



**City of Phoenix**  
FIRE PREVENTION

**Appeal &  
Engineering Interpretation  
Application**



**Reference Phoenix Fire Code Chapter 1**

☐ Engineering Interpretation

☒ Appeal to the Fire Marshal

☐ Appeal to the Fire Safety Advisory Board

Project Name <b>27th Avenue Phoenix Compost Facility</b>		Project Address <b>3060 S 27th Avenue, Phx AZ 85009</b>	Appeal / Interpretation Number <b>FPAP 150070</b>
Owner's Name <b>City of Phoenix-Allan Smolko</b>	Address <b>200 W Washington St, 7th Floor, 85020</b>		Kiva Number
Applicant Name (person not business) <b>Marcelo Reyna</b>	Applicant's Address <b>5240 N 16th Street, Suite 101, 85016</b>		Phone <b>602-534-3749</b>
Applicant's Email Address <b>mareyna@awarch.com</b>		Phone <b>602-279-4373</b>	
Relationship to Project and Company Name <b>Architectural Representative - Arrington Watkins Architects</b>		FP Staff Familiar with Project <b>Steve Petrie</b>	
A request is hereby made for an appeal or engineering interpretation related to Section(s) of the Phoenix Fire Code, which requires that: (use attachment if necessary).		<b>2808.3</b>	
<p>Piles shall not exceed 25 feet in height, 150 feet in width and 250 feet in length</p>			
<p>State in detail what is proposed in lieu of literal compliance with the Fire Code (use attachment if necessary).</p> <p>A variance is being requested to allow an increase in width and length for piles that are not to exceed 10 feet in height. This will result in a lower allowable maximum volume of materials in the pile than the resulting volume from a pile described by the code section. See attached letter for detailed information.</p>			
<b>MARCELO REYNA</b> If applicant is not the owner, Owner's architect or engineer, the owner's signature must appear on the line above.		<b>[Signature]</b> Applicant's Signature Title <b>Project Manager</b>	
FOR FIRE PREVENTION USE ONLY			
<input type="checkbox"/> Approved		<input checked="" type="checkbox"/> Approved with Stipulations	
<input type="checkbox"/> Denied			
Hearing Date & Time:	<b>7/29/15 @ 9:50am</b>		
Hearing Attendees:			
<b>[Signature]</b> Fire Marshal		<b>7-29-15</b> Date	

This publication can be made available in alternate formats (Braille, large print, computer media, or audiotape) upon request.

Phoenix Fire Department – Fire Prevention Division  
150 South 12<sup>th</sup> St. Phoenix, Arizona 85034-2301  
602-262-6771 or (602) 495-5555 TTY



## City of Phoenix

### FIRE PREVENTION DIVISION PETITION OF APPEAL TO THE FIRE MARSHAL

Date: July 29, 2015  
FPAP: 150070  
Name: 27 Avenue Phoenix Compost Facility  
Address: 3060 South 27 Avenue, Phoenix, AZ

#### APPROVED WITH STIPULATIONS

We are in receipt of your appeal for the 27 Avenue Phoenix Compost Facility, 3060 South 27 Avenue, Phoenix, AZ. It is our understanding that you have requesting relief from the 2012 Phoenix Fire Code, Section 2808.3 Size of piles. Piles shall not exceed 25 feet (7620 mm) in height, 150 feet (45 720 mm) in width and 250 feet (76 200 mm) in length

Exception: The *fire code official* is authorized to allow the pile size to be increased when additional fire protection is provided in accordance with Chapter 9. The increase shall be based upon the capabilities of the system installed.

Upon review of the appeal and information provided the request to allow an increase in width and length for piles that are not to exceed ten feet in height has been approved with the following stipulations:

- A Policy/procedure shall be provided for the process.
- Storing piles shall stay inside fire requirements.
- Dedicated front loaders (2), water truck, and burner truck shall be available for use in case of an event.
- A middle fire access lane will be maintained if/when piles become separated.

