



July 2, 2018

Planning & Economic Development Department
100 Santa Rosa Avenue
Santa Rosa, CA 95404

RE: Cannabis Odor Mitigation Plan
Cannabis Manufacturing, Type 6 & 7

To Whom It May Concern:

Radiant Farm, Inc. has retained my services to develop the mechanical systems for the project located at 1821 Empire Industrial Court, Suite G in Santa Rosa. The project includes odor mitigation systems.

The included plan has been developed to comply with Title-20, Division 4, Chapter 20-46.050 General Operating Requirements, Paragraph 'H' Odor Control requirements as set forth by The City of Santa Rosa.

Successful application of this plan will effectively mitigate cannabis odor detection outside the structure in which the proposed business is to operate.

Thank you for your consideration. I am available to discuss the plan at your convenience.

Regards,

Jeff Warner, PE
Warner Mechanical Engineering, Inc.
CEO, Principal Engineer
CA No: M32903

City of Santa Rosa

JUL 09 2018

Planning & Economic
Development Department

WARNER MECHANICAL ENGINEERING, INC.

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ODOR MITIGATION PLAN

RADIANT FARM, INC.
1821 Empire Industrial Ct, Ste. G, Santa Rosa CA

Abstract

The following plan has been developed to comply with City of Santa Rosa Title-20, Division 4, Chapter 20-46.050 General operating Requirements, paragraph 'H' Odor Control requirements.



WARNER MECHANICAL ENGINEERING, INC.

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Introduction

The following plan has been developed to comply with City of Santa Rosa Title-20, Division 4, Chapter 20-46.050 General Operating Requirements, paragraph 'H' Odor Control Requirements.

This plan has been developed based on the owner's proposed operational criteria as outlined in the conditional use permit application. Administrative, operational and engineering controls noted are consistent with the commonly accepted best available cannabis-industry-specific technologies designed to mitigate cannabis odors.

Successful application of this plan will effectively mitigate cannabis odor detection outside the structure in which the proposed business is to operate.

Project Details

The owner intends to manufacture cannabis extracts (type-6 and type-7). Processes include: grinding/product handling, loading/unloading extraction columns, post processing (vacuum pumps and curing ovens), winterization (fume hood). On-site consumption through incineration (smoking and vaping) will not be permitted. This plan does not address incineration related odors.

Operational Processes and Maintenance Plan

Detailed operational and maintenance plans should be developed by the owner. The following items should be included for odor mitigation purposes:

1. Routine verification of odor mitigation effectiveness through inspection of odors in the general vicinity of the building.
2. Routine monitoring of exhaust system carbon filter differential static pressure to verify filter condition/effectiveness.

Filter replacement is required any time monitoring yields unacceptable pressure monitoring results.



Staff Training

Standard operating procedures, including staff training, should be developed by the owner. The following items should be included for odor mitigation purposes:

1. Routine verification of odor mitigation effectiveness monitoring: It should be clear who is responsible for this activity, where and how data is collected and cataloged. A map with clearly indicated data collection test points should be available for reference. Testing should be conducted while processing is occurring and exhaust systems are active. Testing should occur both in the morning (when winds are calm); and in the afternoons (when winds are typically greater). Results should be recorded in a log and should include: operator name, time of day, date, results by test location, relative wind speed and weather conditions.
2. Reporting of cannabis odors outside the building: It should be clear what an employee is to do in the event cannabis odors are detected outside the building. The General Manager or other supervisor should be notified immediately upon detection. The person responsible for receiving notifications should take immediate steps to remedy the problem including, but not limited to, notifying service personnel for repairs or routine maintenance. If odors persist, odor producing operations should be stopped until an effective solution can be implemented.
3. Odor mitigation effectiveness monitoring training: All employees should be trained to conduct odor mitigation effectiveness tests. Training procedures should be included in readily available employee handbooks for reference.
4. Routine carbon filter testing: It should be clear who is responsible for this activity, where, and how data is collected. Carbon filter differential pressure measurements should be collected on a weekly basis. Results should be recorded in a log for each filter and should include: operator name, values, date and time. A map with clearly indicated data collection test points should be available for reference. Testing should be conducted while processing is occurring and exhaust systems are active. Results within 20% of the manufacturer's recommended values should be reported to the maintenance team immediately.
5. Replacing carbon filters: Filters should be replaced immediately as pressure differential measurements exceed routine carbon filter testing limits (see item 4 above). The maintenance team should be trained to perform this task. Training procedures should be included in readily available employee



handbooks for reference. Filter replacement dates should be recorded in a service log including operator name, date, initial and final pressure readings. Replacement filters should be kept on-site at all times.

