

**Exam Knowledge Expectations for
Qualified Applicator Certificate & Qualified Applicator License
O – Field Fumigation Pest Control Sub-Category**

Use these knowledge expectations (KEs) to help study the suggested material, *Field Fumigation* (2008 Edition) *and Addendum to the Field Fumigation Study Guide* (2012 Edition)

Knowing the information from all of the KEs should prepare you for taking the exam.

Chapter 1 Regulatory Requirements for Field Fumigation in California

- A. Describe licensing requirements for people applying soil fumigants to agricultural fields.
- B. Describe where to find the current regulations regarding field fumigation methods.
- C. Explain how local regulations may be more restrictive than the pesticide label and know the importance of communicating with the agricultural commissioner.
- D. Explain what a nonattainment area (NAA) is and how it affects the application of fumigants.
- E. Describe reporting requirements for the various types of fumigant applications and the roles of the county agricultural commissioner and the California Department of Pesticide Regulation (DPR).
- F. Describe posting requirements for the various types of fumigant applications and where to find the current regulations regarding posting.
- G. Explain the role of “product stewardship” programs and how they relate to laws and regulations.

Chapter 2 Fumigants

- A. Describe and contrast true fumigants and less volatile products, including the mode of transport and distribution in the soil.
- B. Describe the relative volatility, warning agents, solubility and ability to move in water, movement in soil, persistence, boiling point, and appropriate uses (including application methods and target pests) of the following active ingredients
 - a. Methyl bromide
 - b. Chloropicrin
 - c. 1,3-dichloropropene (Telone II)
 - d. 1,3-dichloropropene emulsifiable concentrate (Telone EC, Inline)
 - e. MITC generators
 - i. Metam sodium (Vapam, Sectagon)
 - ii. Metam potassium (K-Pam, Sectagon-K)
 - iii. Dazomet (Basamid)
 - iv. Carbon disulfide liberators (Enzone)
- C. Describe the toxicity and hazards associated with the active ingredients listed above.

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Chapter 3 Pre-Application Considerations

- A. Locate the pre-application section on a sample soil fumigation label.
- B. For chemigation, soil injection, soil incorporation, and other types of applications
 - a. Identify site soil texture, tilth, and plant debris conditions that impact fumigant volatilization and loss to the atmosphere
 - b. Describe how to recognize when site soil texture, tilth, and plant debris conditions are conducive (or not conducive) to satisfactory control and reduced volatilization
 - c. Describe procedures that can be taken to correct unsatisfactory soil tilth or plant debris conditions to achieve satisfactory control and reduced volatilization
 - d. Describe soil moisture requirements for satisfactory control and reduced volatilization and how to measure soil moisture at various depths to determine whether conditions are satisfactory
 - e. Describe soil temperature requirements for satisfactory control and reduced volatilization and how to measure temperature at various depths to determine whether conditions are satisfactory
 - f. Explain measures that can be taken to correct unsatisfactory soil moisture or temperature conditions
- C. Explain the concepts of buffer zones and setbacks as they apply to field fumigation and list potential site conditions that can affect them.
- D. Describe where to find the current requirements for buffer zones and setbacks.
- E. Explain the process of filing a Notice of Intent.
- F. Describe procedures to ensure that people will not enter a treated field before the restricted entry interval expires.
- G. Describe the posting requirements for field fumigation sites.
- H. Explain the importance of identifying inhabited structures nearby.
- I. Describe the site conditions and application methods that favor satisfactory control of the following pest groups
 - a. Bacteria, fungi, and water molds
 - b. Weeds
 - c. Nematodes
 - d. Insects
- J. Describe life cycles of pests in the groups above that fumigants are used to control, how these pests are damaging to plants, and any life stages resistant to certain fumigants.

Chapter 4 Application Methods

- A. Describe the following pieces of equipment and how they are used in chemical injection systems
 - a. Positive displacement pumps
 - b. Centrifugal pumps

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- c. Venturi injection systems
 - d. Check valves
 - e. Chemigation valves
 - f. Solenoid valves
 - g. Bypass valves
 - h. Non-draining valves for nozzles
 - i. Purge valves
 - j. Electrical interlock systems
- B. Explain how closed systems work.
- C. Explain how electronic metering systems can be used during fumigation.
- D. Describe the purpose and requirements of a backflow prevention system.
- E. Describe how to carry out a liquefied-gas injection application, including calibration and identification of potential problems.
- F. Describe how to carry out a chisel-and-plow injection shank application using shanks or spray blades, including identification of potential problems.
- G. Describe how to carry out a granular formulation, soil-incorporation application using power mulch systems.
- H. Explain the steps required to carry out the following procedures with chemigation systems
- a. Inspection of backflow prevention systems
 - b. Pre-injection irrigation system inspection
- I. Identify appropriate types of application equipment for applying the materials listed in Chapter 2.
- J. Describe the general procedures for monitoring during the application of a fumigant and where to find the current requirements.