Approved by:

Jack Ballentine  
Fire Marshal







Arrington Watkins Architects

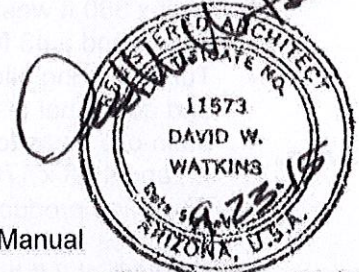
## Project Memo

To: Steve Petrie  
City of Phoenix - Fire Department

Project: 27<sup>th</sup> Avenue Compost Facility Project  
Project No. PW16700021 / Contract No. 140407

Date: September 21, 2015

Subject: City of Phoenix 27<sup>th</sup> Avenue Compost Facility Operations Manual  
Excerpts for Fire Prevention / Control



EXPIRES 12-31-15

This memo was prepared for the fire regulation variance requested for the City of Phoenix 27<sup>th</sup> Avenue Compost Facility. The following is a brief summary of the operations and controls approach to managing organics through the facility, with excerpts from the operations manual on fire prevention/control plans and operator training. Our design team has worked closely with City of Phoenix staff and compost professionals to develop a site strategy, including careful pile management, and temperature controlled aeration systems that will meet and exceed existing and pending fire code regulations for compost facilities within the City of Phoenix.

*Operations management (volumes and times):* The phase I compost design has a total processing capacity of 110,000 tons per year (TPY) and phase II capacity of 220,000 TPY. The facility will serve City of Phoenix single family residents, bulk residential pick-up and self-haul services, city institutions, and commercial green and food customers (e.g., grocery stores, landscapers, organics hauling partners). Hours of operation for public are Mon – Fri 5:30am – 5pm and Sat 7am – 3 pm, with Sundays closed to the public but operating from 7am – 1 pm.

Organic feedstocks are managed on-site for 50 - 120 days, moving through active composting, curing and screening/storage. The compost operation will use best management practices and will be in compliance with fire regulations for pile management from the Phoenix Fire Department, as well as any approved exceptions for this site. City of Phoenix regulations for mulching operations include piles sizes that are no greater than 150 ft x 250 ft, piles no taller than 24 ft and elevation marking poles nearby, fire hydrants within 400 ft of all areas of the pile, fire lane access within 150 ft of all sections of a pile, and push-out areas the size of 1/4 of the pile volume at 3 ft adjacent to each pile. The operation is installing all required fire hydrants and access roads within these specifications.

The major elements of the compost facility are listed below and on the attached site plan:

- Located in the southwestern part of the 27<sup>th</sup> Avenue Transfer station, the project utilizes existing controlled-access entrance and exit roads from the NW facility gate
- Materials receiving areas on the south side of the facility are for green and other organics unloading, including two 25 ft x 100 ft areas for small vehicles and one 25 ft x 125 ft area for larger commercial customers
- Fixed position or mobile machinery for sorting and grinding and mixing to prepare materials for composting or mulch.
- Turned aerated pile (TAP) active composting area with two to four active compost piles built to a height of 8 ft and dimensions of 175 ft x 180 ft. In-ground forced aeration systems using a biofilter and reversing air flow will control temperatures and odors, while

[Excerpts from 'Operations Manual for 27<sup>th</sup> Avenue Compost Facility' related to pile management and fire prevention/control]

### Compost Facility Overview

The City of Phoenix 27<sup>th</sup> Avenue compost facility is a modern controlled turned aerated pile (TAP) composting operation, which manages for temperature using forced aeration and frequent mixing (every 3 to 7 days). Compost piles are kept at a height no greater than 9-ft and at a moisture content greater than 40%. A temperature control system monitors compost pile temperatures continuously and increases the aeration flow when pile temperatures exceed 135°F. Moisture lost due to forced aeration is replaced during turning operations. These key temperature-controlled system and moisture management features are designed in the optimum range for high quality compost product development, to control odors, vectors, and to significantly reduce the likelihood of fires.

### Materials Flow

Materials flow through four areas in the facility over 50 – 120 days, including receiving, active composting through TAP system, turned curing, and screening/storage. The flow of materials from start to finish is explained further here and corresponding areas can be viewed in the site plan.

