

# out think the box

## Community Compost Toilet System (IAPMO WE·Stand Model)

*Prepared for those who want to know more about being a poo guru...*

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#### Recommended Citation

“Community compost toilet and urine diversion system modeled after the International Association of Plumbing and Mechanical Officials (IAPMO) Water Efficiency and Sanitation Standard (WE·Stand)” (2018).  
<http://www.kimgerly.com/projects/IAPMO-WEStand.pdf>

# out think the box

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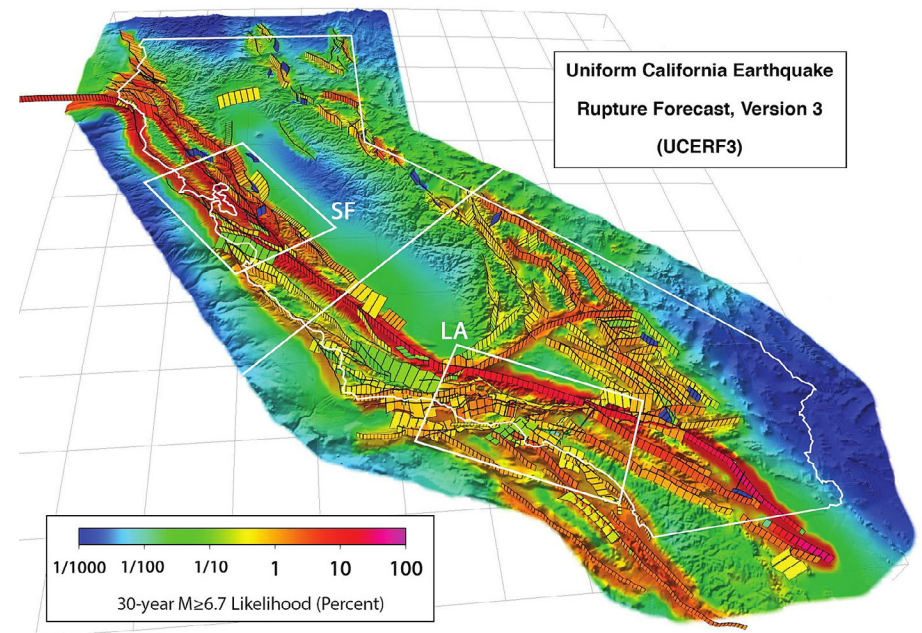
# introduction

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## THE OTHER 'DROUGHT'

*Pacific Rim (USA West Coast) mega-quakes predicted*

- California's 'other drought'
  - San Andreas Fault (Southern California)
  - Hayward Fault (highly urbanized SF East Bay)
- 23Jan18 | 7.9 magnitude earthquake AK Kodiak Island
- Cascade subduction zone (Pacific NW)



California's major faults. The 3rd Uniform California Earthquake Rupture Forecast (UCERF3) estimated probabilities. The San Andreas Fault and Hayward Fault systems are red on the likelihood scale.

Citation: USGS, <https://on.doi.gov/2qVm5n0>

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# the opportunity

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## WHY DISASTER SANITATION?

Out think the box.  
Prepare. Respond. Adapt.

*Culturally the USA West Coast is attuned to earthquake readiness, but lacks a:*

- Long-term strategy
- Holistic, resilient, redundant response

*So what are the consequences?*



## PHLUSH (Public Hygiene Lets Us Stay Human)

- What happens when the toilets don't work?
- What will happen to the sewer infrastructure?
- Do we have the knowledge and materials to build safe, functional toilet systems?
- Shouldn't we plan for more resilient sanitation systems?



# resilient sanitation system 6

## THE ANSWER

*Community composting  
toilet system*

EcoVillage Eco-san

1.75 acre (0.7 hectares)

Portland, OR, USA

- Latitude: 45°29'31.39"N
- Longitude: 122°37'31.02"W

*We don't have to pan for gold anymore!*



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# what is iapmo we•stand\*? 7

## INT'L ASSOC. OF PLUMBING AND MECHANICAL OFFICIALS (IAPMO)

*1st comprehensive  
codified requirements for  
compost & urine diversion  
toilet fixtures*



### Requirements:

- Separate collecting devices (commodes) & compost processor
- Material construction (durable, non-corrosive)
- No environmental composting leachate discharge
- Compost processor must be:
  - covered (rain prevention)
  - enclosed, ventilated (vermin prevention)

*\*Water Efficiency and Sanitation Standard*

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# 2017 iapmo we-stand I commode materials list

