



Douglas A. Ducey
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY



Misael Cabrera
Director

Notice of Proprietary Treatment Product Listing Reference Design Pursuant to Arizona Administrative Code R18-9-A309(E) and R18-9-E303

ADEQ File No. 20160215; LTF #64722

1. Product Name, Model, and Description

Product Name:	WMG Composting Toilet Construction Plans & Specifications
Models:	Barrel Composting Toilet & the Masonry Chamber Composting Toilet
Description:	<p>The Barrel Composting Toilet system utilizes 55-gallon high-density polyethylene barrels in a batch-type toilet system. A batch design refers to the complete segregation of aging material from fresh material.</p> <p>The Masonry Chamber Composting Toilet system utilizes separated chambers constructed of masonry block or formed concrete. Each chamber is approximately 1 cubic yard in volume. The batch-type composting toilet system allows for complete segregation of aging material from fresh material.</p>

2. Manufacturer Information

Name:	Watershed Management Group
Address:	1137 N. Dodge Blvd.
City/State/Zip:	Tucson, Arizona 85716
Country:	USA
Phone:	520-396-3266
Fax:	520-300-6700
Website:	https://watershedmg.org/

3. Treatment Performance

This product consists of the plans and specifications to construct a composting toilet. The design meets the requirements of R18-9-E303(C) and meets the requirements of Class A Biosolids according to 40 CFR 503.32. The product is approved for residential use. As a result, subsurface disposal of kitchen sink water and other sewage not treated in the composting toilet is required per R18-9-E303(F) unless the sewage is discharged to a sewage collection system per R18-9-A309(A)(5).

4. Product Applicability and Limitations for Use for a Recognized General Permit Technology

Applicability:

This approval is for only the Barrel Composting Toilet & the Masonry Chamber Composting Toilet models.

Limitations:

1. The product is for residential use and subject to A.A.C. R18-9-A312(F)(2) and (3).
2. The composting toilet should be installed in a covered structure to protect it from the elements and to keep it warm in cold/freezing temperature. The monthly average ambient temperature of the structure where the composting toilet will be installed should be above 12°C or 55°F for optimum composting unless additional storage for biosolids is provided as per R18-9-E303(E)(4).
3. No anti-freeze or any other chemicals should be added to prevent freezing.
4. Only biodegradable or 1-ply white Toilet paper can be used.
5. The WMG Composting Toilet system shall conform to the following:

Composting Model	Treatment System Design Capacity (adults per day) (See Note 1)	Number of Barrels or Chambers	Other Product Appurtenances			
			Vent Fan(See Note 2)	Wind turbine (See Note 2)	Interceptor & Dispersal Field (See Note 3)	Additives (See Note 4)
Barrel	1	2	None	None	Yes	Yes
Barrel	2	3	None	None	Yes	Yes
Barrel	3	4	None	None	Yes	Yes
Barrel	4	5	None	None	Yes	Yes
Chamber	1 - 5	2	None	None	Yes	Yes
Chamber	6-10	3	None	None	Yes	Yes

NOTES:

1. Children 10 years of age or less will be treated as 0.5 adult usage. Children over 10 years of age will be treated as an adult for usage calculations.
2. If used, maintain temperature requirements per A.A.C. R18-9-E303(E).
3. Dispersal of wastewater must comply with R18-9-E303(C & F) unless discharged to a sewage collection system per R18-9-A309(A)(5).
4. A.A.C. R18-9-E303(G)(1)(b), additives must be used per Manufacturer's Specifications.

5. Alternative Criteria and Exceptions for Use Under the Recognized General Permit Technology

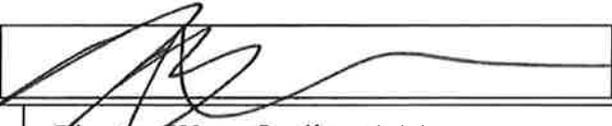
Alternative:	1. When the interceptor is receiving only urine, the minimum interceptor size will be determined using a minimum detention time of 2.1 days and urine unit flow rates from standard texts, literature sources or relevant area or regional studies.
Exception:	1. When the wastewater source is from a non-residential source, a Manufacturer's Design Review Report shall be submitted with the Notice of Intent to Discharge to specify component capacities, control settings, and supplemental installation & operational practices.

6. Documents Used as the Basis for this Proprietary Treatment Product Listing Notice

Application for Treatment Product Listing:	Tab # 1 - Arizona PPL Application: Dated 09/12/2016
Technical Drawings :	Tab # 2 – Technical Drawings
Engineering Details and Calculations:	Tab # 3 – Design Guidelines
O & M Material:	Tab # 4 – O & M Material
Third Party Test Data:	Tab # 5 – Third Party Testing Data
NOTE 1 – This document is an integral part of this Proprietary Product Listing Notice and is included in the Arizona Department of Environmental Quality website at: http://www.azdeq.gov/envIRON/water/engineering/product.html	

