

**RESTRICTED USE PESTICIDE**

Due to acute inhalation toxicity to humans.  
For retail sale to and use by certified applicators or persons under their direct supervision and only for those uses covered by the certified applicator's certification.



A SOIL FUMIGANT SOLUTION FOR SPECIFIC CROPS AS LISTED IN THIS LABEL

**MAY BE APPLIED BY WATER-RUN APPLICATIONS (e.g., CHEMIGATION), SOIL INJECTION OR SOIL BEDDING EQUIPMENT TO SUPPRESS AND/OR CONTROL SOIL-BORNE PESTS IN LISTED ORNAMENTALS, FOOD AND FIBER CROPS**  
For the control or suppression of Weeds, Diseases and Nematodes. Controls or suppresses weeds such as Bermudagrass, Chickweed, Dandelion, Ragweed, Henbit, Lambsquarter, Pigweed, Watercress, Amaranths species: Watergrass, Johnsongrass, Nightshade, Nut-sedge, Wild Morning-Glory and Purslane, Nematodes and Symphylids. Soil-borne diseases such as Rhizoctonia, Pythium, Phytophthora, Verticillium, Sclerotinia, Oak Root Fungus and Club Root of Crucifers. Refer to specific cropping and application methods to determine control or suppression of the target.

**ACTIVE INGREDIENT:**

Sodium methylthiocarbamate (anhydrous)\*.....42.0%

**INERT INGREDIENTS:**.....58.0%

**TOTAL:**.....100.0%

\*Contains 4.26 lbs. Metam Sodium per gallon

**PRECAUTIONARY STATEMENTS**

**HAZARDS TO HUMANS AND DOMESTIC ANIMALS**

**DANGER.** Corrosive -- Causes skin damage. May be fatal if absorbed through the skin. Do not get on skin or clothing. Prolonged or frequent repeated skin contact may cause allergic reactions in some individuals. Harmful if swallowed or inhaled. Irritating to eyes, nose and throat. Avoid breathing vapor or spray mist. Do not get in eyes.

**PERSONAL PROTECTIVE EQUIPMENT (PPE)**

Some materials that are chemical-resistant to this product are barrier laminate or viton ≥ 14 mils. For more options, follow the instructions for category H on an EPA chemical-resistance category selection chart.

Handlers applying via weed sprayer while irrigation sprinklers are running or handlers who may be exposed to liquid spray while repairing a malfunctioning chemigation system or shutting off equipment must wear:

- Chemical-resistant coveralls over long-sleeve shirt and long pants,
- Chemical-resistant gloves,
- Chemical-resistant footwear plus socks,
- Chemical-resistant headgear,
- Protective eyewear, and
- Respirator of the type specified in the respiratory protection section in the PPE requirements on this label.

Handlers wearing chemical-resistant attire are limited to 30 minutes of exposure in any 60-minute period to prevent heat illness, and, as required by the Worker Protection Standard for Agricultural Pesticides, employers of these handlers must take any necessary steps to avoid heat illness.

Except as required above, handlers transferring or loading liquid formulations, handlers operating motorized ground equipment with open cabs, handlers repairing or inactivating irrigation or chemigation equipment during application, and handlers cleaning up spills or equipment must wear:

- Coveralls over long-sleeve shirt and long pants,
- Chemical-resistant gloves,
- Chemical-resistant footwear plus socks,
- Chemical-resistant apron if transferring or loading the fumigant or cleaning up spills or equipment,
- Protective eyewear, and
- Respirator of the type specified in the PPE requirements for respiratory protection section in the PPE requirements on this label if triggered.

All other handlers including handlers operating motorized ground equipment with closed cabs (except for handlers who set up and calibrate chemigation and irrigation equipment and start the application from inside the application block) as stated in this labeling must wear:

- Long-sleeve shirt and long pants,
- Shoes plus socks, and
- Respirator of the type specified in the eye and respiratory protection section in the PPE requirements on this label if triggered.

All handlers who set-up and calibrate chemigation and irrigation equipment and start the application from inside the application block must wear:

- Long-sleeve shirt and long pants,
- Shoes plus socks,
- Protective eyewear, and
- Respirator of the type specified in the respiratory protection section in the PPE requirements on this label if triggered.

**KEEP OUT OF REACH OF CHILDREN  
DANGER - PELIGRO**

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.

(If you do not understand the label, find someone to explain it to you in detail.)

FIRST AID	
<b>If on skin or clothing:</b>	<ul style="list-style-type: none"> <li>• Take off contaminated clothing.</li> <li>• Rinse skin immediately with plenty of water for 15-20 minutes.</li> <li>• Call a poison control center or doctor for treatment advice.</li> </ul>
<b>If in eyes:</b>	<ul style="list-style-type: none"> <li>• Hold eye open and rinse slowly and gently with water for 15-20 minutes.</li> <li>• Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.</li> <li>• Call a poison control center or doctor for treatment advice.</li> </ul>
<b>If inhaled:</b>	<ul style="list-style-type: none"> <li>• Move person to fresh air.</li> <li>• If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible.</li> <li>• Call a poison control center or doctor for further treatment advice.</li> </ul>
<b>If swallowed:</b>	<ul style="list-style-type: none"> <li>• Call a poison control center or doctor immediately for treatment advice.</li> <li>• Have person sip a glass of water if able to swallow.</li> <li>• Do not induce vomiting unless told to do so by a poison control center or doctor.</li> <li>• Do not give anything by mouth to an unconscious person.</li> </ul>
EMERGENCY INFORMATION	
Have the product container or label with you when calling a poison control center or doctor, or going for treatment. FOR THE FOLLOWING EMERGENCIES, PHONE 24 HOURS A DAY: Transportation: CHEMTREC..... 1-800-424-9300 Other: AMVAC..... 1-323-264-3910	
NOTE TO PHYSICIAN	
Possible mucosal damage may contraindicate the use of gastric lavage. This product may pose an aspiration pneumonia hazard.	

EPA Reg. No. 5481-468

EPA Est. No.  5481-CA-1  1448-MO-1

61842-WA-1  Other \_\_\_\_\_

Net Weight:

As Marked on Container

**AMVAC**  
4100 E. Washington Blvd.  
Los Angeles, CA 90023, USA  
1-323-264-3910

## PERSONAL PROTECTIVE EQUIPMENT (PPE) FOR RESPIRATORY PROTECTION

When respiratory protection is required, in lieu of protective eyewear, handlers must wear:

- At least a NIOSH-approved full-face, or helmet/hood style respirator with either:
  - An organic-vapor removing cartridge with a pre-filter approved for pesticides (NIOSH approval number prefix TC-23C), or
  - A respirator with a canister approved for pesticides (NIOSH approval number prefix TC-14G) or canister with any N, R, P or HE prefilter.

## USER SAFETY REQUIREMENTS

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them.

DO NOT transport contaminated clothing inside a closed vehicle unless stored in a sealed container. Wash or dispose as specified.

### USER SAFETY RECOMMENDATIONS

#### Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

## ENVIRONMENTAL HAZARDS

This pesticide is toxic to mammals, birds, aquatic invertebrates and fish. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash waters or rinsate.

Metam sodium has certain properties and characteristics in common with chemicals that have been detected in groundwater (highly soluble in water and has low adsorption to soil).

For untarped applications, leaching and runoff may occur if there is heavy rainfall after soil fumigation.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift.

## DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation. Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR, Part 170. Refer to supplemental labeling under "Agricultural Use Requirements" in this section for information about this standard.

The following activities are prohibited from being performed in the fumigant application block (i.e., the field or portion of a field treated with a fumigant in any 24-hour period or, for center pivot applications which occur over many days, the total acres of a field treated) by anyone other than persons who have been appropriately trained and equipped as handlers in accordance with the requirements in the Worker Protection Standard (40 CFR Part 170), from the start of the application until the entry-restricted period ends (NOTE: persons installing, perforating, removing, repairing, and monitoring tarps are considered handlers for the durations listed below). Those activities include those persons:

- Participating in the application as supervisors, loaders, drivers, tractor copilots, shovelers, cross ditchers, or as other direct application participants (the application starts when the fumigant is first introduced into the soil and ends after the fumigant has stopped being delivered/dispensed to the soil);
- Using devices to take air samples to monitor fumigant air concentrations;
- Persons cleaning up fumigant spills (this does not include emergency personnel not associated with the fumigation application);
- Handling or disposing of fumigant containers;
- Cleaning, handling, adjusting, or repairing the parts of fumigation equipment that may contain fumigant residues;
- Installing, repairing, operating, or removing irrigation equipment in the application block;
- Entering the application site to perform scouting, crop advising, or monitoring tasks;
- Installing, perforating (cutting, punching, slicing, poking), removing, repairing, or monitoring tarps:
  - o until 14 days after application is complete if tarps are not perforated and removed during those 14 days, or
  - o until tarp removal is complete if tarps are **both** perforated **and** removed less than 14 days after application; or

o until 48 hours after tarps perforation is complete if they will not be removed within 14 days after application.

NOTE: See Tarp Perforation and/or Removal section on this labeling for requirements about when tarps are allowed to be perforated.

- Performing any handling tasks as defined by the Worker Protection Standard.
- In addition to the above, persons outside the perimeter of the application block who visually monitor application equipment to ensure proper functioning and monitor fumigant air concentrations in accordance with the fumigant site monitoring requirement must also be trained and equipped as handlers in accordance with the requirements in the Worker Protection Standard (40 CFR Part 170).

Use in greenhouses is prohibited. Application with handheld equipment is prohibited. Application with cement grinder and shredder equipment is prohibited. Open-pour applications are prohibited.

Do not apply when wind speed favors drift beyond the area intended for treatment. Do not use in a greenhouse or any other enclosed structure or confined area.

## SUPERVISION OF HANDLERS

For all applications except water run: from the start of the application until the fumigant has stopped being delivered/dispensed into the soil, i.e., after the soil is sealed, the certified applicator must be at the fumigation site in the line of sight of the application and must directly supervise all persons performing handling activities.

For all water-run applications (e.g., sprinkler/chemigation, wheel line, center pivot, lateral move, drip, flood, etc.), the certified applicator must be at the fumigation site in the line of sight of the application to start the application including set-up, calibration, and initiation of the application. The certified applicator may leave the site but must return at least every two hours to visually inspect the equipment to ensure proper functioning and must directly supervise all Worker Protection Standard-trained handlers on-site until the fumigation has stopped being delivered/dispensed into the soil. Worker Protection Standard-trained handlers may perform the monitoring functions in place of the certified applicator but must be under the supervision of the certified applicator and able to communicate with the certified applicator at all times during monitoring activities via cell phone or other means. The results of monitoring activities must be captured in the Fumigation Management Plan (FMP).

For handling activities that take place after the fumigant has been delivered/dispensed into the soil until the entry restricted period expires, the certified applicator does not have to be on-site, but must have communicated, in a manner that can be understood by the site owner/operator and handlers responsible for carrying out those activities, the information necessary to comply with the label and procedures described in the FMP (e.g., emergency response plans and procedures).

The results of communication activities must be captured in the FMP.

**IMPORTANT:** This requirement does not override the requirements in the Worker Protection Standard for Agricultural Pesticides for information exchange between owners/operators of agricultural establishments and commercial pesticide applicators.

The certified applicator must provide Fumigant Safe Handling information to each handler involved in the application or confirm that each handler participating in the application has received Fumigant Safe Handling information in a manner they can understand within the past 12 months. Fumigant Safe Handling information will be provided where this product is purchased or at <http://www.epa.gov/fumigantraining>.

The certified applicator supervising the application and the owner/operator of the establishment where the fumigation is taking place must make sure that all persons who are not trained and PPE-equipped and who are not performing one of the handling tasks defined in this labeling are excluded from application block during the entry restricted period.

The employer of any handler (as stated in this label) must make sure that all handlers are provided and correctly wear the required PPE. The PPE must be cleaned and maintained as required by the Worker Protection Standard for Agricultural Pesticides.

At least one handler must have the appropriate respirator and cartridges available, and they must be fit-tested, trained, and medically examined.

The fumigation handler employer must confirm and document in the FMP that an air-purifying respirator and appropriate cartridges of the type specified in the PPE section of this labeling are immediately available for each handler who will wear one.

This must be documented in the FMP.

Cartridges or canisters must be replaced when odor or irritation from this product becomes apparent, if the measured concentration of MITC is greater than 6000 ppb, or after 8 hours of use, whichever occurs first.

## RESPIRATOR FIT TESTING, MEDICAL QUALIFICATION, AND TRAINING

Employers must verify that any handler that uses a respirator is:

- Fit-tested and fit-checked using a program that conforms to OSHA's requirements (see 29 CFR Part 1910.134);
- Trained using a program that conforms to OSHA's requirements (see 29 CFR Part 1910.134);
- Examined by a qualified medical practitioner to verify physical ability to safely wear the style of respirator to be worn. A qualified medical practitioner is a physician or other licensed health care professional who will evaluate the ability of a worker to wear a respirator. The initial evaluation consists of a questionnaire that asks about medical conditions (such as a heart condition) that would be problematic for respirator use. If concerns are identified, then additional evaluations, such as a physical exam, might be necessary. The initial evaluation must be done before respirator use begins. Handlers must be reexamined by a qualified medical practitioner if their health status or respirator style or use-conditions change. Upon request by local/state/federal/tribal enforcement personnel, employers must provide documentation how they have complied with these requirements.