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Commode	Design inspired by the Joseph Jenkins Loveable Loo™
Cabinet	Sealed fir, pine, or other untreated wood capable of holding a 5-gallon container
Lid	Plywood
Toilet Seat	Standard, compression molded plastic
Container	5-gallon with lid (humanure collection device)
Features and recommendations	<ul style="list-style-type: none"><li>• Waterproof, sealed wood</li><li>• Easy to install</li><li>• No electricity, water, plumbing connections required</li></ul>



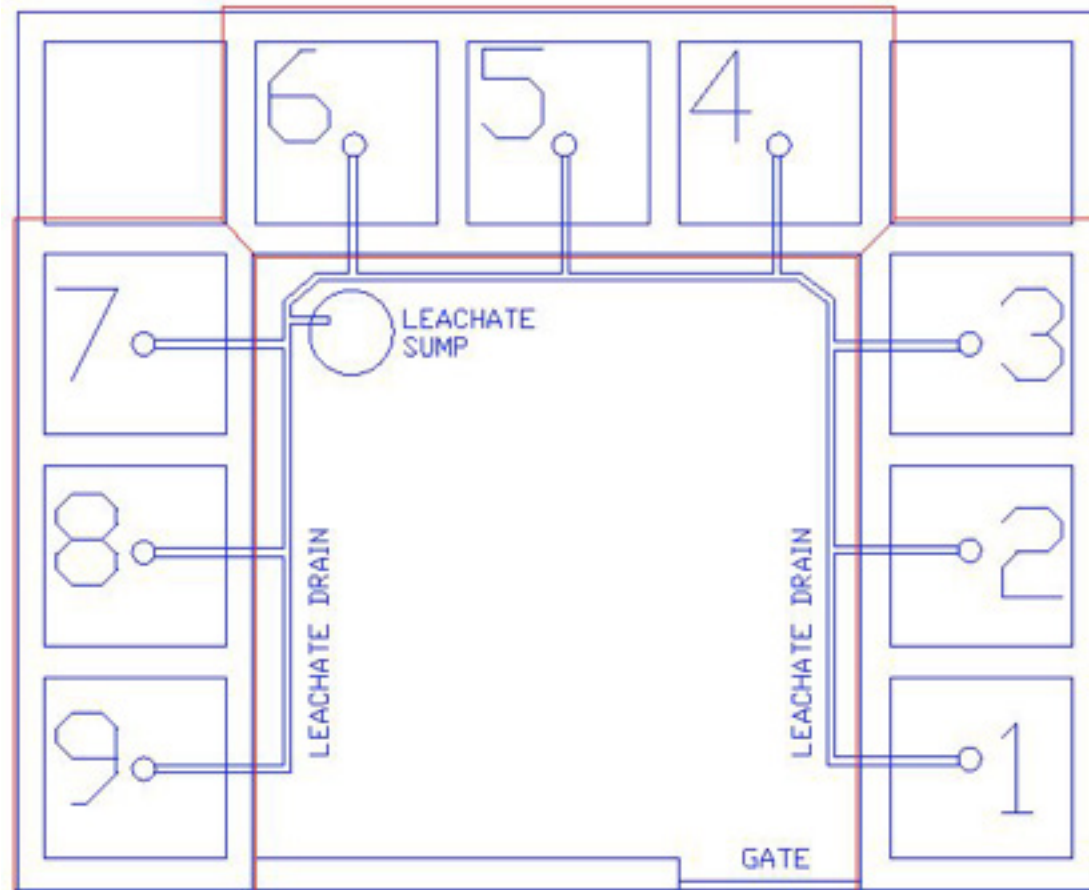
# 2017 iapmo we-stand I composting processor (1)

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Composting Processor	Features
<p><b>Bins (9 count, 3 modules)</b></p>	<p><b>DIMENSIONS</b></p> <ul style="list-style-type: none"> <li>• Exterior (~25' x 19')</li> <li>• Interior (48" x 48" x 48" ~2.4 yards<sup>3</sup>)</li> </ul> <p><b>WALLS</b></p> <ul style="list-style-type: none"> <li>• Durable, low-cost, 8" x 8" x 16" concrete blocks (insulation)</li> <li>• Vermin proof</li> <li>• Wooden sill plate for roof support (located on top of walls)</li> </ul> <p><b>BOTTOM</b></p> <ul style="list-style-type: none"> <li>• Sloped concrete pad (4" above pad perimeter lip)</li> <li>• Waterproof</li> <li>• Center drain grate (leachate collection)</li> </ul> <p><b>ROOF ASSEMBLY (sloped)</b></p> <ul style="list-style-type: none"> <li>• Corrugated, galvanized steel</li> <li>• Rain accumulation prevention</li> <li>• Vermin mitigation</li> <li>• Hinged</li> <li>• 3-bin module shares a common roof</li> <li>• No electricity, water, plumbing connections required</li> </ul>
<p><b>Sump Area (Plumbing)</b></p>	<p>Leachate collection includes drain grate, sump barrel, sump lid; 2" ABS piping with 1/4" per foot slope, 2" ABS fittings; Contamination prevention of local soil and groundwater</p>
<p><b>Ventilation</b></p>	<p>Wire mesh screen air vent (hardware cloth); Vermin and insect management; ~70 in<sup>2</sup></p>
<p><b>Security</b></p>	<p>Gated courtyard (hinged and latched)</p>