7. Terms and Conditions for this Proprietary Treatment Product Listing Notice

- A. This Notice of a Proprietary Treatment Product Listing shall remain in effect until any of the following occurs:
 - 1. Applicable provisions of the Arizona Administrative Code, Title 18, Chapter 9, Article 3 are revised;
 - 2. Documents used for the basis of this listing are altered or modified;
 - 3. Manufacturer claims which are relied upon for this listing are later determined to contain an error or omission;
 - 4. The manufacturer requests termination of this listing;
 - 5. A listing error or omission is identified; or
 - 6. The manufacturer and ADEQ mutually agree to reissue this notification to incorporate correction or update for any reason.
- B. This Notice of a Proprietary Treatment Product Listing does not apply when the:
 - 1. Facilities constructed according to the Proprietary Treatment Product Listing are modified or operated in a manner that conflicts with Arizona law or the documents used for the basis of this approval in Section 6.
 - 2. Facilities constructed according to the Proprietary Treatment Product Listing are used in a manner that cannot achieve the performance in Section 3 above.
- C. This Notice of a Proprietary Treatment Product Listing applies solely to the product specified in Section 1 above.
- D. The manufacturer is responsible for notifying the ADEQ of changes to contact information at the following address:
 - Attention: Product Listing Supervisor
 - Engineering Review Desk,
 - 1110 West Washington Street
 - Phoenix, AZ 85007.
- E. The listing by ADEQ of any proprietary product or service is not an endorsement by ADEQ or the State of Arizona. ADEQ does not endorse, represent, guarantee, warranty or defend the use of any product which is authorized for use pursuant to A.A.C. R18-9-A309(E). Product providers are a direct source unrelated to ADEQ or the State of Arizona. Use of any listed product is at the user's risk and the State assumes no liability.

Signature:		Date Signed:	12-28-16
Title:	Director, Water Quality Division		

Design Guidelines

Composting Toilet Barrel Kit Sizing Recommendations

- A) Locations with existing permitted wastewater system or hookup: 1 full-time user = 2 barrels; >1 user = 3 barrels
- B) Locations without existing permitted wastewater system or hookup: # barrels = # full-time users + 1;

Composting Toilet Multiple Chamber Kit Sizing Recommendations

- A) Locations with existing permitted wastewater system or hookup: 1+ full-time (FT) user = 2 chambers; >1 user = 2 chambers
- B) Locations without existing permitted wastewater system or hookup: # chambers = 1-5 full-time users

The above summary recommendations are based on the following:

Industry accepted capacity calculations are based on ~ 0.25 gallons per adult per day for total volume of combined feces, toilet paper and dry carbonaceous material.

Barrel Kit Sizing:

- Total capacity of one standard high-density polyethylene barrel = 55 gal.
- Effective capacity of one standard polyethylene barrel, allowing 9" of vertical clearance between top of barrel and top of compost = 41 gal.
- Effective capacity in days per barrel per adult = 164 days (41 gallons per barrel ÷ 0.25 gal. per person per day) which gives a 4-6month rotation per adult per barrel in full-time use. For outdoor installations, the average low temperature from November through February must be greater than 50°F.
- For locations where the average monthly temperatures for the 4 coldest months is less than 50°F the following practice is recommended until further testing is done: For every 5 degrees below 50°F, add 1 barrel per person. This insures that all barrels will have 4 months minimum exposure to average temperatures above 50°F. This guideline for colder temperatures is based on retention time calculations for 3 Arizona locations with monthly average temperatures during the 4 coldest months of less than 50°F.
- System sizing is based on the effective capacity calculations. The number of 55-gallon barrels required = the number of adults using the toilet on a daily basis + 1.
 - 1 adult requires a 2 barrel system (1 active barrel + 1 aging barrel)
 - 2 adults require a 3 barrel system (1 active barrel + 2 aging barrels)
 - 3 adults require a 4 barrel system (1 active barrel + 3 aging barrels)
 - 4 adults require a 5 barrel system (1 active barrel + 4 aging barrels)

Chamber Kit Sizing:

- Total capacity of one masonry chamber (~3ft x 3ft x 3ft) of the multiple chamber system = 201 gal.
- Effective capacity of one masonry chamber, allowing 9" of vertical clearance between top of chamber and top of compost = 151.5 gal.
- Effective capacity in days per chamber per adult = 606 days (151.5 gallons per chamber ÷ 0.25 gal. per person per day).

- Maximum number of full-time users to allow for a 4-6 month composting time in the aging (non-active) chamber is $606 \text{ days} \div 120 \text{ days} = 5 \text{ users}$. For outdoor installations, the average low temperature from November through February must be greater than 50°F .
- For locations where the average monthly temperatures for the 4 coldest months is less than 50°F the following practice is recommended until further testing is done: For every 5 degrees below 50°F , add 1 chamber per 3 persons. This insures that all barrels will have 4 months minimum exposure to average temperatures above 50°F . This guideline for colder temperatures is based on retention time calculations for 3 Arizona locations with monthly average temperatures during the 4 coldest months of less than 50°F .
- System sizing is based on the effective capacity:
 - 1-5 adults requires a 2 chamber system (1 active chamber + 1 aging chamber)
 - 6-10 adults require a 3 chamber system (1 active chamber + 2 aging chambers)

Urine Diversion Interceptor Sizing

- According to The Composting Toilet System Book, David del Porto and Carol Steinfeld, 1999, P. 40, "Studies have shown that the "average" adult from a northern European community will produce about 40.6 fluid ounces (1.2 liters) of urine...daily." This is corroborated by information on the Medline Plus website (<https://medlineplus.gov/ency/article/003425.htm>) posted by the U.S. Department of Health, National Institutes of Health, U.S. National Library of Medicine: "The normal range for 24-hour urine volume is 800 to 2000 milliliters per day (with a normal fluid intake of about 2 liters per day)."
- Urine interceptor volume in gallons = gallons of urine per person per day x 2.1 days of retention x # of adult users.
 - Assuming the high end of the above cited range (2000 ml = 0.53 gal), interceptor volumes would be:
 - 1 person = 1.1 gallons
 - 2 people = 2.2 gallons
 - 3 people = 3.3 gallons
 - 4 people = 4.5 gallons
 - Or, assuming a mid-point on the range of urine output, (1400 ml = 0.4 gal), interceptor volume per person per day =
 - 1 person = 0.84 gallons
 - 2 people = 1.7 gallons
 - 3 people = 2.5 gallons
 - 4 people = 3.4 gallons

Urine Diversion Infiltration Bed or Trench Sizing

- See Arizona Administrative Code R18-9-E302

Additional Notes:

Residential use and Non-residential use:

- Full-time users in a residential setting regularly add feces to the active chamber
- Non-residential use of a composting toilet (i.e. a workplace setting) has infrequent additions of feces to the active chamber.
- A Manufacturer's Design Report must be prepared for a non-residential use composting toilet.