## RESPIRATORY PROTECTION AND STOP WORK TRIGGERS

The following procedures must be followed to determine whether an air-purifying respirator is required or if operations must cease for any person performing a handling task as defined in this labeling.

- If at any time any handler experiences sensory irritation (tearing, burning of the eyes or nose) then either:
  - An air-purifying respirator must be worn by all handlers who remain in the application block, or
  - Operations must cease and handlers not wearing an air-purifying respirator must leave the application block.
- Handlers can remove respirators or resume operations if two consecutive breathing-zone samples taken at the handling site at least 15 minutes apart show that levels of MITC have decreased to less than 600 ppb, provided that handlers do not experience sensory irritation. Samples must be taken where the irritation is first experienced.
  - During the collection of air samples, an air-purifying respirator must be worn by the handler taking the air samples.
- When using monitoring devices to monitor air concentration levels, a direct reading detection device, such as a Draeger or Sensidyne device must be used. The devices must have a sensitivity of at least 600 ppb for MITC.
- When breathing zone samples are required, they must be taken outside respiratory protection equipment and within a ten inch radius of handler's nose and mouth.
- When respirators are worn, then air monitoring samples must be collected at least every 2 hours in the breathing zone of a handler performing a representative handling task.
- If at any time: (1) a handler experiences any sensory irritation when wearing an air-purifying respirator, or (2) an air sample is greater than or equal to 6,000 ppb, then all handler activities must cease and handlers must be removed from the application block. If operations cease, the emergency plan detailed in the FMP must be implemented.
- Handlers can resume work activities without respiratory protection, if two consecutive breathing zone samples taken at the handling site at least 15 minutes apart show levels of MITC have decreased to less than 600 ppb, provided that handlers do not experience sensory irritation. During the collection of air samples an air-purifying respirator must be worn by the handler taking the air samples. Samples must be taken where the irritation is experienced.
- Work activities can resume if all the following conditions exist provided that the appropriate air-purifying respirator is worn:
  - Two consecutive breathing zone samples for MITC taken at the handling site at least 15 minutes apart must be less than 6,000 ppb,
  - Handlers do not experience sensory irritation while wearing the air-purifying respirator, and
  - Cartridges have been changed.
  - During the collection of air samples an air-purifying respirator must be worn by the handler taking the air samples. Samples must be taken where the irritation is first experienced.

## TARP PERFORATION AND/OR REMOVAL

**IMPORTANT:** Persons perforating, repairing, removing, and/or monitoring tarps are defined, within certain time limitations, as handlers (see definition of fumigant handlers in this labeling) and must be provided the PPE and other protections for handlers as required on this labeling and in the Worker Protection Standard for Agricultural Pesticides.

- Tarps must not be perforated until a minimum of 5 days (120 hours) have elapsed after the fumigant injection into the soil is complete (e.g., after injection of the fumigant product and tarps have been laid or after drip lines have been purged and tarps have been laid), unless a weather condition exists which necessitates the need for early perforation or removal. See *Early Tarp Removal for Broadcast Applications Only* and *Early Tarp Perforation for Flood Prevention Activities* sections.
- If tarps will be removed before planting, tarp removal must not begin until at least 2 hours after tarp perforation is complete.
- If tarps will not be removed before planting, planting or transplanting must not begin until at least 48 hours after the tarp perforation is complete.
- If tarps are left intact for a minimum of 14 days after fumigant injection into the soil is complete, planting or transplanting may take place while the tarps are being perforated.
- Each tarp panel used for broadcast fumigation must be perforated.

- Tarps used for fumigations may be perforated manually ONLY for the following situations:
  - At the beginning of each row where a coultter blade (or other device which performs similarly) is used on a motorized vehicle such as an ATV;
  - In fields that are 1 acre or less; or
  - During flood prevention activities.
- In all other instances tarps must be perforated (cut, punched, poked or sliced) only by mechanical methods.
- Tarp perforation for broadcast fumigations must be completed before noon.
- For broadcast fumigations, tarps must not be perforated if rainfall is expected within 12 hours.
- Early Tarp Removal for Broadcast Applications Only:
  - Tarps may be removed before the required 5 days (120 hours) if adverse weather conditions have compromised the integrity of the tarp, provided that the compromised tarp poses a safety hazard. *Adverse weather* includes high wind, hail, or storms that blow tarps off the field and create a hazard, e.g., tarps blowing into power lines and onto roads. A *compromised tarp* is a tarp that due to an adverse weather condition is no longer performing its intended function and is creating a hazard.
  - If tarps are removed before the required 5 days have elapsed due to adverse weather, the events must be documented in the post-fumigation summary section of the FMP.
- Early Tarp Perforation for Flood Prevention Activities:
  - Tarp perforation is allowed before the 5 days (120 hours) have elapsed if rain necessitates field drainage.
  - Tarps must be immediately retucked and packed after soil removal.

Only protected handlers may be in the area during application.

### AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. For entry-restricted period and notification requirements, see the *Entry Restricted Period* section of this labeling. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard (WPS).

### ENTRY-RESTRICTED PERIOD

Entry (including early entry that would otherwise be permitted under the Worker Protection Standard) by any person – other than a correctly trained and PPE-equipped handler who is performing a handling task listed on this labeling – is PROHIBITED from the start of the application until:

- 5 days (120 hours) after the application is complete for untarped applications, or
- 5 days (120 hours) after application is complete if tarps are not perforated and removed for at least 14 days following application (Note: persons installing, repairing, or monitoring tarps are handlers until 14 days after the application is complete if tarps are not perforated and removed during those 14 days), or
- 48 hours after tarp perforation is complete if they will not be removed for at least 14 days following application, or
- Tarp removal is completed if tarps are both perforated and removed less than 14 days after application.

**NOTE:** See *Tarp Perforation and/or Removal* section on this labeling for requirements about when tarps are allowed to be perforated.

### NOTIFICATION REQUIREMENT

Notify workers of the application by warning them orally and by posting Fumigant Treated Area sign. The signs must bear the skull and crossbones symbol and state:

- "DANGER/PELIGRO,"
- "Area under fumigation, DO NOT ENTER/NO ENTRE,"
- "Metam Sodium Fumigant in Use,"
- The date and time of fumigation,
- The date and time the entry restricted period is lifted,
- "VAPAM HL", and
- Name, address, and telephone number of the certified applicator in charge of the fumigation.

Post the Fumigant Treated Area sign instead of the Worker Protection Standard sign for this application but follow all Worker Protection Standard requirements pertaining to location, legibility, size, and timing of posting and removal.

Post the Fumigant Treated Area signs at all entrances to the application block (i.e., the field or portion of a field treated with a fumigant in any 24-hour period or, for center pivot applications which occur over many days, the total acres of a field treated).

### MANDATORY GOOD AGRICULTURAL PRACTICES (GAPs)

The following GAPs must be followed during all fumigant applications. All measurements and other documentation planned to ensure that the mandatory GAPs are achieved must be recorded in the FMP and/or the post-application summary report.

## Shank Applications

### Wind Speed

- Wind speed at the application site *must* be a minimum of 2 mph at the start of the application or forecasted to reach at least 5 mph during the application.

### Weather Conditions

- Prior to fumigation, the weather forecast for the day of the application and the 48-hour period following the fumigation *must* be checked to determine if unfavorable weather conditions exist or are predicted (see *Identifying Unfavorable Weather Conditions* section) and whether fumigation should proceed.
- Do not apply if a shallow, compressed (low-level) temperature inversion is forecast to persist for more than 18 consecutive hours for the 48-hour period after the start of application, or if there is an air-stagnation advisory issued by the National Weather Service in effect for the area which the fumigation is planned.
- Detailed local forecasts for weather conditions, wind speed, and air stagnation advisories may be obtained on-line at: <http://www.nws.noaa.gov> or by contacting your local National Weather Service Forecasting Office.

### Identifying Unfavorable Weather Conditions

- Unfavorable weather conditions block upward movement of air, which results in trapping fumigant vapors near the ground. The resulting air mass can move off-site in unpredictable directions. These conditions typically exist prior to sunset and continue past sunrise and persist as late as noontime. Unfavorable conditions are common on nights with limited cloud cover and light to no wind, and their presence can be indicated by ground fog or smog and can also be identified by smoke from a ground source that flattens out below a ceiling layer and moves laterally in a concentrated cloud.

### Soil Conditions, Injection Depth and Soil Sealing

- Soil *must* be in good tilth and free of large clods. Large clods can prevent effective soil sealing and reduce effectiveness of the application. If subsurface soil compaction layers (hardpans) are present within the intended fumigation treatment zone, a deep tillage to fracture these layers *must* occur prior to or as part of the soil fumigant application. The soil *must* be tilled, at minimum to the depth of the treatment zone.
- Plant residue that is present *must* not interfere with the application or the soil seal. Non-decomposed plant material may harbor pests that will not be controlled by fumigation. Crop residue that is present *must* lie flat to permit the soil to be sealed effectively and limit the natural "chimneys" that may occur in the soil when plant residue is present. These "chimneys" allow the soil fumigants to move through the soil quickly and escape into the atmosphere. This may create potentially harmful conditions for workers and bystanders and limits the efficacy of the fumigant. Plant residue on the field serves to prevent soil erosion from both wind and water.

The injection point for bedded and broadcast applications shall be a minimum of 3 inches from the final soil/air interface. Chisel traces *must* be eliminated following an application and the soil surface *must* be sealed immediately after application using one or more of the following methods:

- Compaction with a bed-shaper, roller, press wheel or by similar device, OR
- Covering the treated soil with 3-6 inches of untreated soil, OR
- Applying a minimum of a ½-inch of water beginning immediately after application of a set and completing the water treatment within four hours, OR
- Covering treated area with a tarp.

### Tarps

- When tarps are used for emission control, tarps *must* be installed immediately after application.
- When tarps are used, a written tarp plan *must* be developed and included in the FMP that includes:
  - o Schedule and procedures for checking tarps for damage, tears, and other problems,
  - o Plans for determining when and how repairs to tarp will be made, and by whom,
  - o Minimum time following injection that tarp will be repaired,
  - o Minimum size of damage that will be repaired,
  - o Other factors used to determine when tarp repair will be conducted,
  - o Schedule, equipment and methods used to cut tarp,
  - o Aeration plans and procedures following cutting and/or slitting prior to tarp removal or planting, and
  - o Schedule, equipment, and procedures for tarp removal.

### Soil Temperature

- At the beginning of the application, the maximum soil temperature at the injection depth is 90°F.
- If air temperatures have been above 100°F in any of the three days prior to application, then soil temperature *must* be measured and recorded in the FMP.

### Soil Moisture

- The soil moisture in the top six inches of soil *must* be between 60% to 80% of soil capacity (field capacity) immediately prior to the application, subject to the exception below.
- EXCEPTION: In areas where soil moisture *must* exceed field capacity to form a bed (e.g. certain regions in Florida), soil capacity (field capacity) may exceed the 80% allocated above.

- If appropriate measuring equipment is not used to determine whether the soil moisture in the top six inches of soil is between 60% to 80% of soil capacity (field capacity) immediately prior to the application, the USDA *Feel Method* test may be used to help estimate whether the 60% to 80% soil capacity (field capacity) requirement is met:
  - o **coarse** textured soils (fine sand and loamy fine sand): there *must* be enough moisture (50-75% available soil water moisture) to form a weak ball with loose and clustered sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.
  - o **moderately coarse** textured soils (sandy loam and fine sandy loam): there *must* be enough moisture (50-75% available soil water moisture) to form a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not stick.
  - o **medium** textured soils (sandy clay loam, loam, and silt loam): there *must* be enough moisture (50-75% available soil water moisture) to form a ball, very light staining on fingers, darkened color, pliable and forms a weak ribbon between the thumb and forefinger.
  - o **fine** textured soils (clay, clay loam, and silty clay loam): there *must* be enough moisture (50-75% available soil water moisture) to form a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.
  - o For **fields with more than one soil texture**, soil moisture content in the lightest textured (most sandy) areas *must* comply with this soil moisture requirement. The field may be divided into areas of similar soil texture and the soil moisture of each area should be adjusted as needed. Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If there is uncertainty in determining the soil moisture content of the area to be treated, a local extension service or soil conservation service specialist or pest control advisor (agriculture consultant) should be consulted for assistance.
- If there is insufficient moisture throughout the top six inches of soil immediately prior to the application, the soil moisture *must* be adjusted. If there is adequate soil moisture below six inches, soil moisture can be brought to the surface by tillage before or during injection. To conserve soil moisture, tillage should be done as close to the time of application as possible.