Engineering Controls

Mechanical plans developed for building permit application will include the following features and capabilities:

1. Environmental exhaust systems with in-line carbon filtration will be utilized to mitigate odors.
2. Recirculation filtration systems will be included where processes occur with significant odor sources.
3. Carbon filter(s) will be specified to maintain an acceptable contact time for cannabis odor exhaust and recirculation air stream(s).
4. Exhaust air inlets will be located in areas of the facility where odor generating processes occur.
5. Odors will be contained within the building through system air balancing techniques to eliminate uncontrolled exfiltration of odor to the outdoor environment.
6. Filtered exhaust air streams that are part of the odor mitigation system will be released to the environment in an upward discharge pattern.
7. Exhaust air streams and vent systems containing cannabis odors that do not allow for in-line carbon filtration (E.G. vacuum pump vents, carbon dioxide vents etc.) will include enzymatic water filtration systems.
8. Environmental exhaust fans in non-cannabis odor intensive areas (break room, rest room, etc.) will not be filtered.
9. System testing and balancing will be required of the installing contractor to demonstrate air balancing effectiveness.
10. Filters, fans and other components integral to the odor mitigation plan shall be clearly labeled in accordance with the plans.
11. Contractor shall provide a test and balance report to the owner including: initial carbon filter differential pressure measurements; outdoor air rates at space conditioning and make-up air equipment; and environmental exhaust rates.
12. Installing contractor shall provide written monitoring instructions and provide



operational training to the owner upon placing the system in service.

13. Contractor operational training shall be the basis for routine maintenance and testing standard operating procedures.
14. Construction administration services provided by a licensed mechanical engineer are required to verify the installation is consistent with this plan, including review of test and balance report.

Supplemental Information – Design Considerations

The design of odor control systems is dependent upon odor concentrations associated with the specific cannabis application. A general list of odor concentrations by cannabis processes has been included (see Supplemental Information – Odor Concentrations By Application below).

Carbon filtration is commonly accepted throughout the cannabis industry as the current best engineering control technology for mitigating odors. Odors are generally captured by locating exhaust air/filter intake points in areas of the facility where odor generating activities or raw material product (flower) handling is expected; in conjunction with the implementation of common air balancing techniques. Air balancing effectively eliminates uncontrolled exfiltration of cannabis odors to the exterior of the building.

Additional systems include combination recirculation fan/filtration units and enzymatic water filtration systems. Recirculation systems are often applied where more significant odor sources are expected (E.G. flower rooms, grinding). Recirculation equipment may be fans with passive carbon filters or powered electric air purification units. Enzymatic systems are employed where exhaust air streams and vent systems do not allow for in-line carbon filtration (E.G. vacuum pump vents, carbon dioxide vents etc.). Enzymatic systems are commonly utilized in urban waste processing facilities to eliminate odors.

Carbon filtration odor removal effectiveness depends on three criteria:

1. Exhaust air contact time
2. Filter cleanliness
3. Containment

Contact time is a function of air velocity through the filter and filter surface area. The contact time should be designed to meet or exceed the filter manufacturer's specified minimum. Filter effectiveness decreases with decreased contact time and odors are



passed through the filter to the environment.

Filter cleanliness can be quantified by monitoring system pressure drop across the filter and should not exceed a manufacturer's published performance rating for a given filter. This measurement quantifies the degree to which the filter media has been occluded (becomes dirty). As a filter becomes occluded the pressure drop increases and the fan exhaust rate is reduced. Reductions in the exhaust rate change the air balance and can lead to exfiltration of odor.

Containment is achieved through common air balancing techniques. Proper air balancing allows for negatively pressurizing a room (removing more air than is mechanically supplied) and insures odors pass through filters, eliminating the exfiltration of odors to the environment or to adjacent rooms through random openings in the building (cracks, doors, etc.). These techniques are commonly and successfully implemented in many non-cannabis applications to eliminate the migration of odors to other part of the building, including commercial kitchen and rest room applications.

Engineering controls will vary depending on the severity of the odor source: negligible, minor, moderate, significant (see Supplemental Information – Odor Concentrations By Application below).

1. Negligible odor sources will be controlled via transfer to an odor mitigating exhaust system within the facility through permanent openings (I.E. air will be allowed to flow to areas of greater odor concentration for filtration).
2. Minor odor sources will be controlled via filtered demand control ventilation systems: fans will be activated when odor sources are present (I.E. fans will be activated when unloading delivery vehicles).
3. Moderate and significant odor sources will be controlled via dedicated filtered environmental exhaust systems; rooms will be negatively pressurized continuously during normally occupied hours or when odor sources are present (including during unoccupied hours).



Supplemental Information – Odor Concentrations by Application

The following list includes typical cannabis odor concentrations (negligible, minor, moderate, significant) by cannabis application (cultivation, manufacturing, distribution, retail, etc.). Associated processes are listed:

1. Cultivation:
 - 1.1. Flower room - significant
 - 1.2. Vegetation and Clone rooms - negligible
 - 1.3. Drying/Curing rooms - significant
 - 1.4. Trimming rooms - significant
2. Manufacturing:
 - 2.1. Grinding/product handling – significant
 - 2.2. Loading/unloading extraction equipment - minor
 - 2.3. Post processing, distillation (roto-vap/vacuum pump) - moderate
 - 2.4. Post processing, curing (low temperature oven) - moderate
 - 2.5. Winterization (product handling within fume hood) - minor
 - 2.6. Packaging of extract – minor
 - 2.7. Receiving/vehicle garage - minor
3. Distribution:
 - 3.1. Product Storage, packaged (retail) - minor
 - 3.2. Product Storage, bulk - moderate
 - 3.3. Receiving/vehicle garage - minor
4. Retail/Dispensary:
 - 4.1 Secure storage - minor
 - 4.2 Retail Sales - minor