Children and Adults:

- The amount of feces generated by a full-time user is proportional to body weight.
- It is conservatively assumed that a child of 10 years or less will produce $\frac{1}{2}$ the volume of feces as an adult.
- A child of 10 years or less is given the value of a $\frac{1}{2}$ full-time adult user.

Overview of the Barrel Composting Toilet System

The Barrel Composting Toilet system utilizes 55-gallon high-density polyethylene barrels in a batch-type toilet system. A batch design refers to the complete segregation of aging material from fresh material. The toilet is simple to use and odorless.

The design can be installed indoors or outdoors. In outdoor locations, it must be used in mild climates to insure sufficient heating for effective composting. Outdoor installations are suitable for locations with average temperatures of 50° F or higher during the four coldest months of the year. In colder climates, the system can either have additional barrels to allow the aging barrels to compost fully during warmer months or be located indoors, preferably in a heated space, where it is protected from temperature extremes.

A toilet seat and ventilation assembly is placed on top of an empty barrel. This barrel is known as the “active” barrel. When the active barrel is full, it becomes an “aging” barrel. At this time, the seat and ventilation assembly is moved to an adjacent empty barrel, which now becomes the active barrel. The aging barrel contents continue to compost for a minimum of four months before being emptied. The total number of barrels required for the system is based on the number of people using the toilet.

Safeguarding Public Health. The primary purpose of a composting toilet system is to provide a safe and effective process to handle human excrement. Adherence to the following performance criteria and adoption of the specified best management practices by each and every composting toilet system shall ultimately safeguard human and environmental health for both on-site and community stakeholders.

Composting Toilet Performance Criteria. The multiple barrel-style composting toilet reference design adheres to the following performance criteria, as required in E303(C), which are also indicated on the design sheets:

- 1) Prevention of groundwater contamination (E303(C)(1,3)): The composting chamber is fully contained and designed to maintain all additions within the chamber. The composting toilet is a “dry” system meaning waste liquid is not produced in the process. Diversion of urine occurs prior to contact with composting materials.
- 2) Disease vector control (E303(C)(2)): The barrel system utilizes insect and rodent-proof screens at all openings into the composting chamber. An insect light-trap is included in the design to capture and isolate any flying insects which may have gained access to the chamber during use.

Additional requirements under E303.

- 1) Construction material characteristics (E303(E)(1)): The barrel design is to be constructed with specified materials selected to be durable and corrosion resistant.

- 2) Toilet capacity sized appropriately (E303(D)(1)(d) and (E)(3)(a)): The number of barrels must correspond with the number of regular daily users plus one additional barrel to ensure a composting period of at least 4 months.
- 3) Effective composting environment (E303(G)(1)(a-j)): The best management practices detail how to maintain an effective composting environment which is dependent on an adequate mix of air, moisture, carbon material, and appropriate temperature. For outdoor installations, the average low temperature from November through February must be greater than 50°F. For locations where the average monthly temperatures for the 4 coldest months is less than 50°F the following practice is recommended until further testing is done: For every 5 degrees below 50°F, add 1 barrel per person. This insures that all barrels will have 4 months minimum exposure to average temperatures above 50°F. This guideline for colder temperatures is based on retention time calculations for 3 Arizona locations with monthly average temperatures during the 4 coldest months of less than 50°F.
- 4) Minimizing user interaction with aging compost materials (E303(G)(1)(d)): The system is designed to minimize user interaction with non-fully composted materials. The best management practices detail use and management processes to safeguard individual user's health.
- 5) Deactivation of potential pathogens: This reference design has been tested to ensure effective deactivation of potential pathogens to meet U.S. Environmental Protection Agency standards for Class A Biosolids which allows unrestricted use of the composted material in small quantities.

Best Management Practices. The best management practices outlined below are meant to facilitate both safe handling and optimum composting conditions free of smells and issues with vectors. The Barrel Composting Toilet System: Owner's Manual, which explains best management practices, shall be kept with the composting toilet system and passed on to future users/managers.

Use of the Active Barrel. A toilet seat and ventilation assembly is placed on top of an empty barrel. This barrel is known as the "active" barrel.

After each use of the toilet:

- 1) Moisten toilet paper with water from a squirt bottle (located beside toilet). This helps with the next step. Be sure to moisten only the toilet paper, not the surrounding compost.
- 2) Cover the deposit and toilet paper with sufficient carbon-based cover material to cover deposit and all toilet paper. Appropriate cover materials may include dry, finely chopped, carbonaceous material such as sawdust, wood shavings, chopped straw (less than 3-4" length), shredded paper, etc. Wood shavings can be obtained from pet stores, feed stores, cabinet makers, etc. Avoid shavings from cedar, redwood, treated wood or plywood.