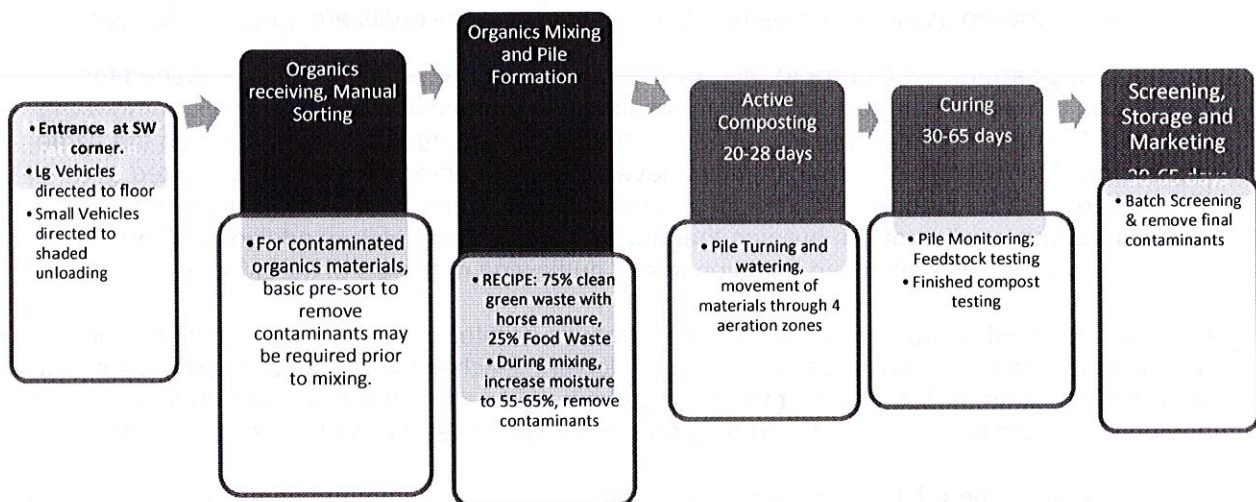


Figure 1 Compost Facility Organic Materials Flow Diagram.

Moisture management and regular turning is key for fire prevention through this composting process. Typical incoming green materials have 15 – 35% moisture content while incoming food scraps will vary from 40 – 80% moisture content depending on cardboard levels. Green materials are wet. Operator management of time interval until the next flipping and re-wetting is critical (every 3 - 7 days). Any piles in storage without active management are flipped monthly to reduce moisture differentiation and to keep mixture evenly distributed.

complete air change every 3 minutes. This air movement strips moisture from the composting materials providing significant cooling through evaporation. As the materials move laterally to the north across the aeration floor over 20 to 28 days, the aeration rate drops to 4 cfm/cubic yard, 3 cfm/cubic yard and finally 2 cfm/cubic yard.

A feature of the aeration system is that it provides more effective cooling of the entire depth of the compost pile. The air flow direction is changed from pushing air out of the floor and up through the pile to drawing air in from the compost bed. This reversing airflow helps control pile hot and cool spots. It improves the pile moisture retention and makes the pile more uniform in temperature than if air was pulled or pushed in one direction only. Top and bottom sensors on each temperature probe are used to determine when to switch air flow directions.

*Temperature controls.* Temperatures are primarily monitored by automated temperature probes placed in the compost piles, 8 probes per active aerated pile that monitor every hour. Pile temperatures during active composting are targeted at 125 – 145°F. The aeration system is activated if temperatures exceed these temperatures and blowers stay on all the time. Each probe has a top sensor 18" below the handle, and a bottom sensor at the tip of the 5 foot probe. The probes send their data to a Programmable Logic Controller (PLC) which then decides what to do based on temperature targets set by the operator. The PLC sends a control signal to the air manifold dampers, which vary the volume of air delivered to each aeration zone.

**Turned Curing Areas.** After 24 days the stabilized compost continues to be turned laterally to the north every 7 – 10 days and is watered as needed to maintain an average of 45% moisture. Materials are moved to the curing area to allow the compost to mature (approximately 30 days). There are four Turned Compost piles that are turned and watered for Phase 2 of the process (with the ability to aerate if necessary to control temperatures).