### Application and Equipment Considerations

- Do not apply or allow fumigant to drain or drip onto the soil surface. Injectors *must* be placed below the soil surface before product flow begins. For each injection line either have a check valve located as close as possible to the final injection point, or drain/purge the line of any remaining fumigant prior to lifting injection shanks from the ground. Do not lift injection shanks from the soil until the shut-off valve has been closed and the fumigant has been depressurized (passively drained) or purged (actively forced out via air compressor) from the system.
- Application equipment *must* be in good working order.
- All tanks, hoses, fittings, valves and connections *must* be serviceable, tightened, sealed and not leaking.
- Dry connect fittings (closed transfer system) *must* be installed on all tanks and transfer hoses.
- Sight gauges and pressure gauges *must* be working.
- Nozzles and metering devices *must* be the correct size and unobstructed.
- Use only tanks, hoses and fittings designed to withstand the pressure of the system and resistant to metam.
- Each nozzle *must* be equipped with a flow monitor, e.g. mechanical, electronic, or Red-ball type monitor.
- For undiluted product, aluminum, brass, copper, galvanized iron, and zinc materials cannot be used.
- All rigs *must* include a filter to remove any particulates from the fumigant, and a check valve that is visible to the tractor pilot during application to prevent backflow of the fumigant into the pressurizing cylinder.
- All rigs *must* include a flow meter or a flow monitoring device.
- All rigs *must* have a constant pressure system with orifice plates to ensure the proper amount of fumigant is applied.
- Valves, vacuum relief valves, and low pressure drains *must* be in place, operational, and leak free.
- Interlocking controls *must* be installed and functioning.
- Use only positive displacement pumps. Do NOT use impellers made of brass, aluminum, or galvanized material.
- Before using a fumigation rig for the first time, or when preparing it for use after storage, the operator *must* check the following items carefully:
  - o Check the filter, and clean or replace the filter element as required.
  - o Check all tubes and chisels to make sure they are free of debris and obstructions.
  - o Check and clean the orifice plates.

## Spray Blade Applications (includes bed-top blade and soil cap applications)

### Wind Speed

- Wind speed at the application site *must* be a minimum of 2 mph at the start of the application or forecasted to reach at least 5 mph during the application.

### Weather Conditions

- Prior to fumigation, the weather forecast for the day of the application and the 48-hour period following the fumigation *must* be checked to determine if unfavorable weather conditions exist or are predicted (see *Identifying Unfavorable Weather Conditions* section) and whether fumigation should proceed.
- Do not apply if a shallow, compressed (low-level) temperature inversion is forecast to persist for more than 18 consecutive hours for the 48-hour period after the start of application, or if there is an air-stagnation advisory issued by the National Weather Service in effect for the area which the fumigation is planned.
- Detailed local forecasts for weather conditions, wind speed, and air stagnation advisories may be obtained on-line at: <http://www.nws.noaa.gov> or by contacting your local National Weather Service Forecasting Office.

### Identifying Unfavorable Weather Conditions

- Unfavorable weather conditions block upward movement of air, which results in trapping fumigant vapors near the ground. The resulting air mass can move off-site in unpredictable directions. These conditions typically exist prior to sunset and continue past sunrise and persist as late as noontime. Unfavorable conditions are common on nights with limited cloud cover and light to no wind, and their presence can be indicated by ground fog or smog and can also be identified by smoke from a ground source that flattens out below a ceiling layer and moves laterally in a concentrated cloud.

### Soil Conditions, Injection Depth and Soil Sealing

- Soil must be in good tilth and free of large clods. Large clods can prevent effective soil sealing and reduce effectiveness of the application. If subsurface soil compaction layers (hardpans) are present within the intended fumigation treatment zone, a deep tillage to fracture these layers must occur prior to or as part of the soil fumigant application. The soil must be tilled, at minimum to the depth of the treatment zone.
- Plant residue that is present must not interfere with the application or the soil seal. Non-decomposed plant material may harbor pests that will not be controlled by fumigation. Crop residue that is present must lie flat to permit the soil to be sealed effectively and limit the natural "chimneys" that may occur in the soil when plant residue is present. These "chimneys" allow the soil fumigants to move through the soil quickly and escape into the atmosphere. This may create potentially harmful conditions for workers and bystanders and limits the efficacy of the fumigant. Plant residue on the field serves to prevent soil erosion from both wind and water.

Apply the product on the soil immediately ahead of the bed-shaping equipment. The soil surface must be compacted immediately after application using one or more of the following methods:

- Compaction with a bed-shaper, roller, press wheel or similar device, OR
- Covering the treated soil with 3-6 inches of untreated soil, OR
- Applying a minimum of a ½-inch of water beginning immediately after application of a set and completing the water treatment within four hours, OR
- Covering treated area with a tarp.

### Tarps

- When tarps are used for emission control, tarps must be installed immediately after application.
- When tarps are used, a written tarp plan must be developed and included in the FMP that includes:
  - Schedule and procedures for checking tarps for damage, tears, and other problems,
  - Plans for determining when and how repairs to tarp will be made, and by whom,
  - Minimum time following injection that tarp will be repaired,
  - Minimum size of damage that will be repaired,
  - Other factors used to determine when tarp repair will be conducted,
  - Schedule, equipment and methods used to cut tarp,
  - Aeration plans and procedures following cutting and/or slitting prior to tarp removal or planting, and
  - Schedule, equipment, and procedures for tarp removal.

### Soil Temperature

- At the beginning of the application, the maximum soil temperature at the injection depth is 90°F.
- If air temperatures have been above 100°F in any of the three days prior to application, then soil temperature must be measured and recorded in the FMP.

### Soil Moisture

- The soil moisture in the top six inches of soil must be between 60% to 80% of soil capacity (field capacity) immediately prior to the application, subject to the exception below.
- EXCEPTION: In areas where soil moisture must exceed field capacity to form a bed (e.g. certain regions in Florida), soil capacity (field capacity) may exceed the 80% allocated above.

- If appropriate measuring equipment is not used to determine whether the soil moisture in the top six inches of soil is between 60% to 80% of soil capacity (field capacity) immediately prior to the application, the USDA *Feel Method* test may be used to help estimate whether the 60% to 80% soil capacity (field capacity) requirement is met:

- **coarse** textured soils (fine sand and loamy fine sand): there must be enough moisture (50-75% available soil water moisture) to form a weak ball with loose and clustered sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.
- **moderately coarse** textured soils (sandy loam and fine sandy loam): there must be enough moisture (50-75% available soil water moisture) to form a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not stick.
- **medium** textured soils (sandy clay loam, loam, and silt loam): there must be enough moisture (50-75% available soil water moisture) to form a ball, very light staining on fingers, darkened color, pliable and forms a weak ribbon between the thumb and forefinger.
- **fine** textured soils (clay, clay loam, and silty clay loam): there must be enough moisture (50-75% available soil water moisture) to form a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.
- For **fields with more than one soil texture**, soil moisture content in the lightest textured (most sandy) areas must comply with this soil moisture requirement. The field may be divided into areas of similar soil texture and the soil moisture of each area should be adjusted as needed. Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If there is uncertainty in determining the soil moisture content of the area to be treated, a local extension service or soil conservation service specialist or pest control advisor (agriculture consultant) should be consulted for assistance.

- If there is insufficient moisture throughout the top six inches of soil immediately prior to the application, the soil moisture must be adjusted. If there is adequate soil moisture below six inches, soil moisture can be brought to the surface by tillage before or during injection. To conserve soil moisture, tillage should be done as close to the time of application as possible.

### Application and Equipment Considerations

- Do not apply or allow fumigant to drain or drip onto the soil surface.
- Application equipment must be in good working order.
- All tanks, hoses, fittings, valves and connections must be serviceable, tightened, sealed and not leaking.
- Dry connect fittings (closed transfer system) must be installed on all tanks and transfer hoses.
- Sight gauges and pressure gauges must be working.
- Nozzles and metering devices must be the correct size and sealed and unobstructed.
- Use only tanks, hoses and fittings designed to withstand the pressure of the system and resistant to metam.
- Each nozzle must be equipped with a flow monitor, e.g. mechanical, electronic, or Red-ball type monitor.
- For undiluted product, aluminum, brass, copper, galvanized iron, and zinc materials cannot be used.
- All rigs must include a filter to remove any particulates from the fumigant, and a check valve that is visible to the tractor pilot during application to prevent backflow of the fumigant into the pressurizing cylinder.
- Before using a fumigation rig for the first time, or when preparing it for use after storage, the operator must check the following items carefully:
  - Check the filter, and clean or replace the filter element as required.
  - Check all tubes and chisels to make sure they are free of debris and obstructions.
  - Check and clean the orifice plates.

### Rotary Tiller Applications

#### Wind Speed

- Wind speed at the application site *must* be a minimum of 2 mph at the start of the application or forecasted to reach at least 5 mph during the application.

#### Weather Conditions

- Prior to fumigation, the weather forecast for the day of the application and the 48-hour period following the fumigation *must* be checked to determine if unfavorable weather conditions exist or are predicted (see *Identifying Unfavorable Weather Conditions* section) and whether fumigation should proceed.
- Do not apply if a shallow, compressed (low-level) temperature inversion is forecast to persist for more than 18 consecutive hours for the 48-hour period after the start of application, or if there is an air-stagnation advisory issued by the National Weather Service in effect for the area which the fumigation is planned.

- Detailed local forecasts for weather conditions, wind speed, and air stagnation advisories may be obtained on-line at: <http://www.nws.noaa.gov> or by contacting your local National Weather Service Forecasting Office.

#### Identifying Unfavorable Weather Conditions

- Unfavorable weather conditions block upward movement of air, which results in trapping fumigant vapors near the ground. The resulting air mass can move off-site in unpredictable directions. These conditions typically exist prior to sunset and continue past sunrise and persist as late as noontime. Unfavorable conditions are common on nights with limited cloud cover and light to no wind, and their presence can be indicated by ground fog or smog and can also be identified by smoke from a ground source that flattens out below a ceiling layer and moves laterally in a concentrated cloud.

#### Soil Conditions, Injection Depth and Soil Sealing

- Soil must be in good tilth and free of large clods. Large clods can prevent effective soil sealing and reduce effectiveness of the application. If subsurface soil compaction layers (hardpans) are present within the intended fumigation treatment zone, a deep tillage to fracture these layers must occur prior to or as part of the soil fumigant application. The soil must be tilled, at minimum to the depth of the treatment zone.
- Plant residue that is present must not interfere with the application or the soil seal. Non-decomposed plant material may harbor pests that will not be controlled by fumigation. Crop residue that is present must lie flat to permit the soil to be sealed effectively and limit the natural "chimneys" that may occur in the soil when plant residue is present. These "chimneys" allow the soil fumigants to move through the soil quickly and escape into the atmosphere. This may create potentially harmful conditions for workers and bystanders and limits the efficacy of the fumigant. Plant residue on the field serves to prevent soil erosion from both wind and water.

Apply the product on the soil immediately ahead of the tiller. The soil surface must be compacted immediately after application using one or more of the following methods:

- Compaction with a bed-shaper, roller, press wheel or similar device, OR
- Covering the treated soil with 3-6 inches of untreated soil, OR
- Applying a minimum of a ½-inch of water beginning immediately after application of a set and completing the water treatment within four hours, OR
- Covering treated area with a tarp.

#### Tarps

- When tarps are used for emission control, tarps must be installed immediately after application.
- When tarps are used, a written tarp plan must be developed and included in the FMP that includes:
  - o Schedule and procedures for checking tarps for damage, tears, and other problems,
  - o Plans for determining when and how repairs to tarp will be made, and by whom,
  - o Minimum time following injection that tarp will be repaired,
  - o Minimum size of damage that will be repaired,
  - o Other factors used to determine when tarp repair will be conducted,
  - o Schedule, equipment and methods used to cut tarp,
  - o Aeration plans and procedures following cutting and/or slitting prior to tarp removal or planting, and
  - o Schedule, equipment, and procedures for tarp removal.

#### Soil Temperature

- At the beginning of the application, the maximum soil temperature at the injection depth is 90°F.
- If air temperatures have been above 100°F in any of the three days prior to application, then soil temperature must be measured and recorded in the FMP.

#### Soil Moisture

- The soil moisture in the top six inches of soil must be between 60% to 80% of soil capacity (field capacity) immediately prior to the application, subject to the exception below.
- EXCEPTION: In areas where soil moisture must exceed field capacity to form a bed (e.g. certain regions in Florida), soil capacity (field capacity) may exceed the 80% allocated above.
- If appropriate measuring equipment is not used to determine whether the soil moisture in the top six inches of soil is between 60% to 80% of soil capacity (field capacity) immediately prior to the application, the USDA *Feel Method* test may be used to help estimate whether the 60% to 80% soil capacity (field capacity) requirement is met:
  - o **coarse** textured soils (fine sand and loamy fine sand): there must be enough moisture (50-75% available soil water moisture) to form a weak ball with loose and clustered sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.
  - o **moderately coarse** textured soils (sandy loam and fine sandy loam): there must be enough moisture (50-75% available soil water moisture) to form a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not stick.
  - o **medium** textured soils (sandy clay loam, loam, and silt loam): there must be enough moisture (50-75% available soil water moisture) to form a ball, very light staining on fingers, darkened color, pliable and forms a weak ribbon between the thumb and forefinger.
  - o **fine** textured soils (clay, clay loam, and silty clay loam): there must be enough moisture (50-75% available soil water moisture) to form a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.