- 3) Urine diverter should be rinsed with approximately 1/4-1/2 cup water from squirt bottle following each use. If pieces of cover material fall into the urine diverter, remove the screen from the diverter, turn it upside down and spray it clean using squirt bottle.
- 4) Close the lid after each use to prevent entry into the composting chamber by insects.

Composting in the Aging (inactive) Barrels:

- 1) The contents of the aging barrel will now compost for a minimum of 4 months with no additional material being added.
- 2) The aging barrels are aerated once every two weeks using a Compost Crank. The barrel containing the oldest material shall be aerated first, then the next oldest and finally the active barrel. This insures that pathogenic material will not be transferred from fresher to older material. The aerating process follows:
 - a. The aerator tool is cranked into the composting chamber until the spiral end contacts the bottom of the barrel. Without turning the crank further, the aerator tool is slowly pulled straight up until the spiral end reaches the surface of the compost. The process is then repeated in another part of the composting chamber approximately until all compost is thoroughly mixed and aerated (approximately 10-12 times).
 - b. Replace screen and cover, then repeat on next oldest chamber and finally on the active chamber.
 - c. After completing the aeration process knock the spiral end of the crank against the inside wall of the chamber to shake off larger composting material adhered to the crank.
 - d. While holding the crank over the chamber opening, a squirt bottle and a toilet brush easily removes the remaining particles adhered to the crank.
 - e. Store the aerator tool in a 30" length of 4" diameter plastic pipe when not in use. The pipe can be partially buried in the ground or mounted to a wall or post. If the pipe is mounted to a wall or post then fit an end cap to the bottom of the pipe.

Moving top assembly from one barrel to another: When a barrel is full, the toilet top assembly is moved to an empty barrel.

Emptying barrels: After a minimum retention time of 4 months, the composted contents of the barrel may be safely handled as a composted material and emptied. The composted material may be spread as compost in mulch basins around shrubs, vines or trees or deposited into an outdoor composting bin for further composting.

Performance Evaluation and Troubleshooting.

Odors: If odor problems arise it indicates that one or more of the four essential elements of composting is out of balance. Typically, the carbon/nitrogen ratio is out of balance, the compost is too wet and not enough air is present. All of these can be remedied by adding dry, high-carbon cover material and then thoroughly aerating the compost.

Attention should be paid to the compost during aeration. If the moisture content is greater than a wrung-out sponge, more carbonaceous material may be added.

Insects: Insects and other arthropods will be excluded from the compost by the insect screen over all vents and the weather stripping around the toilet seat on the active barrel and by the insect screen on top of the aging barrels. An insect trap is incorporated into the design to control insects that may enter the active barrel.

Online Reference Materials:

Reference design and additional materials can be also found at Watershed Management Group's Online Resource Library: <https://watershedmg.org/learn/resource-library>

Additional information about the Barrel Composting Toilet System can be found at www.omick.net/composting_toilets/barrel_toilet.htm and specifically:

Appropriate Climates for Outdoor Installations:

http://www.omick.net/composting_toilets/barrel_toilet_outdoor_locations.htm

Calculating Effective Leaching Chamber Absorption Area for Subsurface Urine Disposal:

http://www.omick.net/composting_toilets/barrel_toilet_urine_leaching_chamber.htm

Overview of the Masonry Chamber Composting Toilet System

The Masonry Chamber Composting Toilet system utilizes separated chambers constructed of masonry block. Each chamber is approximately 1 cubic yard in volume. The batch-type composting toilet system allows for complete segregation of aging material from fresh material. The toilet is simple to use and odorless.

The design can be integrated into new construction or built as a stand-alone structure. For composting toilet structures without heating systems, it must be used in mild climates to insure sufficient heating for effective composting. Outdoor systems are suitable for locations with average temperatures of 50° F or higher during the four coldest months.

A toilet seat and ventilation assembly is integrated into the top of each chamber. A chamber is designated as an “active” chamber and the second chamber is either “inactive” or if a composting pile is present then “aging”. When the active chamber is full, use is switched to the second chamber and the first chamber becomes an “aging” barrel. At this time, the second chamber becomes the “active” chamber. The aging chamber contents continue to compost for a minimum of four months before being emptied. A two chamber system is designed to accommodate approximately up to 5 regular users in a home setting.

Safeguarding Public Health. The primary purpose of a composting toilet system is to provide a safe and effective process to handle human excrement. Adherence to the following performance criteria and adoption of the specified best management practices by each and every composting toilet system shall ultimately safeguard human and environmental health for both on-site and community stakeholders.

Composting Toilet Performance Criteria. The chamber style composting toilet reference design adheres to the following performance criteria which are also indicated on the design sheets:

- 1) Prevention of groundwater contamination (E303(C)(1,3)): The composting toilet is a “dry” system meaning waste waters are not produced in the process. A minimal amount of leachate may infiltrate into the sub-surface native soil floor. Systems shall not be allowed in areas with groundwater levels less than 10 feet from the soil surface. Diversion of urine prior to contact with composting materials is optional in the double chamber composting system with a native soil floor. A urine diversion system is required if the composting chamber has a cement floor.
- 2) Disease vector control (E303(C)(2)): The chamber system utilizes insect and rodent-proof screens at all openings into the composting chamber. An insect light-trap is included in the design to capture and isolate any flying insects which may have gained access to the chamber during use.

Additional requirements under E303.