**Compost Screening and Storage areas.** After the curing period, compost is screened to separate the larger materials from the fine materials to prepare for distribution. Compost distribution will be to City facilities and/or Phoenix residents or commercial businesses. Finished/cured compost products will be stored on-site in stockpiles in the north part of the facility. Storage piles without active management are flipped monthly to reduce moisture differentiation and to keep pile evenly distributed. Above-ground aeration will be used as needed during summer months to cool storage piles.

Compost Operator duties will be as follows:

- To be present during all operating hours.
- Maintain vigilant surveillance of entering and exiting traffic, unloading operations and compost placement operations. Monitor all in-coming waste loads for any unacceptable wastes – the operator has the right to reject any questionable loads.
- Communicate with all users any general questions about the facility operations, hours, contaminant removal, safety, etc.
- Periodic and daily maintenance of all equipment, including inspection and operational check of all fire protection equipment.
- Rewetting and turning piles as required.
- Checking tank levels and pump operation.

- b. A fire hose should be available as the loader removes material to spray directly onto burning embers – or a burning loader. Apply soil or wet compost to piles and materials.
- c. Apply water to hot materials using high volume water hoses from hydrants, water truck and/or fire extinguishers pointed at base of fire.
- d. The fire department or an in-house fire brigade should be on stand-by as the pile is opened.

\*Key operator safety note: Operator should approach fire from up-wind of the pile and back-up into the wind to maintain visibility and keep smoke away from operator.

- 3. Emergency coordinator should also:
  - a. Notify all on-site personnel;
  - b. Ensure clear site access for emergency response personnel.
  - c. Halt all delivery/shipment of materials and site operations;
  - d. Make material handling equipment and operators available for fire department direction to assist in managing the fire.
  - e. Evacuate personnel from the facility by using the east access road to the facility north exit gate.
  - f. Make sure equipment is removed from the location of the fire, if it can safely been done.

### Evacuation Plan for Site Personnel

Due to the nature of the operation, site evacuation is extremely unlikely. However, should such a situation arise, it will be the responsibility of the on-site emergency coordinator to advise all unnecessary personnel to leave the site. An elaborate alarm system is considered unwarranted. Evacuation of the area will proceed via the site access roadway to the south and east. If this road is blocked, evacuation should occur to the west of the site to exit at 35th Avenue.

### General Compost Fire Training for Operators (adapted from Biocycle 2004, V.45, p.30)

#### Heat Definitions

Three terms need to be defined: BTU, temperature versus heat energy, and heat capacity.

**BTU** One BTU is the quantity of energy required to heat one pound of water one degree Fahrenheit. In other words, when you pick up a pint of beer, and hold it in your hand for a bit, by the time that beer has been warmed 1°F, you have transferred 1 BTU of energy to the beer. That's a BTU. (or a Beer Thermal Unit...!!)

**Temperature.** Temperature is a sensory measurement, how it "feels," and can be measured with a thermometer.

**Heat.** Heat is based on how much work, such as warming compost, can be done – the "quantity" of energy. For example, a match flame is really hot, but a bathtub full of warm water has a lot more heat energy if you are trying to warm up your body.

2. **Hot Spots and Vents.** Think of an old, dry compost pile, or a pile of overs screened out of the finished product. Water seeps into the dry compost and restarts microbial activity and initiates reheating. A “macropore” or crack from the hot spot to the surface can develop into a **vent, or chimney**. Air movement up through this vent draws more oxygen into the hot spot where heat is being generated, rapidly escalating the transition from a biological process to chemical oxidation forming smoke and glowing embers. Appearance of this hot, humid air at the surface can be an important indicator that heating is taking place inside the pile.

**How to Identify Compost Hot Spots.** Vents from a hot spot can be identified:

- **At cooler times of the day** - the condensing mist from the vent shows up most easily.
- **Looking for discolored compost areas and mushrooms** – as the mist emerges from the pile, condensation on the surface discolors the compost around the vent. Sometimes, mushrooms may be growing there. Always look for the tell-tale blueish smoke or smell of combustion.

**How to Troubleshoot Hot Spots:**

- Insert your temperature probe near the vent to look for excessive temperatures as an early warning sign. Probing the vent will give an indication of the hottest temperatures within the pile. While detecting an internal temperature of 180°F to 200°F does not guarantee a compost fire, probability of a fire rapidly escalates at this temperature.
- Wet down that part of the pile and turn and re-moisten the pile immediately by loader and hand watering or compost turner with an irrigation hose.

