurable loss of vacuum.

### **Hydrostatic Testing Steps**

- Seal the empty tank.
- Seal access openings, risers, and inlet and outlet pipes.
- Fill the empty tank with water to a point 2" above the point of riser connection, to the top of the tank. Let the tank stand for 1 hour. If there is a measurable drop in the water surface elevation, refill the tank and let the tank stand for 1 hour. The tank passes the water-tightness test once the water level is held for 1 hour without any measurable loss. Tanks may still be used if damp spots on the exterior concrete surface exist.

When leakage occurs and the tank can be repaired, the water-tightness test should be made on the tank after repairs have been completed. The test must be completed in accordance with either **Vacuum or Hydrostatic Testing Steps**.

### **Tank Certification and Submittal Requirements**

- Sewage tanks must be certified as being water-tight prior to Whatcom County Health Department (WCHD) approving an On-Site Sewage (OSS) Application.
- A certification form must be completed by an individual, such as the project design engineer, designer, or installer and submitted to WCHD upon completion of water-tight test, assuring the tank met the water-tight testing requirements.





Whatcom County Health Department

509 Girard Street  
Bellingham, WA 98225  
Telephone: 360-676-6724  
Fax: 360-676-6771

### Water-Tightness Certification of Sewage Tanks

Date of Test October 23-24, 2014 Tax Parcel # 380223 488514 0000

Site Address 2930 Birchwood Ave., Bellingham WA 98225

**Originals must be submitted to the WCHD. No photocopies – no faxes.  
All spaces must be complete or marked N/A if not applicable.**

The following sewage tank has been tested and successfully met the requirements for Whatcom County Health Department (WCHD) septic tank testing for water-tightness.

This form must be completed by the professional engineer, Washington State Department of Licensing licensed designer, WCHD licensed installer or WCHD licensed O&M specialist.

- Manufacturer's Name (if known): Bode's Precast
- Type of Sewage Tank (i.e. concrete, fiberglass, etc.): Concrete, two-compartment
- Liquid Capacity: 750 gallons
- Risers & Lids at Grade: .....  Yes.....  No
- Method of Testing: Hydrostatic
- Test Duration: \_\_\_\_\_ minutes 24 hours
- Water Level Drop: 0 inches
- Tank Location (attach separate site sketch from ROSS or site plan from design).

Comments: Tank is for greywater only. First chamber (510 gal. working vol.) for solids, oil & grease removal, anaerobic decomposition; 2nd chamber as dosing chamber.

**I certify that I have performed the water-tightness test on the above referenced property. The information submitted above is true and correct.**

Michael Moren, P.E.

11/10/2014

Installer, Designer, or Design Engineer Signature

Print

Date



WHATCOM COUNTY HEALTH DEPARTMENT  
**OSS INSTALLER  
EXEMPTION APPLICATION  
PROCEDURES**

509 Girard Street  
Bellingham, WA 98225  
Telephone: 360-676-6724  
Fax: 360-676-6771

1. Complete the attached OSS installer exemption application.
2. You must provide a document from your designer stating they will conduct phased inspections and **provide a record drawing prior** to Whatcom County Health Department conducting a final inspection.
3. You must provide a detailed construction plan on how you plan on installing all components of the OSS. You must include a list of the tools and equipment that you will be using for the OSS installation.

Construction Plan

- Layout - The approved design will be transferred from paper and laid out on the ground, providing the location of all piping, tank location & drain fields.  
\* tools: measuring tapes (25'-200'), marking paint, wood stakes, laser level.
- Excavation -
  - House → tank - Trench dug to specifications noted in approved design
  - Tank - Hole dug to required size as noted in approved design for tank & all observation ports. check level with laser.
  - tank → drain field - Trench dug to specifications noted in approved design.
  - Drain field - drain field excavated to specification in approved design - laser level to confirm bed per design requirements.

\* Designer, Mike Moran, to observe all onsite soil conditions and acceptability of excavation per the design requirements

\* Tools: mini excavator, hand shovels, laser level, marking paint, etc.
- Installation - All piping, tanks, and conveyance equipment will be installed according to the approved design, manufactures recommendations and applicable codes.  
\* tools: - All general handtools for plumbing from pipe cutters to hand drills.  
- All general tools for making electrical connections.  
- laser level  
- hand shovels to keep trenches clear during installation of pipe & tank.

Cont. from front

• Inspection & Back fill - Whatcom County Health and designer, Mike Moran, to observe all installed trenches, piping, tanks and equipment for compliance with design and applicable codes. WCH & designer to observe any required testing of system per design & inspection requirements.

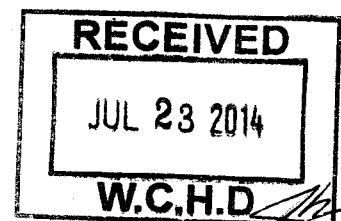
\* Backfilling of any part of the system shall not occur until after inspections.

tools: mini excavator, hand shovels, Raks, etc.