- 1) Construction material characteristics (E303(E)(1)): The chamber design is to be constructed with specified materials selected to be durable and corrosion resistant.
- 3) Toilet capacity sized appropriately (E303(D)(1)(d) and (E)(3)(a)): A double masonry chamber system may accommodate up to 5 regular daily users to ensure a composting period of at least 4-6 months for most parts of Arizona where the average low temperature is greater than 50°F. For outdoor installations, the average low temperature from November through February must be greater than 50°F. For locations where the average monthly temperatures for the 4 coldest months is less than 50°F the following practice is recommended until further testing is done: For every 5 degrees below 50°F, add 1 chamber per 3 persons. This insures that all chambers will have 4 months minimum exposure to average temperatures above 50°F. This guideline for colder temperatures is based on retention time calculations for 3 Arizona locations with monthly average temperatures during the 4 coldest months of less than 50°F.
- 2) Effective composting environment (E303(G)(1)(a-j)): The composting chamber is sized adequately to facilitate the composting process. The best management practices detail how to maintain an effective composting environment which is dependent on an adequate mix of air, moisture, carbon material, and appropriate temperature.
- 3) Minimizing user interaction of aging compost materials (E303(G)(1)(d)): The system is designed to minimize user interaction with non-fully composted materials. The best management practices detail use and management processes to safeguard individual user's health.
- 4) Deactivation of potential pathogens: This reference design has been tested to ensure effective deactivation of potential pathogens to meet US Environmental Protection Agency standards for Class A Biosolids which allows unrestricted use of the composted material in small quantities.

Best Management Practices. The best practices outlined below are meant to facilitate both safe handling and optimum composting conditions free of smells and issues with insects. The Masonry Chamber Composting Toilet reference design shall be kept with the composting toilet system and passed on to future users/managers to ensure documentation of the system is maintained.

Use of the Active Chamber. The empty chamber is known as the "active" chamber.

After each use of the toilet:

- 1) Moisten toilet paper with a squirt bottle (located beside toilet). This helps with the next step. Be sure to moisten only the toilet paper, not the surrounding compost.
- 2) Cover the deposit and toilet paper with ample carbon-based cover material. Appropriate cover materials may include dry, finely chopped, carbonaceous material such as sawdust, wood shavings, chopped straw (less than 3-4" length), shredded paper, etc.. Wood shavings can be

obtained from pet stores, feed stores, cabinet makers, etc. Avoid shavings from cedar, redwood, treated wood or plywood.

- 3) If optional urine diverter is installed, it should be rinsed with approximately 1/4-1/2 cup water from squirt bottle following each use. If pieces of cover material fall into the urine diverter, remove the screen from the diverter, turn it upside down and spray it clean using squirt bottle.
- 4) Close the lid after each use to prevent entry into the composting chamber by insects.

Composting in the Aging (inactive) Chamber:

1. The contents of the aging chamber will now compost for a minimum of 4 months with no additional material being added.
- 1) The aging chamber is aerated once every two weeks using a Compost Crank. At the end of 4-6 months, the chamber may be emptied. The aging chamber(s) shall be aerated prior to aeration of the active chamber to ensure that pathogenic material will not be transferred from fresher to older material. The aerating process follows:
 - a. The aerator tool is cranked into the composting chamber until the spiral end contacts the bottom of the barrel. Without turning the crank further, the aerator tool is slowly pulled straight up until the spiral end reaches the surface of the compost. The process is then repeated in another part of the composting chamber approximately until all compost is thoroughly mixed and aerated (approximately 10-12 times).
 - b. Replace screen and cover, then repeat on next oldest chamber and finally on the active chamber.
 - c. After completing the aeration process knock the spiral end of the crank against the inside wall of the chamber to shake off larger composting material adhered to the crank.
 - d. While holding the crank over the chamber opening, a squirt bottle and a toilet brush easily removes the remaining particles adhered to the crank.
 - e. Store the aerator tool in a 30" length of 4" diameter plastic pipe when not in use. The pipe can be partially buried in the ground or mounted to a wall or post. If the pipe is mounted to a wall or post then fit an end cap to the bottom of the pipe.

Emptying chamber: After a minimum retention time of 4 months, the composted contents of the chamber may be safely handled as a composted material and emptied. The composted material may be spread as compost in mulch basins around shrubs, vines or trees or deposited into an outdoor composting bin for further composting.

Performance Evaluation and Troubleshooting.

Odors: If odor problems arise it indicates that one or more of the four essential elements of composting is out of balance. Typically, the carbon/nitrogen ratio is out of balance, the compost is too wet and not enough air is present. All of these can be remedied by adding dry, high-carbon cover material and then thoroughly aerating the compost.

Attention should be paid to the compost during aeration. If the moisture content is greater than a wrung-out sponge, more carbonaceous material should be added.

Insects: Insects and other arthropods will be excluded from the compost by the insect screen over all vents and the weather stripping around the toilet seat on the active barrel and by the insect screen on top of the aging chamber. An insect trap is incorporated into the design to control insects that may enter the active chamber.