As Smokey the Bear knows best, only you can prevent [compost] fires. Prevention is the only adequate solution to avoiding dangerous and expensive fires at compost facilities. Here are our rules of thumb for operators to prevent compost fires:

**Rule #1.** Review fire prevention and fire control measures frequently. Plan and practice fire control procedures with Phoenix fire department representatives.

**Rule #2.** Assure adequate ventilation of compost pile to release heat and increase evaporation of water, a heat absorbing process. Ventilation can be achieved by turning the pile or using a mechanical aeration system.

**Rule #3.** Avoid pile depths greater than 12-feet, and watch for vents in deep piles. Use these vents to monitor internal pile temperatures.

**Rule #4.** Locate the hot spot before it turns into a fire. Monitor temperature of all piles on a weekly basis, *seeking out the hottest spots in the pile*. For this proactive monitoring, you are not looking for the average pile temperature. You need to know the hottest spot in the pile.

**Rule #5.** If you smell smoke, you have a fire. Do not climb on the piles for any reason as a cavity can be formed by burning materials, however the fire still needs to be located in the pile. Locate the fire very carefully using a large wheel loader to open up the pile. A fire hose should be available as the loader removes material to spray directly onto burning embers or a burning loader. The fire department or an in-house fire brigade should be on stand-by as the pile is opened. Don't underestimate the damage – physical or political – a smoky fire can do.



July 9, 2015

Steve Petrie,  
Phoenix Fire Department  
**Attn: Fire Preventions**  
150 South 12th Street  
Phoenix, AZ 85034

Re: 27<sup>th</sup> Avenue Phoenix Compost Facility  
Fire Department Appeal for Variance to Phoenix Fire Code

Dear Steve,

This submittal is to request an appeal to the Fire Department for a variance from the Phoenix Fire Code Section 2808.3 provision on the maximum size for compost piles for the City of Phoenix Compost Facility at the 27<sup>th</sup> Avenue Transfer Station Complex. The code provision as written indicates *'Piles shall not exceed 25 feet in height, 150 feet in width and 250 feet in length.'* We are requesting a variance to allow an increase in width and length for piles that are not to exceed 10 feet in height. This will result in a lower allowable maximum volume of materials in the pile than the resulting volume from a pile described by the code section.

The reason for this appeal is that our facility is designed to operate in a manner that significantly decreases the risk of fire risk as compared to the larger, static pile operations typically found in the valley and as defined in the code. Our attached site plan and the remainder of this letter summarizes how our facility meets the intent of the code section.

The proposed compost facility is a modern controlled composting operation which will manage temperature within the active composting stage using forced aeration as well as frequent mixing every 3 to 7 days. The frequency of the turning and addition of moisture replaces water that is lost due to the forced aeration process and actively manages the conditions within the pile. All of these key components are designed to be kept within the optimum range. This system controls the temperature, moisture levels, and pile porosity which will significantly reduce the likelihood of fires.

- The turning and aeration system controls oxygen, moisture and temperature:
  - The 'active' and 'turned' compost piles will not be static piles, but will be turned every 3 to 7 days.
  - Water is added as needed at each turn to maintain an average of 55% moisture in the composting materials.