Chapter 5 Post Fumigation Field Surface Treatment Methods

- A. Explain the importance of post fumigation field surface treatments in relation to product efficacy, public safety, and environmental health (emission reduction).
- B. Have a general knowledge in the use of tarps and how to determine whether tarps are acceptable for use:
- a. Describe the general range of products available
 - i. Thickness and uses
 - ii. Density
 - iii. Permeability
 - b. Explain how to seal the tarp or film edges with
 - i. Adhesives
 - ii. Soil
 - c. Explain other important tarp characteristics that may be important
 - i. Tolerance to ultraviolet (UV) light

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- ii. Stretching
- iii. Color
- C. Explain the major components of a tarp repair response plan.
- D. Discuss tarp removal, including how long to wait before removing after cutting.
- E. Describe the steps required to create an effective mechanical seal.
- F. Describe the steps required to create an effective water treatment using sprinkler irrigation.
- G. Describe the general requirements for monitoring after an application of metam sodium or metam potassium and where to go for current information.

Chapter 6 Hazards Associated with Field Fumigation

- A. Explain how fumigants move in the environment in air, water, and sediment.
- B. Describe the impact of fumigants in California Regional Air Quality basins in regard to VOC emissions.
- C. Explain the impact of fumigants on nontarget organisms.
- D. Describe how the various fumigants enter the body.
- E. Describe how people get exposed to field fumigants.
- F. Describe the health effects of exposure to the various fumigants.

Chapter 7 Protecting People and the Environment

- A. Describe where to find information about pesticide hazards and safety, for example; pesticide labels, material safety data sheets (MSDSs), the Pesticide Safety Information Series (PSIS), and technical information bulletins (TIBs).
- B. Know how to carry out all safety and precautionary requirements on labels.
- C. Know how to select, fit, care for, and use personal protective equipment when handling pesticides.
- D. Know how to keep pesticides out of the environment through proper application and disposal practices.
- E. Explain how to recognize hazards at the application site that could endanger people or the environment during a fumigation.
- F. Describe requirements for tractor-mounted equipment to protect applicators, including air-dilution fans.
- G. Know how workers can minimize time of exposure with work hour limits.
- H. Describe how to recognize, treat, and prevent heat illness that can be associated with the use of personal protective equipment.
- I. Explain the need to communicate with people who might enter the treated area and understand notification requirements.
- J. Describe how buffer zones help reduce problems.

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- K. Describe the posting requirements for fumigant applications.
- L. Describe methods to reduce the environmental impact of fumigant use.
- M. Know how environmental conditions, especially wind and inversions, increase hazards (e.g., fumigant drift or a blowing tarp).
- N. Explain how to minimize drift of fumigants to nontarget areas.
- O. Know where to find information regarding endangered species and where in California they are likely to be encountered.
- P. Explain how to properly store, transport, and label pesticides and pesticide service containers.
- Q. Describe how to safely handle the various fumigants, including special requirements for handling cylinders or bulk versus packaged materials.
- R. Explain how to safely clean application equipment and dispose of empty containers.

Chapter 8 Pesticide Emergencies

- A. Explain how to recognize and respond to fumigant emergencies.
- B. Describe procedures for responding to emergencies, including who to call.
- C. Describe appropriate first responses for human exposures, including first aid procedures.
- D. Describe procedures for dealing with fumigant leaks and spills.
- E. Describe procedures for dealing with fumigant fires.
- F. Describe procedures for properly dealing with fumigant misapplications, including how to address errors made during mixing, loading, and application.

Study Guide Addendum: Site-Specific Fumigation Management Plans and Post-Application Summaries

- A. Know the elements of a site-specific fumigation management plan
 - a. Applicator contact information
 - b. General site information
 - c. General application information
 - d. Tarp information, including repair and handling procedures v. Soil conditions
 - e. Weather conditions
 - f. Handler personal protection equipment
 - g. Emergency procedures
 - h. Warning sign posting
 - i. Owner/supervisor/applicator/handler communication plan
 - j. Authorized on-site personnel
 - k. Air monitoring plan
 - l. Good agricultural practices

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- m. Description of hazard communication
- n. Record-keeping procedures
- B. Know the purpose of requiring a site-specific fumigation management plan is to address exposure risks to bystanders, handlers, and other workers from soil fumigations.