Online Reference Materials

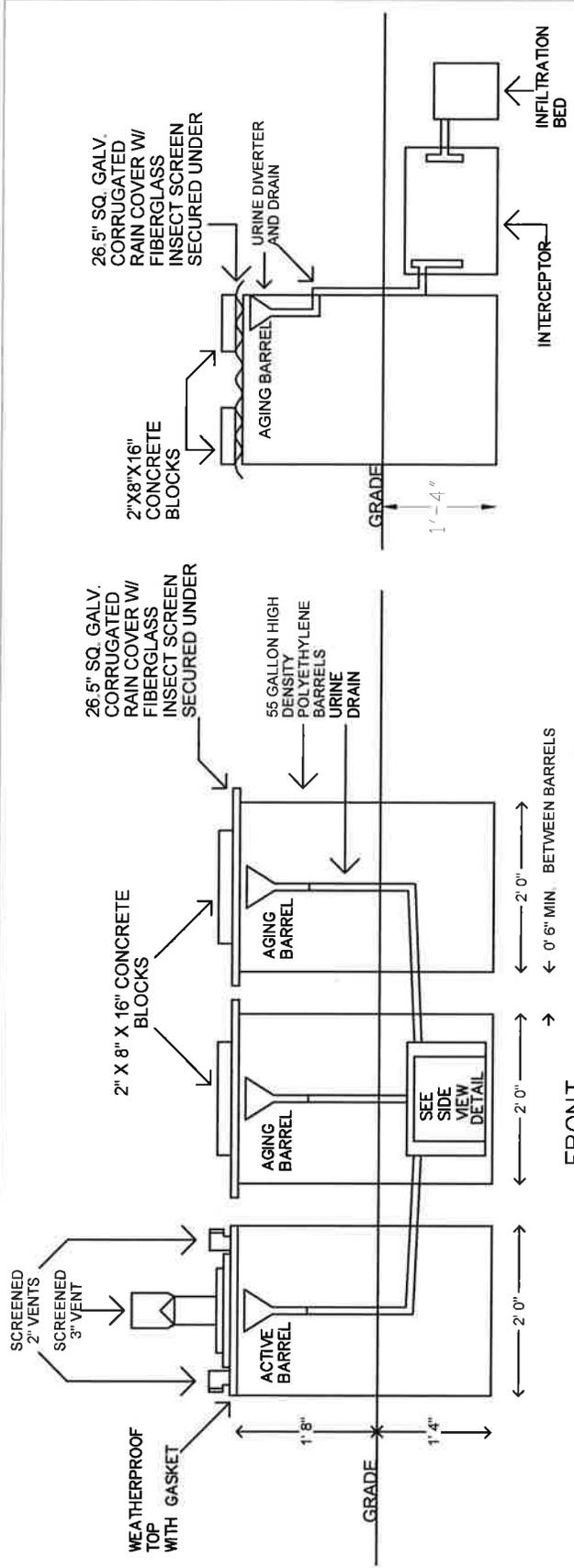
Reference design and additional materials can be also found at Watershed Management Group's Online Resource Library: <https://watershedmg.org/learn/resource-library>

Appropriate Climates for Outdoor Installations:

http://www.omick.net/composting_toilets/barrel_toilet_outdoor_locations.htm

Calculating Effective Leaching Chamber Absorption Area for Subsurface Urine Disposal:

http://www.omick.net/composting_toilets/barrel_toilet_urine_leaching_chamber.htm



SIDE VIEW

FRONT VIEW

SEE ACCOMPANYING TEXT FOR SIZING DETAILS OF NUMBER OF USERS, INTERCEPTOR, AND URINE INFILTRATION BED

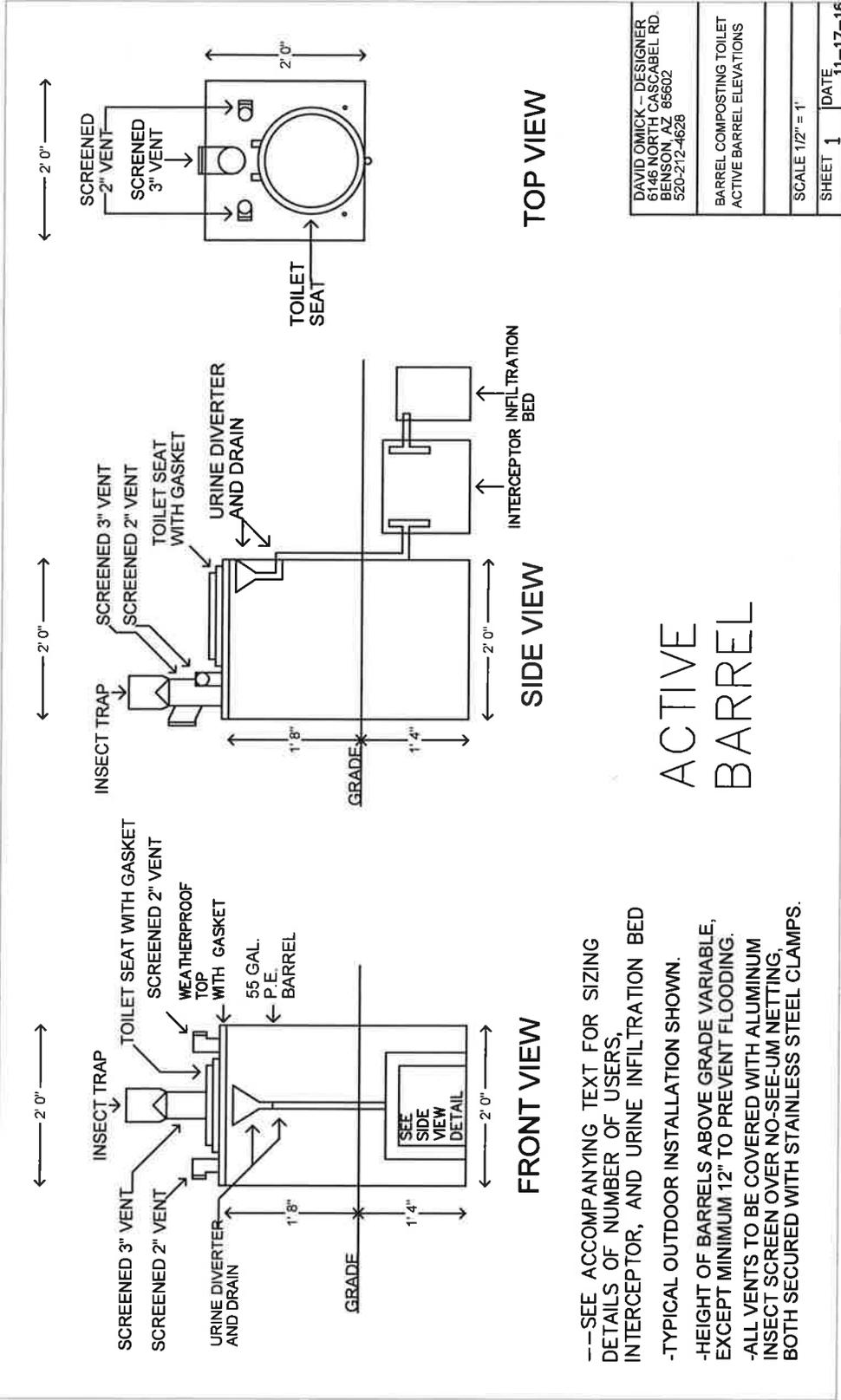
DAVID OMICK - DESIGNER
 14400 N. 171 CASCABEL RD.
 BEINSVALE, AZ 85602
 520-212-4628