- o For fields with more than one soil texture, soil moisture content in the lightest textured (most sandy) areas must comply with this soil moisture requirement. The field may be divided into areas of similar soil texture and the soil moisture of each area should be adjusted as needed. Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If there is uncertainty in determining the soil moisture content of the area to be treated, a local extension service or soil conservation service specialist or pest control advisor (agriculture consultant) should be consulted for assistance.
- If there is insufficient moisture throughout the top six inches of soil immediately prior to the application, the soil moisture must be adjusted. If there is adequate soil moisture below six inches, soil moisture can be brought to the surface by tillage before or during injection. To conserve soil moisture, tillage should be done as close to the time of application as possible.

#### Application and Equipment Considerations

- Do not apply or allow fumigant to drain or drip onto the soil surface.
- Dry connect fittings (closed transfer system) must be installed on all tanks and transfer hoses.
- Application equipment must be in good working order.
- All tanks, hoses, fittings, valves and connections must be serviceable, tightened, sealed and not leaking.
- Sight gauges and pressure gauges must be working.
- Nozzles and metering devices must be the correct size and sealed and unobstructed.
- Use only tanks, hoses and fittings designed to withstand the pressure of the system and resistant to metam.
- Each nozzle must be equipped with a flow monitor, e.g. mechanical, electronic, or Red-ball type monitor.
- For undiluted product, aluminum, brass, copper, galvanized iron, and zinc materials cannot be used.
- All rigs must include a filter to remove any particulates from the fumigant, and a check valve that is visible to the tractor pilot during application to prevent backflow of the fumigant into the pressurizing cylinder.
- Before using a fumigation rig for the first time, or when preparing it for use after storage, the operator must check the following items carefully:
  - o Check the filter, and clean or replace the filter element as required.
  - o Check all tubes and chisels to make sure they are free of debris and obstructions.
  - o Check and clean the orifice plates.

#### Center Pivot Applications

##### Wind Speed

- For sprinkler or center pivot applications: 1) not using a solid stream type nozzle, OR 2) having a release height or spray height greater than 4 feet, OR 3) having 30 lbs or greater PSI at the sprinkler head, wind speed at the application site *must* be a minimum of 2 mph at the start of the application or forecasted to reach 5 mph during the application and the maximum wind speed is 10 mph.
- For sprinkler or center pivot applications using: 1) a solid stream, AND 2) having release height and spray height less than 4 feet, AND 3) having 29 lbs or less PSI at the sprinkler head, wind speed at the application site *must* be a minimum of 2 mph at the start of the application or forecasted to reach 5 mph during the application and the maximum wind speed is 25 mph.

##### Weather Conditions

- Prior to fumigation, the weather forecast for the day of the application and the 48-hour period following the fumigation *must* be checked to determine if unfavorable weather conditions exist or are predicted (see *Identifying Unfavorable Weather Conditions* section) and whether fumigation should proceed.
- Do not apply if a shallow, compressed (low-level) temperature inversion is forecast to persist for more than 18 consecutive hours for the 48-hour period after the start of application, or if there is an air-stagnation advisory issued by the National Weather Service in effect for the area which the fumigation is planned.
- Detailed local forecasts for weather conditions, wind speed, and air stagnation advisories may be obtained on-line at: <http://www.nws.noaa.gov> or by contacting your local National Weather Service Forecasting Office.

#### Identifying Unfavorable Weather Conditions

- Unfavorable weather conditions block upward movement of air, which results in trapping fumigant vapors near the ground. The resulting air mass can move off-site in unpredictable directions. These conditions typically exist prior to sunset and continue past sunrise and persist as late as noontime. Unfavorable conditions are common on nights with limited cloud cover and light to no wind, and their presence can be indicated by ground fog or smog and can also be identified by smoke from a ground source that flattens out below a ceiling layer and moves laterally in a concentrated cloud.

### Soil Conditions

- Soil must be in good tilth and free of large clods. Large clods can prevent effective soil sealing and reduce effectiveness of the application. If subsurface soil compaction layers (hardpans) are present within the intended fumigation treatment zone, tillage to fracture these layers must occur. The soil must be tilled before or during the application, at minimum, to the depth of the intended treatment zone.
- Plant residue that is present must not interfere with the application or the soil seal. Non-decomposed plant material may harbor pests that will not be controlled by fumigation. Except when applying over cover crops as set forth in the General Instructions for Sprinkler System, crop residue that is present must lie flat to permit the soil to be sealed effectively and limit the natural "chimneys" that may occur in the soil when plant residue is present. These "chimneys" allow the soil fumigants to move through the soil quickly and escape into the atmosphere. This may create potentially harmful conditions for workers and bystanders and limits the efficacy of the fumigant. Plant residue on the field serves to prevent soil erosion from both wind and water.

### Soil Temperature

- At the beginning of the application, the maximum soil temperature is 90°F, measured at 3 inches in depth.
- If air temperatures have been above 100°F in any of the three days prior to application, then soil temperature must be measured and recorded in the FMP.

### Soil Moisture

- The soil moisture in the top six inches of soil must be between 60% to 80% of soil capacity (field capacity) immediately prior to the application.
- If appropriate measuring equipment is not used to determine whether soil moisture in the top six inches of soil is between 60% to 80% of soil capacity (field capacity) immediately prior to the application, the USDA *Feel Method* test may be used to help estimate whether the 60% to 80% soil capacity (field capacity) requirement is met:
  - o **coarse** textured soils (fine sand and loamy fine sand): there must be enough moisture (50-75% available soil water moisture) to form a weak ball with loose and clustered sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.
  - o **moderately coarse** textured soils (sandy loam and fine sandy loam): there must be enough moisture (50-75% available soil water moisture) to form a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not stick.
  - o **medium** textured soils (sandy clay loam, loam, and silt loam): there must be enough moisture (50-75% available soil water moisture) to form a ball, very light staining on fingers, darkened color, pliable and forms a weak ribbon between the thumb and forefinger.
  - o **fine** textured soils (clay, clay loam, and silty clay loam): there must be enough moisture (50-75% available soil water moisture) to form a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.
  - o For **fields with more than one soil texture**, soil moisture content in the lightest textured (most sandy) areas must comply with this soil moisture requirement. The field may be divided into areas of similar soil texture and the soil moisture of each area should be adjusted as needed. Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If there is uncertainty in determining the soil moisture content of the area to be treated, a local extension service or soil conservation service specialist or pest control advisor (agriculture consultant) should be consulted for assistance.
- If there is insufficient moisture throughout the top six inches below the surface of soil immediately prior to the application, the soil moisture must be adjusted. If there is adequate soil moisture below six inches, soil moisture can be brought to the surface by tillage prior to the application. To conserve existing soil moisture, tillage should be done as close to the time of application as possible.

### Flushing Irrigation Lines

- Do not allow fumigant to remain in the irrigation system after the application is complete. After application of the fumigant, flush the injection and irrigation system with untreated water. The flush time must be adequate to purge the fumigant from the injection and irrigation system, but should be less than the amount that could over-saturate the beds. If common lines are used for both the fumigant application and the water treatment/seal (if applied), these lines must be adequately flushed before starting the water treatment/seal.

### Application and Equipment Considerations

- Anti-siphon and back-flow prevention devices must be installed and in working order.
- Use only tanks constructed with materials approved for handling metam. Tanks must be in good condition to ensure product does not spill or leak.
- Tanks must have proper pesticide labels on them.
- All tanks, hoses, fittings, valves and connections must be serviceable, tightened, sealed and not leaking.
- Use only tanks, hoses and fittings designed to withstand the pressure of the system and resistant to metam.

- Use only positive displacement pumps. Do NOT use impellers made of brass, aluminum, or galvanized material.
- For undiluted product, aluminum, brass, copper, galvanized iron, and zinc materials cannot be used.
- The system must contain a functional check valve, vacuum relief valve, inspection port, and low-pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from backflow.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid toward the injection pump.
- The pesticide injection pipeline must also contain a functional, normally-closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
- The irrigation line or water pump must include a functional pressure switch that will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

### Solid Set Sprinkler Applications

#### Wind Speed

- Wind speed at the application site *must* be a minimum of 2 mph at the start of the application or forecasted to reach at least 5 mph during the application and the maximum wind speed is 10 mph.

#### Weather Conditions

- Prior to fumigation, the weather forecast for the day of the application and the 48-hour period following the fumigation *must* be checked to determine if unfavorable weather conditions exist or are predicted (see *Identifying Unfavorable Weather Conditions* section) and whether fumigation should proceed.
- Do not apply if a shallow, compressed (low-level) temperature inversion is forecast to persist for more than 18 consecutive hours for the 48-hour period after the start of application, or if there is an air-stagnation advisory issued by the National Weather Service in effect for the area which the fumigation is planned.
- Detailed local forecasts for weather conditions, wind speed, and air stagnation advisories may be obtained on-line at: <http://www.nws.noaa.gov> or by contacting your local National Weather Service Forecasting Office.

#### Identifying Unfavorable Weather Conditions

- Unfavorable weather conditions block upward movement of air, which results in trapping fumigant vapors near the ground. The resulting air mass can move off-site in unpredictable directions. These conditions typically exist prior to sunset and continue past sunrise and persist as late as noontime. Unfavorable conditions are common on nights with limited cloud cover and light to no wind, and their presence can be indicated by ground fog or smog and can also be identified by smoke from a ground source that flattens out below a ceiling layer and moves laterally in a concentrated cloud.

### Soil Conditions

- Soil must be in good tilth and free of large clods. Large clods can prevent effective soil sealing and reduce effectiveness of the application. If subsurface soil compaction layers (hardpans) are present within the intended fumigation treatment zone, tillage to fracture these layers must occur. The soil must be tilled prior to the application, at a minimum to the depth of the treatment zone.
- Plant residue that is present must not interfere with the application or the soil seal. Non-decomposed plant material may harbor pests that will not be controlled by fumigation. Except when applying over cover crops as set forth in the General Instructions for Sprinkler System, crop residue that is present must lie flat to permit the soil to be sealed effectively and limit the natural "chimneys" that may occur in the soil when plant residue is present. These "chimneys" allow the soil fumigants to move through the soil quickly and escape into the atmosphere. This may create potentially harmful conditions for workers and bystanders and limits the efficacy of the fumigant. Plant residue on the field serves to prevent soil erosion from both wind and water.

### Soil Temperature

- At the beginning of the application, the maximum soil temperature is 90°F, measured at 3 inches in depth.
- If air temperatures have been above 100°F in any of the three days prior to application, then soil temperature must be measured and recorded in the FMP.

### Soil Moisture

- The soil moisture in the top six inches of soil must be between 60% to 80% of soil capacity (field capacity) immediately prior to the application.

- If appropriate measuring equipment is not used to determine whether soil moisture in the top six inches of soil is between 60% to 80% of soil capacity (field capacity) immediately prior to the application, the USDA *Feel Method* test may be used to help estimate whether the 60% to 80% soil capacity (field capacity) requirement is met:
  - o **coarse** textured soils (fine sand and loamy fine sand): there must be enough moisture (50-75% available soil water moisture) to form a weak ball with loose and clustered sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.
  - o **moderately coarse** textured soils (sandy loam and fine sandy loam): there must be enough moisture (50-75% available soil water moisture) to form a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not stick.
  - o **medium** textured soils (sandy clay loam, loam, and silt loam): there must be enough moisture (50-75% available soil water moisture) to form a ball, very light staining on fingers, darkened color, pliable and forms a weak ribbon between the thumb and forefinger.
  - o **fine** textured soils (clay, clay loam, and silty clay loam): there must be enough moisture (50-75% available soil water moisture) to form a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.
  - o For **fields with more than one soil texture**, soil moisture content in the lightest textured (most sandy) areas must comply with this soil moisture requirement. The field may be divided into areas of similar soil texture and the soil moisture of each area should be adjusted as needed. Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If there is uncertainty in determining the soil moisture content of the area to be treated, a local extension service or soil conservation service specialist or pest control advisor (agriculture consultant) should be consulted for assistance.
- If there is insufficient moisture throughout the top six inches below the surface of soil immediately prior to the application, the soil moisture must be adjusted. If there is adequate soil moisture below six inches, soil moisture can be brought to the surface by tillage prior to the application. To conserve existing soil moisture, tillage should be done as close to the time of application as possible.