Study Guide Addendum: Buffer Zones

- A. Understand these are the exemptions for transit through buffer zones
 - a. Vehicular and bicycle traffic on private and public roadways are permitted
 - b. Bus stops and other locations where persons wait for public transit are not permitted within buffer zones
- B. Know that buffer zones are intended to provide distance between the edge of the treated field and bystanders.
- C. Know that buffer zone distances will be listed on fumigant labels and based on these factors
 - a. Application rate
 - b. Field size
 - c. Application equipment methods
 - d. Credits from using emission reducing measures
- D. Know that the buffer zone period starts when any fumigant is delivered or dispensed to the soil and ends at minimum 48 hours after the fumigant has stopped being delivered or dispensed to the soil.
- E. Know that fumigant labeling will require site-specific buffer zone distances with the minimum required distance of 25 feet regardless of site-specific application parameters.
- F. Know there are restrictions for fumigations near difficult-to-evacuate sites, such as
 - a. Schools
 - b. State-licensed day care centers
 - c. Nursing homes
 - d. Assisted living facilities
 - e. Hospitals
 - f. In-patient clinics, and
 - g. Prisons
- G. Understand the fumigation restrictions for applications near “difficult-to-evacuate” sites.
- H. Understand this exemption and prohibition for transit through buffer zones
 - a. Vehicular and bicycle traffic on private and public roadways are permitted.
 - b. Bus stops and other locations where persons wait for public transit are not permitted with buffer zones.
- I. Know that buffer zones are intended to protect bystanders from acute exposure to air concentrations of fumigants.

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Study Guide Addendum: Posting Requirements for Buffer Zones

- A. Know that the general posting location requirement for buffer zone warning signs is the perimeter of the buffer zone.
- B. Know the specific locations for posting warning signs around the perimeter of the buffer zone.
- C. Know examples of usual points of entry into buffer zones, including and not limited to
 - a. Roadways
 - b. Sidewalks
 - c. Paths
 - d. Bike trails
- D. Know that buffer zones must be posted with warning signs unless a physical barrier prevents bystander access to the buffer zone.
- E. Understand the posting exception for fumigating multiple contiguous blocks with a 14-day period, the entire periphery of the contiguous blocks buffer zone may be posted.

Study Guide Addendum: Worker Protection Measures

- A. Know that all persons are considered to be handlers when they
 - a. Supervise, drive or co-drive (co-pilot) tractor, shovel, cross ditch, or perform any other direct handler activity
 - b. Monitor air concentrations, clean up spills, handle or dispose of containers
 - c. Clean, repair, adjust or otherwise handle contaminated fumigant equipment
 - d. Install, repair, operate, or remove irrigation equipment within an application block or buffer zone
 - e. Perform scouting or other crop advising tasks within the application block or buffer zone during buffer zone periods
 - f. Install, perforate, remove, repair, or monitor tarps
- B. Know that all fumigant handlers participating in fumigations shall be trained and equipped according to the Worker Protection Standard.

Study Guide Addendum: Emergency Preparedness and Response Requirements

- A. Know that the option to monitor the fumigation site perimeter requires the applicator to perform numerous monitoring and record keeping activities as detailed in fumigant labeling. These include:
 - a. Start monitoring on the day the application begins until the buffer zone expires
 - b. Monitoring 1 hour before sunset of first application day; once during the night; once 1 hour after sunrise; once a day until the buffer zone ends
 - c. Monitor for sensory irritation for metam sodium/potassium, dazomet,

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- chloropicrin, and methyl bromide products containing at least 20% chloropicrin
- d. Use a direct-read instrument to measure for methyl bromide products containing less than 20% chloropicrin
 - e. Assure monitoring is conducted by or under supervision of a certified applicator
 - f. Monitor in areas between buffer zone perimeter and occupied areas/structures
 - g. Implement the emergency response plan when sensory irritation indicates fumigant exposure
 - h. Activate appropriate control plan if a problem occurs
 - i. Record in the post-application summary the location and results of air monitoring methyl bromide products containing less than 20% chloropicrin
 - j. Record in the post-application summary the location of any sensory irritation from methyl bromide products containing at least 20% chloropicrin
- B. Know that the supervising applicator is responsible for the emergency preparedness and response requirements including the option of on-site monitoring of buffer zones or providing response information to people when occupied structures lay within a buffer zone.

Study Guide Addendum: Good Agricultural Practices

- A. Understand that fumigant labeling will make it mandatory to use good agricultural practices prior to fumigating soil, including but not limited to
 - a. Proper soil preparation/tilling
 - b. Ensuring optimal soil moisture and temperature
 - c. Appropriate use of sealing techniques

Study Guide Addendum: Application Method, Practice, and Rate Restrictions

- A. Know that fumigant labeling will restrict or prohibit certain high-risk methods and practices including, but not limited to untarped applications for some fumigants.
- B. Know that fumigant labeling will lower the maximum application rate for certain high-risk methods and practices for some fumigants.

Study Guide Addendum: Restricted Use Classification

- A. Know that after the Department of Pesticide Regulation listed metam sodium, metam potassium, and dazomet as Restricted Materials in California, U.S. EPA re-classified them from general use to restricted use pesticides because they meet federal restricted use criteria.