BARREL COMPOSTING TOILET ELEVATIONS FOR TYPICAL 3 BARREL TOILET SYSTEM

SCALE	1/2" = 1'
SHEET	1
DATE	11-17-16

TYPICAL 3 BARREL SYSTEM



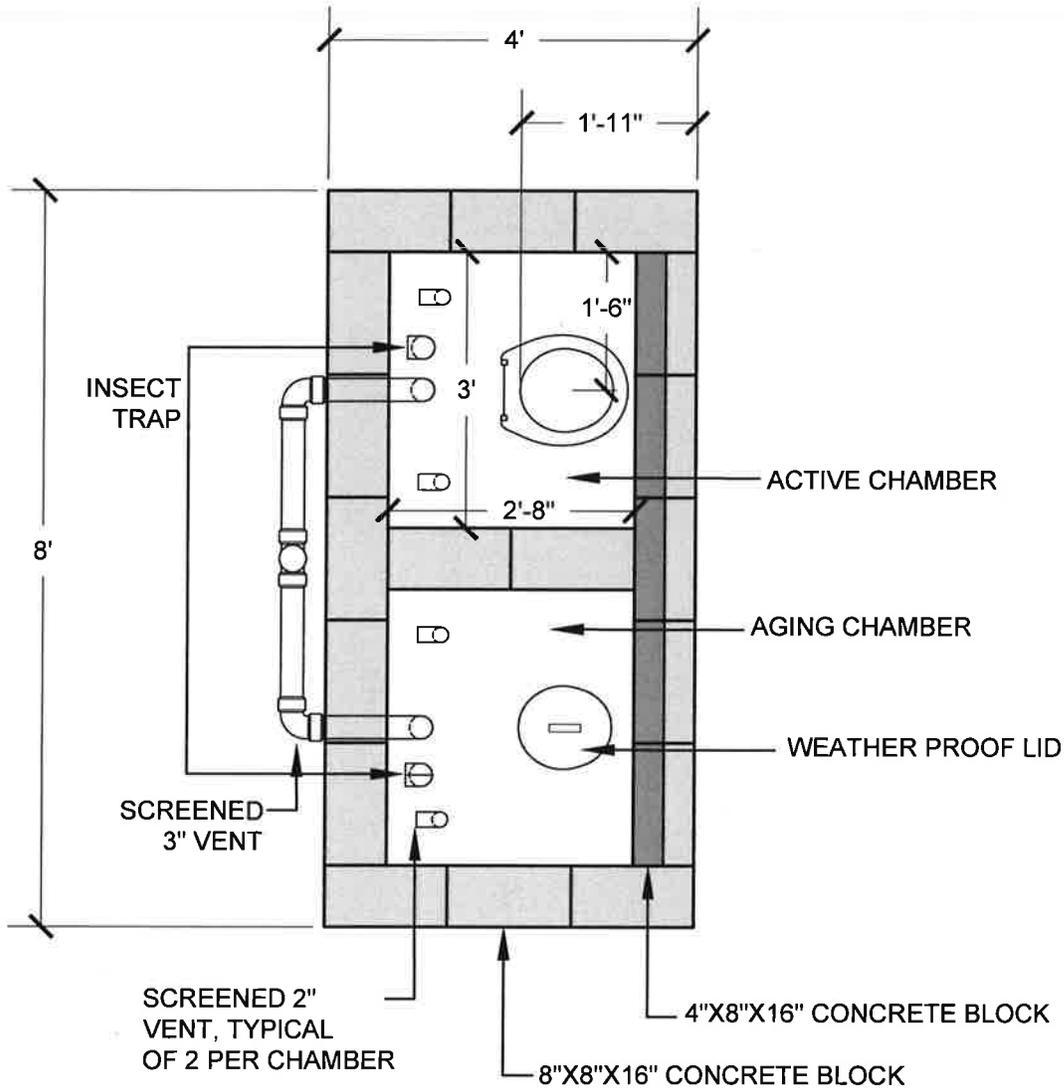


- SEE ACCOMPANYING TEXT FOR SIZING DETAILS OF NUMBER OF USERS, INTERCEPTOR, AND URINE INFILTRATION BED
- TYPICAL OUTDOOR INSTALLATION SHOWN.
- HEIGHT OF BARRELS ABOVE GRADE VARIABLE, EXCEPT MINIMUM 12" TO PREVENT FLOODING.
- ALL VENTS TO BE COVERED WITH ALUMINUM INSECT SCREEN OVER NO-SEE-UM NETTING, BOTH SECURED WITH STAINLESS STEEL CLAMPS.