#### Flushing Irrigation Lines

- Do not allow fumigant to remain in the irrigation system after the application is complete. After application of the fumigant, flush the injection and irrigation system with untreated water. The flush time must be adequate to purge the fumigant from the injection and irrigation system, but should be less than the amount that could over-saturate the beds. If common lines are used for both the fumigant application and the water treatment/seal (if applied), these lines must be adequately flushed before starting the water treatment/seal.

#### Application and Equipment Considerations

- Anti-siphon and back-flow prevention devices must be installed and in working order.
- Use only tanks constructed with materials approved for handling metam. Tanks must be in good condition to ensure product does not spill or leak.
- Tanks must have proper pesticide labels on them.
- All tanks, hoses, fittings, valves and connections must be serviceable, tightened, sealed and not leaking.
- Use only tanks, hoses and fittings designed to withstand the pressure of the system and resistant to metam.
- Use only positive displacement pumps. Do NOT use impellers made of brass, aluminum, or galvanized material.
- For undiluted product, aluminum, brass, copper, galvanized iron, and zinc materials cannot be used.
- The system must contain a functional check valve, vacuum relief valve, inspection port, and low-pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from backflow.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid toward the injection pump.
- The pesticide injection pipeline must also contain a functional, normally-closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
- The irrigation line or water pump must include a functional pressure switch that will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

## Drench Applications

### Wind Speed

- Wind speed at the application site *must* be a minimum of 2 mph at the start of the application or forecasted to reach 5 mph during the application.

### Weather Conditions

- Prior to fumigation, the weather forecast for the day of the application and the 48-hour period following the fumigation *must* be checked to determine if unfavorable weather conditions exist or are predicted (see *Identifying Unfavorable Weather Conditions* section) and whether fumigation should proceed.
- Do not apply if a shallow, compressed (low-level) temperature inversion is forecast to persist for more than 18 consecutive hours for the 48-hour period after the start of application, or if there is an air-stagnation advisory issued by the National Weather Service in effect for the area which the fumigation is planned.
- Detailed local forecasts for weather conditions, wind speed, and air stagnation advisories may be obtained on-line at: <http://www.nws.noaa.gov> or by contacting your local National Weather Service Forecasting Office.

### Identifying Unfavorable Weather Conditions

- Unfavorable weather conditions block upward movement of air, which results in trapping fumigant vapors near the ground. The resulting air mass can move off-site in unpredictable directions. These conditions typically exist prior to sunset and continue past sunrise and persist as late as noontime. Unfavorable conditions are common on nights with limited cloud cover and light to no wind, and their presence can be indicated by ground fog or smog and can also be identified by smoke from a ground source that flattens out below a ceiling layer and moves laterally in a concentrated cloud.

### Soil Conditions

- Soil must be in good tilth and free of large clods. Large clods can prevent effective soil sealing and reduce effectiveness of the application. If subsurface soil compaction layers (hardpans) are present within the intended fumigation treatment zone, tillage to fracture these layers must occur. The soil must be tilled prior to the application, at a minimum to the depth of the treatment zone.
- Plant residue that is present must not interfere with the application or the soil seal. Non-decomposed plant material may harbor pests that will not be controlled by fumigation. Crop residue that is present must lie flat to permit the soil to be sealed effectively and limit the natural "chimneys" that may occur in the soil when plant residue is present. These "chimneys" allow the soil fumigants to move through the soil quickly and escape into the atmosphere. This may create potentially harmful conditions for workers and bystanders and limits the efficacy of the fumigant. Plant residue on the field serves to prevent soil erosion from both wind and water.

### Soil Temperature

- At the beginning of the application, the maximum soil temperature is 90°F, measured at 3 inches in depth.
- If air temperatures have been above 100°F in any of the three days prior to application, then soil temperature must be measured and recorded in the FMP.

### Soil Moisture

- The soil moisture in the top six inches of soil *must* be between 60% to 80% of soil capacity (field capacity) immediately prior to the application.
- If appropriate measuring equipment is not used to determine whether soil moisture in the top six inches of soil is between 60% to 80% of soil capacity (field capacity) immediately prior to the application, the USDA *Feel Method* test may be used to help estimate whether the 60% to 80% soil capacity (field capacity) requirement is met:
  - o **coarse** textured soils (fine sand and loamy fine sand): there must be enough moisture (50-75% available soil water moisture) to form a weak ball with loose and clustered sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.
  - o **moderately coarse** textured soils (sandy loam and fine sandy loam): there must be enough moisture (50-75% available soil water moisture) to form a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not stick.
  - o **medium** textured soils (sandy clay loam, loam, and silt loam): there must be enough moisture (50-75% available soil water moisture) to form a ball, very light staining on fingers, darkened color, pliable and forms a weak ribbon between the thumb and forefinger.
  - o **fine** textured soils (clay, clay loam, and silty clay loam): there must be enough moisture (50-75% available soil water moisture) to form a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.
  - o For **fields with more than one soil texture**, soil moisture content in the lightest textured (most sandy) areas must comply with this soil moisture requirement. The field may be divided into areas of similar soil texture and the soil moisture of each area should be adjusted as needed. Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If there is uncertainty in determining the soil moisture content of the area to be treated, a local extension service or soil conservation service specialist or pest control advisor (agriculture consultant) should be consulted for assistance.

- If there is insufficient moisture throughout the top six inches below the surface of soil immediately prior to the application, the soil moisture must be adjusted. If there is adequate soil moisture below six inches, soil moisture can be brought to the surface by tillage prior to the application. To conserve existing soil moisture, tillage should be done as close to the time of application as possible.
- Applications must be followed immediately with 0.20 to 0.50 inches of water through solid set sprinklers.
- A minimum of two more water seals must be applied; one water seal on the first evening of the application and the second on the evening of the day after application.

#### Application and Equipment Considerations

- Anti-siphon and back-flow prevention devices must be installed and in working order.
- Use only tanks constructed with materials approved for handling metam. Tanks must be in good condition to ensure product does not spill or leak.
- Tanks must have proper pesticide labels on them.
- All tanks, hoses, fittings, valves and connections must be serviceable, tightened, sealed and not leaking.
- Dry connect fittings (closed transfer system) must be installed on all tanks and transfer hoses.
- Use only tanks, hoses and fittings designed to withstand the pressure of the system and resistant to metam.
- For undiluted product, aluminum, brass, copper, galvanized iron, and zinc materials cannot be used.
- Each nozzle must be equipped with a flow monitor, e.g., mechanical, electronic, or Red-ball type monitor.
- To inject fumigant, use a metering system, effectively designed and constructed of materials that are compatible with the fumigant and capable of being fitted with system interlocking controls.
- Nozzles and metering devices are of correct size and are sealed and unobstructed.
- The system must contain a functional check valve, vacuum relief valve, inspection port, and low-pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from backflow.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid toward the injection pump.
- The pesticide injection pipeline must also contain a functional, normally-closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
- The irrigation line or water pump must include a functional pressure switch that will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

#### Drip Applications

##### Wind Speed

- Wind speed at the application site *must* be a minimum of 2 mph at the start of the application or forecasted to reach at least 5 mph during the application.

##### Weather Conditions

- Prior to fumigation, the weather forecast for the day of the application and the 48-hour period following the fumigation *must* be checked to determine if unfavorable weather conditions exist or are predicted (see *Identifying Unfavorable Weather Conditions* section) and whether fumigation should proceed.
- Do not apply if a shallow, compressed (low-level) temperature inversion is forecast to persist for more than 18 consecutive hours for the 48-hour period after the start of application, or if there is an air-stagnation advisory issued by the National Weather Service in effect for the area which the fumigation is planned.
- Detailed local forecasts for weather conditions, wind speed, and air stagnation advisories may be obtained on-line at: <http://www.nws.noaa.gov> or by contacting your local National Weather Service Forecasting Office.

#### Identifying Unfavorable Weather Conditions

- Unfavorable weather conditions block upward movement of air, which results in trapping fumigant vapors near the ground. The resulting air mass can move off-site in unpredictable directions. These conditions typically exist prior to sunset and continue past sunrise and persist as late as noontime. Unfavorable conditions are common on nights with limited cloud cover and light to no wind, and their presence can be indicated by ground fog or smog and can also be identified by smoke from a ground source that flattens out below a ceiling layer and moves laterally in a concentrated cloud.

#### Soil Conditions

- Soil must be in good till and free of large clods. Large clods can prevent effective soil sealing and reduce effectiveness of the application. If subsurface soil compaction layers (hardpans) are present within the intended fumigation treatment zone, tillage to fracture these layers must occur. The soil must be tilled prior to the application, at a minimum to the depth of the treatment zone.
- Plant residue that is present must not interfere with the application or the soil seal. Non-decomposed plant material may harbor pests that will not be controlled by fumigation. Crop residue that is present must lie flat to permit the soil to be sealed effectively and limit the natural "chimneys" that may occur in the soil when plant residue is present. These "chimneys" allow the soil fumigants to move through the soil quickly and escape into the atmosphere. This may create potentially harmful conditions for workers and bystanders and limits the efficacy of the fumigant. Plant residue on the field serves to prevent soil erosion from both wind and water.

#### Soil Temperature

- At the beginning of the application, the maximum soil temperature is 90°F, measured at 3 inches in depth.
- If air temperatures have been above 100°F in any of the three days prior to application, then soil temperature must be measured and recorded in the FMP.

#### Soil Moisture

- The soil moisture in the top six inches of soil must be between 60% to 80% of soil capacity (field capacity) immediately prior to the application, subject to the exception below.
- **EXCEPTION:** In areas where soil moisture must exceed field capacity to form a bed (e.g. certain regions in Florida), soil capacity (field capacity) may exceed the 80% allocated above.
- If appropriate measuring equipment is not used to determine whether soil moisture in the top six inches of soil is between 60% to 80% of soil capacity (field capacity) immediately prior to the application, the USDA *Feel Method* test may be used to help estimate whether the 60% to 80% soil capacity (field capacity) requirement is met:
  - o **coarse** textured soils (fine sand and loamy fine sand): there must be enough moisture (50-75% available soil water moisture) to form a weak ball with loose and clustered sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.
  - o **moderately coarse** textured soils (sandy loam and fine sandy loam): there must be enough moisture (50-75% available soil water moisture) to form a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not stick.
  - o **medium** textured soils (sandy clay loam, loam, and silt loam): there must be enough moisture (50-75% available soil water moisture) to form a ball, very light staining on fingers, darkened color, pliable and forms a weak ribbon between the thumb and forefinger.
  - o **fine** textured soils (clay, clay loam, and silty clay loam): there must be enough moisture (50-75% available soil water moisture) to form a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.
  - o For **fields with more than one soil texture**, soil moisture content in the lightest textured (most sandy) areas must comply with this soil moisture requirement. The field may be divided into areas of similar soil texture and the soil moisture of each area should be adjusted as needed. Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If there is uncertainty in determining the soil moisture content of the area to be treated, a local extension service or soil conservation service specialist or pest control advisor (agriculture consultant) should be consulted for assistance.
- If there is insufficient moisture throughout the top six inches below the surface of soil immediately prior to the application, the soil moisture must be adjusted. If there is adequate soil moisture below six inches, soil moisture can be brought to the surface by tillage prior to the application. To conserve existing soil moisture, tillage should be done as close to the time of application as possible.

#### Tarps

- When tarps are used for emission control in drip irrigation, the tarps must be installed immediately after application.
- When tarps are used, a written tarp plan must be developed and included in the FMP that includes:
  - o Schedule and procedures for checking tarps for damage, tears, and other problems,
  - o Plans for determining when and how repairs to tarp will be made, and by whom,

- o Minimum time following injection that tarp will be repaired,
- o Minimum size of damage that will be repaired,
- o Other factors used to determine when tarp repair will be conducted,
- o Schedule, equipment and methods used to cut tarp,
- o Aeration plans and procedures following cutting and/or slitting prior to tarp removal or planting, and
- o Schedule, equipment, and procedures for tarp removal.

#### Flushing Drip Irrigation Lines

- After application of the fumigant, continue to irrigate the area with water to flush the injection and irrigation system with untreated water. Do not allow fumigant to remain in the irrigation system after the application is complete. The total volume of water must be adequate to completely remove the fumigant from the irrigation system, but should be less than the amount that could over-saturate the beds. If common lines are used for both the fumigant application and the water treatment/seal (if applied), these lines must be adequately flushed before starting the water treatment/seal and/or normal irrigation practices.

#### Application and Equipment Considerations

- Anti-siphon and back-flow prevention devices must be installed and in working order.
- Use only tanks constructed with materials approved for handling metam. Tanks must be in good condition to ensure product does not spill or leak.
- Tanks must have proper pesticide labels on them.
- All tanks, hoses, fittings, valves and connections must be serviceable, tightened, sealed and not leaking.
- Use only tanks, hoses and fittings designed to withstand the pressure of the system and resistant to metam.
- For undiluted product, aluminum, brass, copper, galvanized iron, and zinc materials cannot be used.
- The drip irrigation system (main lines, headers, drip tape) must be thoroughly checked for leaks before the start of the application. An adequate run-time and pressure are needed to detect leaks. Look for puddling along major pipes (holes on pipes or leaky joints), at the top and ends of rows (leaky connections, open drip tape), in the furrows and on the bed surface (damaged drip tape, malfunctioning emitters).
- To inject fumigant, use a metering system, effectively designed and constructed of materials that are compatible with the fumigant and capable of being fitted with system interlocking controls.
- The system must contain a functional check valve, vacuum relief valve, inspection port, and low-pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from backflow.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid toward the injection pump.
- The pesticide injection pipeline must also contain a functional, normally-closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
- The irrigation line or water pump must include a functional pressure switch that will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.
- Nozzles and metering devices are of correct size and are sealed and unobstructed.