5240 N. 16<sup>th</sup> Street  
Suite 101  
Phoenix, Arizona 85016  
Telephone: (602) 279-4373  
FAX: (602) 279-9110

A Limited Liability Company

- The aeration system in the 'active' compost blows air through the compost piles to provide significant cooling through evaporation.
  - After 24 days the compost moves into the 'turned' compost piles which will be turned every 3 to 7 days and watered as needed to maintain an average of 45% moisture.
- Temperatures are monitored by temperature probes placed in the compost piles, 2 per aeration zone. Each aeration zone is about 22' wide. Each probe has a top sensor 18" below the handle, and a bottom sensor at the tip of the 5 foot probe. The probes send their data to a controller which then controls the volume of air delivered to each aeration zone cooling the piles towards the targeted temperature goal.
- The aeration system for this facility will use a reversing airflow system to provide more effective cooling of the entire depth of the compost pile. The air flow direction is changed from pushing air out of the floor and up through the pile to drawing air in through the pile into the pipes below. This reversing airflow improves the piles moisture retention, and makes the pile more uniform in temperature than if air was pulled or pushed in one direction only. The top and bottom sensors on each probe are used to determine when to switch air flow directions.
- Pile Size in Active and Turned Compost:
  - Each of the piles in the Active Compost areas are 360 feet by 180 feet by 8 feet tall 19,200 cubic yards 55% of the volume described under section 2808 of the Fire Code.
  - Each of the piles in the Turned Compost areas are 360 feet by 160 feet by 8 feet tall or 17,000 cubic yards, 49% of the volume described under section 2808 of the Fire Code.
  - Neither of these piles meet the size of piles limitations outlined in length (250 feet) and width (150 feet). The piles in this facility will be limited in height because it would be impossible to turn efficiently with compost turners if the piles were taller. **In light of the very frequent turning and re-watering and the aeration cooling system along with the decreased pile height, we look for the Fire Department to allow this facility to increase the width and length of the turned compost piles.**
- Pile Size in curing piles, recycled biocover, biofilters and product storage: The other piles on the site meet the size limitations in the Fire Code and will meet all the static pile protection requirements.
- All piles will have clear area adjacent to them that can be used to spread materials in the event of a fire as suggested in the proposed changes to the code. These areas are

marked on the plans and are available for all piles including the active and turned compost piles, although these piles will never sit statically as defined in the 'proposed' changes to the code.

- The Delivery and Tipping Areas
  - Tipping areas for landscapers: (2) areas that are 100 feet by 25 feet and separated by a 20 foot gap between the piles. The Landscape Vehicles unloading areas are under an elevated shade canopy with a misting system to reduce odors and dust. These areas are cleared frequently every few hours throughout the day, and skid into a lower bunker for staging to the grinder. This structure will also be equipped with fire sprinklers.
  - Tipping areas for large packer trucks and end dumps: This area is to be kept separate from the smaller landscape and residential trucks for safety purposes. This Large Vehicle Tipping Area is a movable area 20 feet wide and 125 feet long that follows the location of the portable grinder.
  - These three areas are not within the 'proposed' changes to the code for designated tipping areas limitations and there is no current limitation. This facility will be required to have the capacity to accommodate a large number of landscape vehicles, and a separate area for the large vehicles as it is projected that it will be receiving 1,500 to 3,000 cubic yards per day.
- Fire suppression
  - Our project team agrees that providing push-out areas is a key component to fighting a potential fire in a compost facility. Our site plan does provide push-out areas and clear space to address a potential fire. However, it is important to note that our shorter, actively managed active compost piles have a much lower risk than the larger, taller static piles. The taller, heavier piles create a combustible environment that goes untracked in the larger static piles. Turning our smaller shorter piles more frequently is our primary version of fire prevention. The shorter piles are also a lot easier to push-out from a material handling perspective should that be necessary.
  - The biofilters and the shaded unloaded areas have canopies that can provide additional suppression in the form of fire sprinklers. However, our design team does anticipate using the sprinklers as a primary form of suppression. In some ways, these may be detrimental to the process. The primary fire control measures will remain the operational/process scenarios summarized above. Our team is planning on a full canopy over Active Compost in Phase I, although with our phased Master Plan it may become a phased item.
  - Fire hydrants are located throughout the site to provide water access to emergency vehicles.

- o Structural Columns will be marked with 1'-0" increments to visibly monitor pile heights.

We believe that the design and control features of this facility limits the fire risk below the standard conditions found in typical compost facilities. The design requires consistent oversight and active management of the piles which not only meet, but we feel exceed the intent of the current code section. The facility will be designed to meet the other requirements contained in the current Fire Code.

Please contact me if you have any questions or comments.

Sincerely,  
**Arrington Watkins** Architects, LLC

A handwritten signature in black ink, appearing to read "Marcelo Reyna". The signature is fluid and cursive, with a large, stylized initial 'M'.

**Marcelo Reyna**  
Project Manager