DAVID OMICK - DESIGNER 6146 NORTH CASCABEL RD. BENSON, AZ 85602 520-212-4628	
BARREL COMPOSTING TOILET ACTIVE BARREL ELEVATIONS	
SCALE 1/2" = 1'	DATE 11-17-16
SHEET 1	

ACTIVE BARREL





SPECIFICATIONS:

CONCRETE BLOCK: 8" x 8" x 16" AND 4" x 8" x 16" OR FORMED CONCRETE

REBAR: #4 (1/2"), ALL OVERLAPS 40 DIAMETERS (20" MINIMUM)

CONCRETE: 3500psi, CONCRETE MIX FOR FOOTINGS AND FLOOR

MORTAR: TYPE S

GROUT: 3500psi, CONCRETE MIX OF EASILY POURED CONSISTENCY

COMPOSTING CHAMBER TREATED WITH A CONCRETE SEALANT (E.G. THOROSEAL) TO PREVENT LEACHING

NOTE:

ALL VENTS TO BE COVERED WITH ALUMINUM INSECT SCREEN OVER NO-SEE-UM

NETTING, BOTH SECURED WITH STAINLESS STEEL CLAMPS

SEE ACCOMPANYING TEXT FOR SIZING DETAILS OF NUMBER OF USERS, INTERCEPTOR,

AND URINE INFILTRATION BED

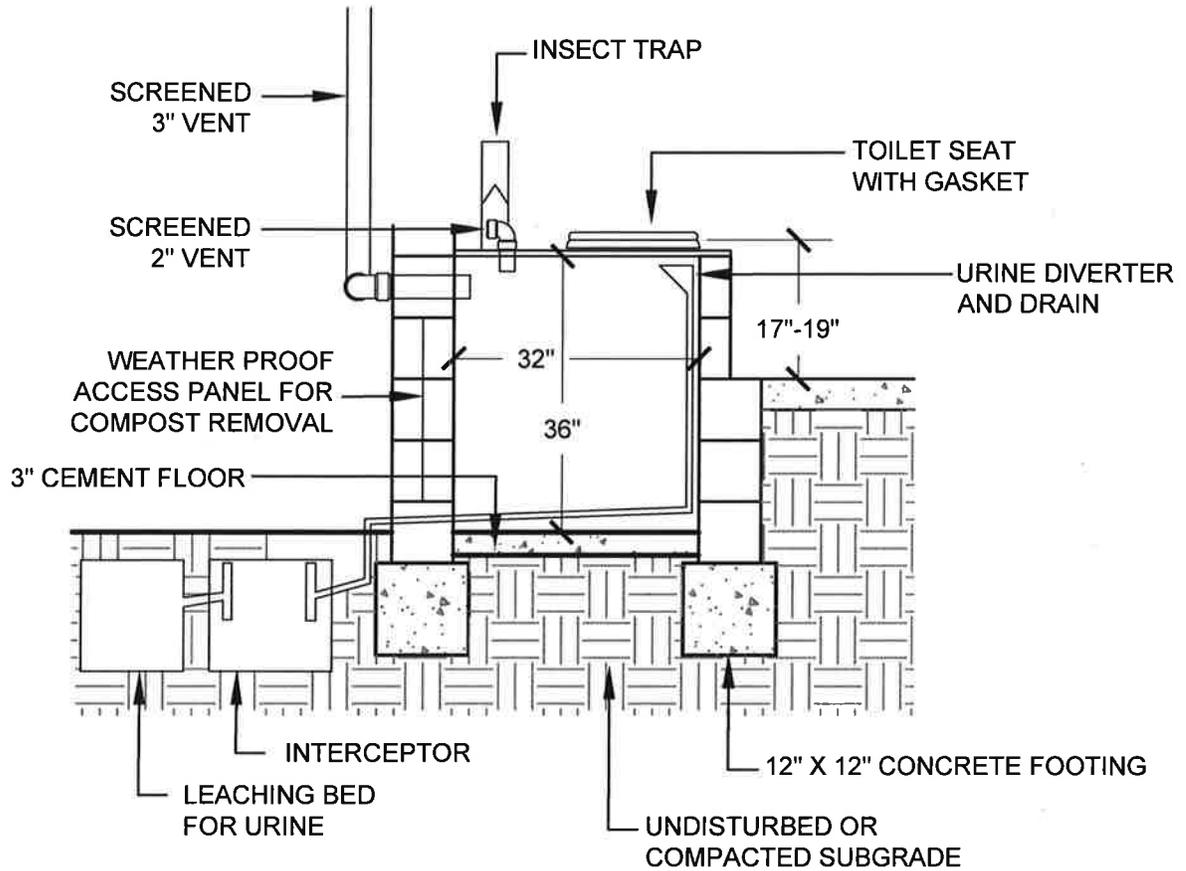
TYPICAL MASONRY 2 CHAMBER SYSTEM

SHEET 1

TOP VIEW

SCALE 1/2" = 1'-0"





TYPICAL MASONRY CHAMBER SYSTEM
WITH URINE DIVERSION AND CEMENT FLOOR

SHEET 2

SIDE VIEW

SCALE $\frac{1}{2}" = 1'-0"$