# 2017 iapmo we-stand I composting processor (2)

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# 2017 iapmo we-stand I composting processor (3)

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# 2017 iapmo we-stand I

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## composting bin construction



a



b



c



d

**Pad edge:** 4" tall lip, channels all leachate to the center drain (a). **Bin Bottom:** 4" thick, 48"x 48" waterproof concrete pad sloped toward a center drain (b). **Vapor barrier (6 mil):** Placed under each concrete pad (c). **Drain plumbing:** Shown prior to vapor barrier placement and concrete pad poured (d).

# 2017 iapmo we-stand I

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## compost leachate collection



**a**



**b**



**c**

Leachate sump area (a). Drains for bins 3, 4, 5, and 6 to sump area (b). Sump area shutoff valve (c).

# 2017 iapmo we-stand I urine diversion

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Two-275 gallon (1041 liter) tote tanks fitted with a capped urine funnel on the top port (a, b, c).

Adding urine from a bottle (d).

Tank's bottom discharge port can be fitted with a convenient adapter (e, f) to facilitate transfer to a distribution container (g).



a

b

c

d



e

f

g

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# [more] urine diversion

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## ON-SITE URINE TREATMENT, DISPOSAL

- IAPMO WE•Stand Section 403.9.11.1-8
  - Retention without addition for 6 months before usage
  - Application to the compost processor
  - Pasteurization to 158°F (70°C) for thirty minutes, or
  - Other method approved by the Authority Having Jurisdiction

## REUSE OF URINE

- Stimulate plant growth w/ P, N, K, S, micronutrients
- Distribute urine to the base of plants:
  - Dilute urine 1:5 or 1:10 depending on vegetation
  - Irrigate with water to clean vegetation

# temperature data

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## BIN #6

Compost temperatures, weekly log (°F/°C)

Bin completed 25Oct2015

Week	0	Peak (Day 5)	1	2	3	4	5	6	7	8	9 Final Check
Center	131/55	167/75	160/71	147/64	139/59	135/57	130/54	108/42	97/36	70/21	60/16
4" Inside Perimeter	107/42	133/56	130/54	121/49	113/45	105/41	91/33	73/23	71/22	63/17	56/13
Perimeter	91/33	85/29	84/28	78/26	72/22	65/18	56/13	49/9	49/9	45/7	40/4
Date	25 Oct	29 Oct	1 Nov	8 Nov	15 Nov	22 Nov	29 Nov	6 Nov	13 Nov	20 Dec	27 Dec



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# pathogen testing

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## MISSION ACCOMPLISHED!

Out think the box.  
Prepare. Respond. Adapt.

Results exceeds USEPA\* Class A  
Biosolids standards (<1000 fecal  
coliform units (cfu)/g) for com-  
post safety

WE•Stand exceeds NSF/ANSI\*\*  
Standard 41: Non-liquid System

\*United States Environmental Protection Agency

\*\*National Sanitary Foundation/American National Standards Institute



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# performance based

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## eco-san

### COMPARED TO FLUSH TOILETS

Out think the box.  
Prepare. Respond. Adapt.

- Destroys pathogens
- Safe and secure
- Odor-free
- Vermin-free
- Retains nutrients
- Conserves water

**Definition:** ecological sanitation (eco-san)  
Safely close the loop between sanitation and  
agriculture.



↑ Economic viability & empowerment

↑ Job opportunities

↑ Resiliency

↑ Food security

↑ Healthy, fresh food access

↓ Dependency on social services agencies

↓ Stress on municipal H<sub>2</sub>O infrastructure

↓ GHG emissions e.g. locally grown produce



*Composting Toilet and  
Urine Diversion System  
Operation & Maintenance  
(O&M) Manual* - available on request

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*IAPMO WE•Stand*

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