#### Flood Basin, Furrow and Border Application

##### Wind Speed

- Wind speed at the application site *must* be a minimum of 2 mph at the start of the application or forecasted to reach at least 5 mph during the application.

##### Weather Conditions

- Prior to fumigation, the weather forecast for the day of the application and the 48-hour period following the fumigation *must* be checked to determine if unfavorable weather conditions exist or are predicted (see *Identifying Unfavorable Weather Conditions* section) and whether fumigation should proceed.

- Do not apply if a shallow, compressed (low-level) temperature inversion is forecast to persist for more than 18 consecutive hours for the 48-hour period after the start of application, or if there is an air-stagnation advisory issued by the National Weather Service in effect for the area which the fumigation is planned.
- Detailed local forecasts for weather conditions, wind speed, and air stagnation advisories may be obtained on-line at: <http://www.nws.noaa.gov> or by contacting your local National Weather Service Forecasting Office.

#### Identifying Unfavorable Weather Conditions

- Unfavorable weather conditions block upward movement of air, which results in trapping fumigant vapors near the ground. The resulting air mass can move off-site in unpredictable directions. These conditions typically exist prior to sunset and continue past sunrise and persist as late as noontime. Unfavorable conditions are common on nights with limited cloud cover and light to no wind, and their presence can be indicated by ground fog or smog and can also be identified by smoke from a ground source that flattens out below a ceiling layer and moves laterally in a concentrated cloud.

#### Soil Conditions

- Soil must be in good tilth and free of large clods. Large clods can prevent effective soil sealing and reduce effectiveness of the application. If subsurface soil compaction layers (hardpans) are present within the intended fumigation treatment zone, tillage to fracture these layers must occur. The soil must be tilled prior to the application, at a minimum to the depth of the treatment zone.
- Plant residue that is present must not interfere with the application or the soil seal. Non-decomposed plant material may harbor pests that will not be controlled by fumigation. Crop residue that is present must lie flat to permit the soil to be sealed effectively and limit the natural "chimneys" that may occur in the soil when plant residue is present. These "chimneys" allow the soil fumigants to move through the soil quickly and escape into the atmosphere. This may create potentially harmful conditions for workers and bystanders and limits the efficacy of the fumigant. Plant residue on the field serves to prevent soil erosion from both wind and water.

#### Tarps

- When tarps are used for emission control, the tarps must be installed immediately after application.
- When tarps are used, a written tarp plan must be developed and included in the FMP that includes:
  - o Schedule and procedures for checking tarps for damage, tears, and other problems,
  - o Plans for determining when and how repairs to tarp will be made, and by whom,
  - o Minimum time following injection that tarp will be repaired,
  - o Minimum size of damage that will be repaired,
  - o Other factors used to determine when tarp repair will be conducted,
  - o Schedule, equipment and methods used to cut tarp,
  - o Aeration plans and procedures following cutting and/or slitting prior to tarp removal or planting, and
  - o Schedule, equipment, and procedures for tarp removal.

#### Soil Temperature

- At the beginning of the application, the maximum soil temperature is 90°F, measured at 3 inches in depth.
- If air temperatures have been above 100°F in any of the three days prior to application, then soil temperature must be measured and recorded in the FMP.

#### Soil Moisture

- Soil moisture in the top six inches of soil must be between 60% to 80% of soil capacity (field capacity) immediately prior to the application.
- EXCEPTION: In areas where soil moisture must exceed field capacity to form a bed (e.g., certain regions in Florida), soil capacity (field capacity) may exceed the 80% allocated above.
- If appropriate measuring equipment is not used to determine whether soil moisture in the top six inches of soil is between 60% to 80% of soil capacity (field capacity) immediately prior to the application, the USDA *Feel Method* test may be used to help estimate whether the 60% to 80% soil capacity (field capacity) requirement is met:
  - o **coarse** textured soils (fine sand and loamy fine sand): there must be enough moisture (50-75% available soil water moisture) to form a weak ball with loose and clustered sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.
  - o **moderately coarse** textured soils (sandy loam and fine sandy loam): there must be enough moisture (50-75% available soil water moisture) to form a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not stick.
  - o **medium** textured soils (sandy clay loam, loam, and silt loam): there must be enough moisture (50-75% available soil water moisture) to form a ball, very light staining on fingers, darkened color, pliable and forms a weak ribbon between the thumb and forefinger.
  - o **fine** textured soils (clay, clay loam, and silty clay loam): there must be enough moisture (50-75% available soil water moisture) to form a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.

- For **fields with more than one soil texture**, soil moisture content in the lightest textured (most sandy) areas must comply with this soil moisture requirement. The field may be divided into areas of similar soil texture and the soil moisture of each area should be adjusted as needed. Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If there is uncertainty in determining the soil moisture content of the area to be treated, a local extension service or soil conservation service specialist or pest control advisor (agriculture consultant) should be consulted for assistance.
- If there is insufficient moisture throughout the top six inches below the surface of soil immediately prior to the application, the soil moisture must be adjusted. If there is adequate soil moisture below six inches, soil moisture can be brought to the surface by tillage prior to the application. To conserve existing soil moisture, tillage should be done as close to the time of application as possible.

#### *Application and Equipment Considerations*

- Systems using a gravity flow pesticide dispersing system must meter the pesticide into the water at the head of the field and downstream of a hydraulic discontinuity such as a drop structure or weir box to decrease potential for water source contamination from backflow if water flow stops.
- Meter at a steady rate into 3 to 18 inches of water per treated acre during irrigation. **IMPORTANT:** Prior to starting the application, always inspect ditches and border areas to ensure containment of the irrigation waters. Apply only into field head ditch. **DO NOT APPLY INTO ANY LATERAL DITCHES.**
- Back-flow prevention devices must be installed and in working order.
- Use only tanks constructed with materials approved for handling metam. Tanks must be in good condition to ensure product does not spill or leak.
- Dry connect fittings (closed transfer system) must be installed on all tanks and transfer hoses.
- Tanks must have proper pesticide labels on them.
- All tanks, hoses, fittings, valves and connections must be serviceable, tightened, sealed and not leaking.
- Use only tanks, hoses and fittings designed to withstand the pressure of the system and resistant to metam.
- For undiluted product, aluminum, brass, copper, galvanized iron, and zinc materials cannot be used.
- To inject fumigant, use a metering system, effectively designed and constructed of materials that are compatible with the fumigant and capable of being fitted with system interlocking controls.
- Flow rates must be calibrated and checked for each application.
- All previous materials applied with the system must be cleaned thoroughly prior to fumigant application.
- System must be flushed after application to totally remove all fumigant.

#### **SITE-SPECIFIC FUMIGATION MANAGEMENT PLAN (FMP):**

Prior to the start of fumigation, the certified applicator supervising the application must verify that a site-specific FMP exists for each application block (i.e., the field or portion of a field treated with a fumigant in any 24-hour period, or, for center pivot applications which occur over many days, the total acres of a field treated). In addition, agricultural operations fumigating multiple application blocks as part of a larger fumigation may format their FMP in a manner whereby all of the information that is common to all the application blocks is captured once, and any information unique to a particular application block or blocks is captured in subsequent, separate sections.

The FMP must be prepared by the certified applicator, the site owner/operator, registrant, or other party.

The certified applicator must verify in writing (sign and date) that the site-specific FMP(s) reflects current site conditions before the start of fumigation.

Each site-specific FMP must contain the following elements:

- Applicator information (name, phone number, pesticide applicator license and/or certificate number, employer name, employer address).
- General site information.
  - Application block location (e.g., county, township, range, quadrant), address, or global positioning system (GPS) coordinates.
  - Name, address, and phone number of owner/operator of the application block.

- General application information (target application date/window, brand name of fumigant, EPA registration number).
- Tarp information and procedures for repair, perforation and removal (if tarp is used).
  - Brand name, lot number, thickness.
  - Name and phone number of person responsible for repairing tarps.
  - Schedule for checking tarps for damage, tears, and other problems.
  - Maximum time following notification of damage that the person(s) responsible for tarp repair will respond.
  - Minimum time following application that tarp will be repaired.
  - Minimum size of damage that will be repaired.
  - Other factors used to determine when tarp repair will be conducted.
  - Name and phone number of person responsible for cutting and/or removing tarps (if other than certified applicator).
  - Equipment/methods used to cut tarps.
  - Schedule and target dates for cutting tarps.
  - Schedule and target dates for removing tarps.
- Soil conditions (description of soil texture in application block, method used to determine soil moisture).
- Weather conditions (summary of forecasted conditions for the day of the application and the 48-hour period following the fumigant application).
  - Wind speed.
  - Inversion conditions (e.g., shallow, compressed (low-level) temperature inversion).
  - Air stagnation advisory.
- Respirators and other PPE for handlers (handler task, protective clothing, respirator type, respirator cartridge type, respirator cartridge replacement schedule, eye protection, gloves, other PPE).
- Emergency procedures (evacuation routes, locations of telephones, contact information for first responders, local/state/federal/tribal contacts, key personnel and emergency procedures/responsibilities in case of an incident, equipment/tarp/seal failure, odor complaints, or other emergencies).
- Fumigant Treated Area posting procedures (name, address, and phone number of person(s) who will post Fumigant Treated Area signs, location of posting Fumigant Treated Area signs, procedures for Fumigant Treated Area sign removal).
- Plan describing how communication will take place between applicator, land owner/operator, and other on-site handlers (e.g., tarp cutters/removers, irrigators) for complying with label requirements (e.g., treated area location, timing of tarp cutting and removal, PPE).
  - Name and phone number of persons contacted.
  - Date contacted.
- Authorized on-site personnel.
  - Names, addresses and phone numbers of handlers.
  - Name, address, and phone number for employers of handlers.
  - Tasks that each handler is authorized and trained to perform.
  - For handlers designated to wear air purifying respirators (an air-purifying respirator is required for a minimum of one handler):
    - date of medical qualification to wear an air-purifying respirator,
    - date of air-purifying respirator training, and
    - date of fit testing for the air-purifying respirator.
- Air monitoring Plan.
  - If sensory irritation is experienced, indicate whether operations will be ceased or operations will continue with an air-purifying respirator.
  - If the intention is to cease operations when sensory irritation is experienced, provide the name, address, and phone number of the handler that will perform monitoring activities prior to operations resuming.
  - When air-purifying respirators are worn:
    - Representative handler tasks to be monitored.
    - Monitoring equipment to be used and timing of monitoring.
- Good Agricultural Practices (GAPs).
  - Description of applicable mandatory GAPs.
  - Measurements and documentation to ensure GAPs are achieved (e.g., measurement of soil and other site conditions).
- Description of hazard communication. (e.g., The treated area has been posted in accordance with the label. Pesticide product labels and material safety data sheets are on-site and readily available for employees to review.)
- Record-keeping procedures (the owner/operator of the application block as well as the certified applicator, must keep a signed copy of the site-specific FMP for 2 years from the date of application).

For situations where an initial FMP is developed and certain elements do not change for multiple fumigation sites (e.g., applicator information, authorized on-site personnel, record-keeping procedures, emergency procedures, etc.), only elements that have changed need to be updated in the site-specific FMP provided the following:

- The certified applicator supervising the application has verified that those elements are current and applicable to the application block before it is fumigated and has documented the verification in the site-specific FMP; and
- Record-keeping requirements are followed for the entire FMP (including elements that do not change).

Once the application begins, the certified applicator must make a copy of the FMP available for viewing by handlers involved in the fumigation. The certified applicator or the owner/operator of the application block must provide a copy of the FMP to any federal, state, tribal, or local enforcement personnel who request the FMP. In case of an emergency, the FMP must be made available when requested by federal/state/tribal/local emergency response and enforcement personnel.

Within 30 days of completing the application portion of the fumigation process, the certified applicator supervising the application must complete a post-fumigation application summary that describes any deviations from FMP that have occurred, measurements taken to comply with GAPs as well as any complaints and/or incidents that have been reported to him/her.