Questions?

- Please contact

Dan Welch - 360.296.2657





WHATCOM COUNTY HEALTH DEPARTMENT  
**OSS INSTALLER  
 EXEMPTION APPLICATION**

509 Girard Street  
 Bellingham, WA 98225  
 Telephone: 360-676-6724  
 Fax: 360-676-6771

As per Whatcom County Code 24.05.140 *Installation*, the Whatcom County Health Department (WCHD) shall require certified installers to construct OSS. However, the WCHD may exempt OSS installers from certification requirements if all the following conditions are met:

1. The OSS installer owns or has a beneficial interest as a contract purchaser of the land on which the OSS is to be installed; and
2. The OSS is either located on the same lot as the residence or situated on adjoining property controlled by the owner and legally listed as a encumbrance; and
3. The OSS installer will reside in or use the building served by the OSS; and

In addition, people engaged in the business of buying, selling, and constructing homes or land shall not qualify for the certification exemption.

Please complete the information below and sign:

Tax Parcel # 380 223 488 514  
 Applicant Name Dan Welch  
 Mailing Address 2930 Birchwood Ave.  
Bellingham, WA 98225  
 Phone # 360.296.2657

I certify that I meet all of the above requirements necessary for installer licensing exemption. In addition, I am aware that all other requirements of WCC 24.05 *Installation* apply to the installation of this OSS.

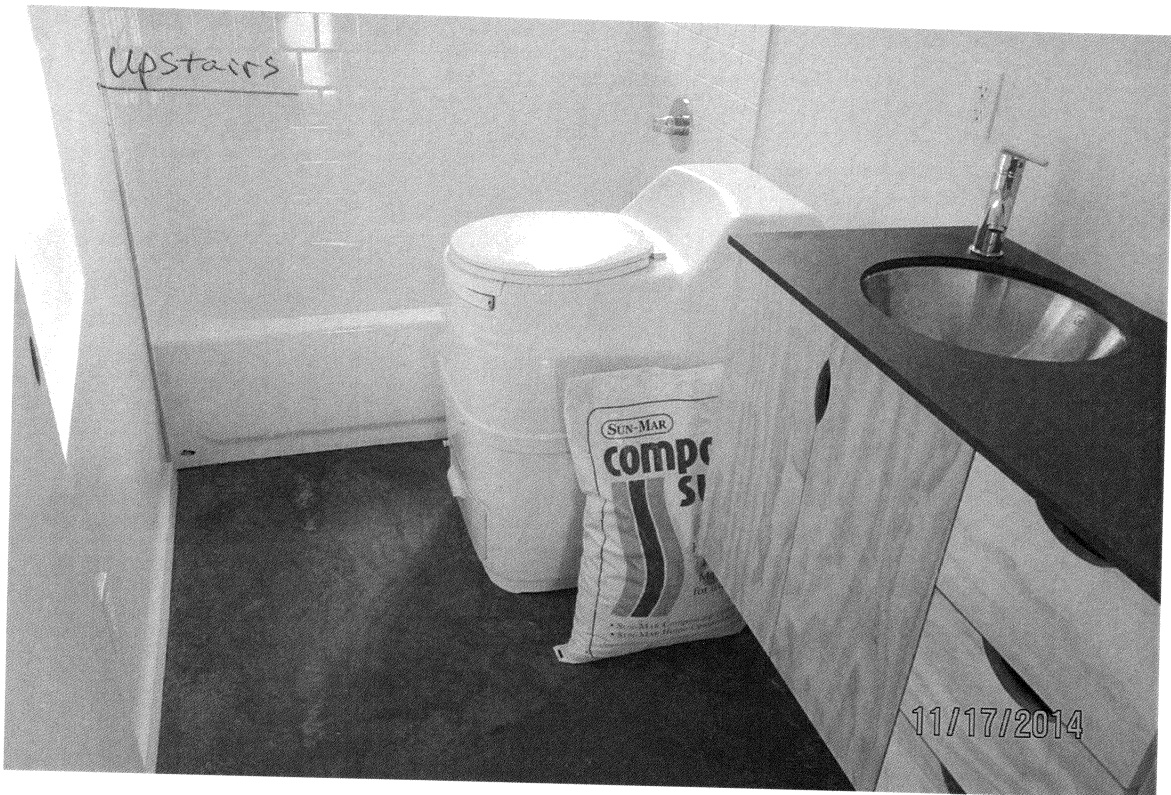
Dan Welch  
 Signature of Applicant July 22, 2014  
Date

Health Department Use Only

Approved [Signature] Date 7-24-14

Denied \_\_\_\_\_ Date \_\_\_\_\_

Reason \* Owner to not notify WCHD when the installation starts



OSS Permit Construction Inspection - Verification of Composting  
Toilet installation.  
2930 Birchwood Ave, TPN 380223-488514  
11-17-14 (LP) WCHD