The Post-Application Summary must contain the following elements:

- Actual date of the application, application rate, and size of application block fumigated.
- Summary of weather conditions on the day of the application and during the 48-hour period following the fumigant application.
- Tarp damage and repair information (if applicable).
  - o Location and size of tarp damage.
  - o Description of tarp/tarp seal/tarp equipment failure.
  - o Date and time of tarp repair.
- Tarp perforation/removal details (if applicable).
  - o Description of tarp removal (if different than in the FMP).
  - o Date tarps were perforated.
  - o Date tarps were removed.
- Complaint details (if applicable).
  - o Person filing complaint (e.g., on-site handler, person off-site).
  - o If off-site person: name, address, and phone number of person filing complaint.
  - o Description of control measure or emergency procedures followed after complaint.
- Description of incidents, equipment failure, or other emergency and emergency procedures followed (if applicable).
- Details of elevated air concentrations monitored on-site (if applicable).
  - o Location of elevated air concentration levels.
  - o Description of control measure or emergency procedures followed.
    - When sensory irritation experienced:
      - Date and time of sensory irritation.
      - Handler task/activity.
      - Handler location where irritation was observed.
      - Resulting action (e.g., cease operations, continue operations with air-purifying respirators).
    - When using a direct-read instrument:
      - Sample date and time.
      - Handler task/activity.
      - Handler location.
      - Air concentration.
      - Sampling method.
- Date of Fumigant Treated Area sign removal.
- Any deviations from the FMP.
- Record-keeping procedures (the owner/operator of the application block as well as the certified applicator must keep a signed copy of the post-application summary for 2 years from the date of application).

## MAXIMUM APPLICATION RATES FOR PRE-PLANT SOIL FUMIGATION

Maximum application rate is 320 lbs ai/A (75 gallons per treated acre).

Only for use on the following:

Cover crops (i.e., crops planted between periods of regular crop production to prevent soil erosion); Crops grown solely for seed; as well as (in alphabetical order): alfalfa; amaranth (including: leafy amaranth, Chinese spinach, tampala); anise; apple (including: balsam, crabapple); apricot; artichokes; arugula (roquette); asparagus (nursery production only); barley; basil; beans (including: lima, green, fava, seed beans); beet (including garden); berry (including: black satin berry, blackberry, blueberry, boysenberry, chesterberry, lowberry, wild raspberry, youngberry, dar-rowberry, dewberry, cloudberry, elderberry, Cherokee blackberry, coryberry, European barberry, huckleberry, hullberry, gooseberry, cranberry, highbush cranberry, Himalayaberry, jostaberry, juneberry, saskatoon berry, lingonberry, loganberry, lavacaberry, lucretiaberry, mammoth blackberry, marionberry, bingleberry, mountain pepper berries, mulberry, olallieberry, dirksen thornless berry, nectarberry, Oregon evergreen berry, partridgeberry, phenomenalberry, rangeberry, raspberry (black and red), ravenberry, riberry, rossberry, schisandra berry, serviceberry, Shawnee blackberry, strawberry) bok choy; broccoli; brussels sprouts; cabbage (including Napa); calabaza; calamondin; cardoon; carrot; casaba; cauliflower; celeriac; celery (including Chinese); celtuce; chayote (fruit); che; cherry (including: sweet and tart, chokecherry, pincherry); chervil; cheyenne; Chilean guava; Chinese greens; Chinese okra; Chinese waxgourd (Chinese preserving melon); chinquapin; chironja; chry-santhemum; cilantro; citrus citron; citrus hybrids; collard; corn salad; corn; cotton; cress (including: upland, yellow rocket, winter cress); cucumber (including Chinese cucumber); cucuzza; currant, (including: black, red, native and other varieties and hybrids); dandelion; dill; dock (sorrel); eggplant; endive (escarole); fennel, Florence (finochio); forest seedlings; garland; garlic; gherkin; ginger; gourd; grape; grapefruit; hechima; herbs (all); honey balls; honeysuckle; hyotan; kale; kiwifruit (including: fuzzy and hardy); kohlrabi; kumquat; leek; lemon; lettuce (including: head and leaf); lime; loquat; mandarin (including: tangerine and satsuma); mango; mayhaw; maypop;

melon (including: bitter melon, cantaloupe, hybrids and/or cultivars, citron melon, crenshaw melon, golden pershaw melon, mango melon, honeydew melon, musk-melon, Persian melon, pineapple melon, Santa Claus melon, snake melon, water-melon); mint; muntries; mustard; nectarine; nursery stock (fruit seedlings and rose bushes only); nursery tree crops (including crops like maple, ash, dogwood); nut (including: almond, beech nut, cashew, chestnut, hickory nut, Brazil nut, macada-mia nut (bush nut), filbert (hazelnut), pecan, pistachio, walnut (black and English/Persian)); onion; orach; orange (including: sour and sweet); ornamentals; parsley; peas (including: English and garden); peach; peanut; pear (including: oriental and balsam); pepper; phalsa; plum (including: Chickasaw and Damson); plumcot; potato; prune (fresh); pummelo; pumpkin; purslane (including: garden and winter); quince; radicchio (red chicory); radish (including Oriental); rappini; rhubarb; rye; salal; sea buckthorn; soybean; spinach (including: New Zealand, Malabar, Indian); squash, (including: summer, winter, butternut, straightneck, Acorn, crookneck, hub-bard, scallop, spaghetti); sugar beet; sweet potato; swiss chard; tangelo; tangor; tobacco; tomatoes; tree nuts (orchard replant only); turf (including golf courses); turnip; vegetable marrow; wheat; yams; zucchini.

## GENERAL INSTRUCTIONS

If fumes become detectable during treatment, apply more water to seal the fumes into the soil where they should be confined to achieve maximum fumigation benefit. Use promptly after mixing with water. Do not allow solution to stand.

**Mycorrhizae:** There are occasions when VAPAM HL is known to temporarily reduce mycorrhizae in agricultural soils. For those crops that are mycorrhizae dependent and planted into VAPAM HL-treated soils, it is necessary to practice a good fertilizer program until the mycorrhizae repopulate the treated area.

## PRODUCT INFORMATION

VAPAM HL is a water soluble liquid. When applied to soil, the liquid is converted into a volatile fumigant (Methylisothiocyanate, MITC). After a sufficient interval of time, the fumigant degrades/dissipates leaving the soil ready for planting.

## WHEN TO USE MAXIMUM AND MINIMUM RATES

The application rate of VAPAM HL is dependent on the soil type to be treated and the position in the soil of the pest to be suppressed or controlled. For maximum control or suppression, an understanding of the pest, its location and its respiring state will ensure maximum performance of VAPAM HL. Generally, a light sandy soil requires a lower application rate than a heavier mineral soil. In addition, if the pest is in the upper portion of the soil profile (annual weeds), a lower application rate is generally required than if the pest is deeper in the soil profile and deeper penetration is desired (perennial weed seeds and nematodes). When a range of application rates is given in this label, consult your local agricultural extension service for more specific information.

**Nematodes and Nutsedge:** Nematode suppression is achieved when VAPAM HL converts to MITC and makes contact with active forms of the nematodes, preferably juveniles. Endo-parasites in plant residue may not be suppressed. Plant residues from previously infected crops should be completely decomposed prior to VAPAM HL application to ensure maximum exposure. Eggs are more difficult to suppress than juveniles, but are susceptible. Pre-irrigation has been demonstrated to stimulate egg hatch of some species and may enhance overall VAPAM HL performance. Nutsedge may be suppressed with VAPAM HL if actively growing and a high use rate is used (75 gal/acre). More often, rhizomes, roots and shoots will be controlled but the tuber will remain viable and at a later time regrow. Treatments made immediately prior to a crop planting (after the necessary waiting period) will give a weed-free period for crop establishment.

## USE PRECAUTIONS

Keep children and pets out of treated areas. VAPAM HL uses described on this label are intended for pre-plant soil preparation only. All plant foliage and any established plants growing on the treatment sites will be either severely damaged or destroyed. Keep the product off of any desirable turf or plants. Do not apply within 3 feet of the drip line of desirable plants, shrubs, or trees. Do not use in greenhouses. Keep container tightly closed when not in use. Do not store near feed or food. NOTE: VAPAM HL will suppress and/or control only those pests in the fumigation zone at the time of treatment. Reinfestation may occur subsequent to the fumigants degradation/dissipation from the soil.

## TREATMENT GUIDELINES

For optimum results, certain procedures should be observed at designated times in the treatment program. Described below are important guidelines for each of the four stages of the treatment process. Consult your Sales Representative for the appropriate treatment program for your particular needs.

- Pre-Application
- Field Preparation Prior to Application
- Application
- Pre-Planting After Application of VAPAM HL

## PRE-APPLICATION

VAPAM HL is applied post-harvest and 14 to 21 days before a new crop is planted (see "Testing of Treated Soil Before Planting" section). In some areas, fall application is preferred as the product will degrade/dissipate over the winter that allows planting to begin as soon as favorable springtime conditions arrive.

### Application Rate

Apply 37.5 to 75 gallons of product per treated acre depending on crop, target pest and soil properties (or see crop-specific considerations in the Additional Information section of this label). Some of the soil properties to consider when determining the application rate include soil texture, percent organic matter and depth of soil to be treated.

### Target Pest and Depth of Treatment

When application rates for this product are given in ranges, use the higher rate if pests (insects, nematodes, etc.) are present in high numbers or if the area to be treated has a history of pest problems. Consult with your State nematologist, entomologist and plant pathologist to determine if crop rotation is more feasible or desirable than fumigation. NOTE: This product will only suppress or control pests that are in the fumigated zone at time of treatment. For control of weeds and fungi which cause seed or seedling diseases, treatment of only the top 2 to 4 inches of soil may be required (see application specific requirements in the Good Agricultural Practices section of this label). Treatment depths greater than 4 inches may be required for control of nematodes and fungi which occur throughout the rhizosphere. The required application rate should be increased proportionately with the depth of the treatment required. Always choose the appropriate application method to evenly distribute this product throughout the soil to the required treatment depth.

### Soil Characteristics

Soil properties to consider when determining the application rate of this product include the depth of soil to be treated, soil texture, and percent organic matter. Due to the absorbing effect of humus, soils with high levels of organic matter under the surface require higher rates. For example, muck soil may require twice the rate that would be used in mineral soils. Application rates will also vary with soil texture. For example, heavy clay soils require a higher rate than light sandy soils.

### Phytotoxicity

VAPAM HL is phytotoxic. Protect valuable, non-target plants by stopping soil applications of this product at least three feet short of the drip line of trees, shrubs and other desirable plants. For sprinkler application, crop injury and lack of effectiveness can result from non-uniform distribution of the treated water.

## APPLICATION OF VAPAM HL

Apply according to the methods and rates outlined below under the section "Uses, Rates and Application Methods."

### Use of Diluted VAPAM HL

Do not store the diluted product. Do not allow the diluted solution to stand overnight. Use the diluted solution promptly after mixing with water. Flush all equipment with water after each day's use; disassemble valves and clean carefully.

### Application in Tank Mix with Liquid Fertilizer

VAPAM HL may be injected in a mixture with liquid fertilizers, however, a dual injection system is preferred. Since the composition of liquid fertilizers vary considerably, the physical compatibility of each VAPAM HL/fertilizer tank mix should be checked by using the following procedure:

Mix a small quantity of VAPAM HL and liquid fertilizer in the same ratio as they will be applied to the field e.g., if 37.5 gallons of VAPAM HL and 37.5 gallons of liquid fertilizer are to be applied per treated acre, then the mixture should be mixed in a 37.5:37.5 or 1:1 ratio. Mix in a glass container. Mixing should be done outdoors and out of direct sunlight. Agitate the liquids to attain a complete uniform mixture. IF A UNIFORM MIX CANNOT BE MADE, THE MIXTURE SHOULD NOT BE USED! If the mixture remains uniform for 30 minutes without agitation, the combination may be used. Should the mixture separate after 30 minutes but is readily remixed with agitation, the mixture can be used if adequate agitation is maintained in the tank.

**DO NOT PLACE CAPS ON MIX JAR AS INCOMPATIBLE MIXES MAY EVOLVE HYDROGEN SULFIDE GAS. USE PROMPTLY AFTER MIXING WITH WATER OR FERTILIZER. DO NOT ALLOW THE SOLUTION TO STAND. FLUSH ALL EQUIPMENT WITH WATER AFTER EACH DAY'S USE. DISASSEMBLE VALVES AND CLEAN CAREFULLY.**

## CHEMIGATION OF VAPAM HL

When applying by chemigation methods, the following directions or warnings must be observed:

Apply this product only through sprinkler including center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move; flood (basin); furrow, border, or drip (trickle) irrigation systems. DO NOT APPLY this product through any other type of irrigation system. Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result from non-uniform distribution of treated water. If you have questions about calibration, you should contact your State Extension Service Specialists, equipment manufacturers or other experts.

Do not connect an irrigation system used for pesticide application to a public water system unless prescribed safety devices for public water systems stated on the pesticide label are in place. A person knowledgeable of the chemigation system and responsible for its operation or under the supervision of the responsible person shall shut the system down and make necessary adjustments should the need arise.

### Chemigation Using a Public Water System

NOTE: AMVAC does not encourage connection of chemigation systems to public water systems. The following information is provided for users who have evaluated alternative application and water source options before choosing to make such a connection.

**OBSERVE THE FOLLOWING PRECAUTIONS IF YOUR CHEMIGATION SYSTEM IS CONNECTED TO A PUBLIC WATER SYSTEM:** Public water system is defined as a system for the provision to the public of piped water for human consumption if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. Chemigation systems must contain a functional, reduced pressure zone (RPZ), backflow preventer or the functional equivalents in the upstream water supply line from the point of pesticide introduction. As an option to the RPZ, the water from the public water system should be discharged into a reservoir tank prior to pesticide introduction. There shall be a complete physical break (air gap) between the outlet end of the fill pipe and top of overflow rim of the reservoir tank of at least the inside diameter of the fill pipe. The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid toward the injection pump.

*Any alternatives to the required safety devices in this label must conform to the list of EPA-approved alternative devices.*

Do not apply when wind speed favors drift beyond the area intended for treatment.

### Sprinkler & Drip Chemigation Systems

See "Field Application Where Entire Area is Being Treated" under Use, Rates and Application Methods section of this label.

## PRE-PLANTING AFTER APPLICATION OF VAPAM HL

### Effects of Rain

If rain occurs within 24 hours after a VAPAM HL application, lack of control at and near the soil surface may occur.

### Recontamination

Precautions must be taken to prevent recontamination of treated fields with plant pathogenic fungi, plant parasitic nematodes or weed seed. Use clean seeds or plants. Before farm equipment is driven into the treated area, it should be rinsed free of untreated soil and weed seeds from other fields.

### Days to Cultivating or Planting After Application

Because VAPAM HL is harmful to germinating seeds and living plants, an appropriate interval must be observed between treatments and planting. On well-drained soils which have a light to medium texture and which are not excessively wet or cold following the application, planting can begin 14 to 21 days after treatment. If soils are heavy or especially high in organic matter or if the soil remains wet and/or cold (below 60°F) following the application, a minimum interval of 21 days or greater should be observed. The interval before planting should be extended until the soil is sufficiently dry to allow for cultivation.

### Cultivation of Soil Before Planting

IMPORTANT: Heavier soils including soils high in clay or organic matter should be allowed to aerate and dry thoroughly after treatment with VAPAM HL. During cold and/or wet weather, frequent shallow cultivation can aid dissipation of VAPAM HL from the treated soil.

On heavy, wet soils, light surface cultivation to break up crusting and promote drying should be done 5 to 7 days after treatment if planting is to occur within 14 to 21 days after treatment. This cultivation may be repeated as necessary.

**NOTE OF CAUTION:** To avoid contaminating treated soils, care should be taken to assure that untreated soils are not mixed with treated soils.

### Testing of Treated Soils Before Planting

Fields are fumigated to control soil-borne fungi, nematodes, insects, and weeds. The length of time required for fumigants to dissipate/escape from the soil before plants can safely be planted varies greatly. Typically 14 to 21 days are needed under typical conditions; however, circumstances which do not favor evaporation of the fumigant can greatly lengthen the waiting period as much as up to 30 days. The release period is short with (1) low rates of fumigants, (2) light soil, (3) high soil temperatures, (4) low soil moisture, (5) shallow application depth, and (6) repeated cultivations after fumigation. Seeded crops are less susceptible to residual soil fumigant injury than transplanted crops. In general, fumigants escape slowly from cold, wet, heavy soils.

If in doubt, perform either the lettuce seed test or the tomato transplant test as described elsewhere in this label. If germination occurs in 1 to 3 days or if tomato plant shows signs of wilting or root burn in 2 days, the product is still available and an extended wait period must be observed.

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NOTE: When applied in the spring, allow a minimum of 14 to 21 days before planting providing no fumes are detectable. When the soil temperature is below 60°F, allow a minimum of 21 days before planting. Check for fumes and aerate as needed. Use a seedling indicator plant with a hot cap to check for activity or fumes (or follow instructions in preceding paragraph). DO NOT plant if fumes are detectable or injury to plant has occurred. Re-aerate the soil and check again.

The information below describes two simple tests to assay for harmful residual soil fumigants before planting.

### Lettuce Seed Test

1. With a trowel, dig into the treated soil to or just below the depth of application. Remove 2 to 4 small (1 to 2 oz) soil samples, mix lightly, and immediately place a portion in an air-tight jar so that fumes will not escape. Use mason, wheat germ or similar jars with gas-tight lids.
2. Sprinkle lettuce seeds on the moistened surface of the soil and recap immediately. Prepare a similar jar with untreated soil (untreated check) for comparison.
3. Keep the jars at 65°F to 85°F; do not place in direct sunlight. Direct sunlight may kill the seed by overheating. Lettuce seed will not germinate in the dark.
4. Inspect the jars for germination in 1 to 3 days.
5. The soil is safe for planting if seeds in the treated jar germinate the same as seeds in the untreated jar.

IMPORTANT: Be sure (1) to sample the field properly in several areas, particularly low, wet areas; (2) that the lids are air tight and have no grit under the seal; and (3) that the jars are placed in indirect sunlight.

### Tomato Transplant Test

Transplant 5 to 10 succulent, fast-growing tomato seedlings into fumigated beds approximately 4 to 6 inches deep. Do the same in a non-fumigated area. If there is variation in the field, plant into the heaviest, wettest soil. Inspect the seedlings in 2 days for wilting or "root burn". If plants in the fumigated zone look the same as those in the non-fumigated zone, it is safe to plant.

### Which Test is Best?

Both the lettuce seed and tomato transplant tests can serve the purpose. The response of tomato seedlings varies somewhat depending on how succulent they are, the relative humidity, soil moisture and temperature. Relative differences between plants in fumigated and non-fumigated areas are key to detecting low level residues. High concentrations should produce clear-cut symptoms. Lettuce seed tested in jars are not subjected to the variations in the field that can affect the response of tomato transplants. However, the process of collecting a soil sample allows some fumigant to escape prior to sealing the jar. In addition, excess soil moisture can inhibit normal lettuce seed germination reducing the sensitivity of the test.

## USES, RATES AND APPLICATION METHODS

### FIELD APPLICATION WHERE ENTIRE AREA IS BEING TREATED

**SOIL INJECTION:** Apply with injectors such as shanks, blades, fertilizer wheels, plows, etc. Apply VAPAM HL at the rate of 37.5 to 75 gallons per treated acre (or see crop-specific considerations in the Additional Information section of this label). Follow immediately with a roller to smooth and compact the soil surface. Light watering or tarping after rolling helps prevent fumigant escape. It may be necessary to stagger the injector placement on two or more tool bars to prevent soil build up during application.

When setting up your soil injection equipment with either spray blades, injection knives or coulters make sure they are evenly and closely placed to create an even application width and depth. To accomplish this, it may require multiple tool bars with the injection tools staggered. This will help prevent build up of trash and aid in the soil sealing. For example, apply VAPAM HL through injectors placed 4 inches below the soil surface and 5 inches apart.

**SOIL COVERING:** VAPAM HL may be applied as a broadcast application immediately in front of soil covering equipment such as bed shapers, rotary tillers, discs, etc. to a minimum depth of 6 inches using a single pass to incorporate. Use 37.5 to 75 gallons of VAPAM HL per treated acre (or see crop-specific considerations in the Additional Information section of this label) followed immediately by a roller/packer to smooth and compact the soil surface.

**ROTARY TILLER OR POWER MULCHER:** Spray VAPAM HL immediately in front of the tiller or mulcher, set to the depth to where control is desired. Use 37.5 to 75 gallons per treated acre (or see crop-specific considerations in the Additional Information section of this label). Follow immediately with a roller, power roller or bed shaper to seal soil surface. Light watering or a tarp after rolling may be used to help prevent fumigant escape.

**SPRINKLER SYSTEM:** Use only those sprinkler systems which give large water droplets to prevent excessive loss. Use 37.5 to 75 gallons of VAPAM HL per treated acre (or see crop-specific considerations in the Additional Information section of this label). Meter continuously throughout the injection period all of the VAPAM HL required to come in contact with the targeted pest in the treated zone. The desired depth of treatment obtained may be contingent upon soil moisture and type. Soil conditions must facilitate even moisture penetration without runoff. Flush lines following injection of VAPAM HL. For proper application rate and placement, consult your local VAPAM HL Sales Representative or County Extension Expert.

**Application Over Cover Crops:** VAPAM HL can be applied through center pivot or solid set sprinkler systems on cover crops that are living and less than approximately eight inches tall such as alfalfa, clover, and grasses such as rye, oats, wheat, and sudan. When applied on cover crops, no soil cultivation is required before the application. The terminated crop must not be used for any food or feed purposes after VAPAM HL has been applied.

**Prevention of Treatment Runoff:** To prevent runoff of the treatment during a sprinkler application, do not apply VAPAM HL at a rate greater than the absorption capacity of the field. Should runoff occur, isolate it from growing crops and water sources. Once collected, reapply to the treated field.

**Check Flood (Basin), Furrow and Border:** Meter VAPAM HL at a steady rate into water during irrigation. Depending on the kind of pest and the treatment depth, use 37.5 to 75 gallons per treated acre in 3 to 18 inches of water per acre. Meter VAPAM HL into the irrigation water at the head of the field at a point with enough turbulence to assure adequate mixing of the product in the water. IMPORTANT: Prior to starting the application, always inspect ditches and border areas to ensure containment of the irrigation waters. Damage to bordering crops will occur if leaks develop. Apply only into field head ditch. **DO NOT APPLY INTO ANY LATERAL DITCHES.**

**DRIP IRRIGATION SYSTEM:** VAPAM HL must be applied through a drip irrigation system designed to wet the soil thoroughly in the area being treated. Meter 37.5 to 75 gallons of VAPAM HL per treated acre (or see crop-specific considerations in the Additional Information section of this label) into the drip system during the entire irrigation period. Flush irrigation system with adequate water after completion of application.

**Important: WEED ELIMINATION WILL NOT BE SATISFACTORY IF TOO MUCH WATER IS APPLIED.** AN ADEQUATE CONCENTRATION OF VAPAM HL MUST BE PRESENT AT THE TIME OF WEED SEED GERMINATION IN ORDER TO BE EFFECTIVE.

NOTE: If VAPAM HL is applied to established plant beds under plastic tarps to terminate growth of a previous crop and to fumigate the bed in preparation of planting a subsequent crop, the terminated crop must not be used for any food or feed purposes after VAPAM HL has been applied.

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**SOIL INJECTION:** VAPAM HL may be applied using (1) a single shank spaced no more than 6 inches apart and a spray nozzle 6 inches deep; (2) a single shank spaced no more than 6 inches apart and spray nozzles spaced 6 to 12 inches deep; (3) a single sweep spaced no more than 12 inches apart and sweep blades 12 inches wide with a spray nozzle that will give broadcast coverage from sweep tip to sweep tip; (4) a double-winged shank spaced no more than 12 inches apart and 9 inches between the wings with spray nozzles giving uniform coverage; (5) a Noble Plow Blade with spray nozzles spaced every 6 inches and set to 12 to 14 inches deep using a disc to immediately incorporate the VAPAM HL placed on the surface. All soil injection applications must be followed immediately with a roller/packer to smooth and compact the soil surface. Regardless of which method used, you must use 37.5 to 75 gallons of VAPAM HL per treated acre (or see crop-specific considerations in the Additional Information section of this label).

When applying VAPAM HL with injector blades, such as Noble Plow Blades in spring, the following precautions must be followed:

- Apply all fertilizers after the VAPAM HL application. Wait a minimum of 7 days before making the fertilizer application.
- Thoroughly aerate the soil 5 to 7 days after the VAPAM HL application by plowing, shallow ripping or discing, or the combination thereof, to allow the fumes to dissipate (if tarps are used, refer to the Tarp Perforation and/or Removal Section for additional guidance on timing of these activities). Do not work soil deeper than the depth of treatment.
- If soil temperatures are below 60°F, delay planting for a minimum of 21 days from the day of the VAPAM HL application regardless of any other precautions that may have been taken.
- In conjunction with the delayed planting, set indicator plants (such as tomatoes) in various places in the treated field with a "hot cap" left undisturbed for a minimum of 24 hours to ensure all of the VAPAM HL has left the soil. (See "Testing of Treated Soil Before Planting" section.)

## FIELD APPLICATION TO BEDS OR ROWS

**SOIL INJECTION (Pre-formed Beds):** VAPAM HL may be injected into pre-formed plant beds following the directions in the "Soil Injection" section above. If a wider treated band is desired, space 2 or more shanks at intervals of 5 inches to cover the desired treating width. Use thin injection shanks and inject VAPAM HL 4 inches deep into well prepared soil. Follow immediately with a bedshaper, roller press wheel or similar device, or cover with an adequate amount of soil to seal the fumigant into the soil. Light watering or a tarp after rolling may be used to help prevent fumigant escape. Apply at the rate of 37.5 to 75 gallons per treated acre (or see crop-specific considerations in the Additional Information section of this label) (see "Method of Determining Fluid Ounces per 100 Feet of Linear Row" section). Place shanks 5 inches apart to cover the desired treating width.

**SOIL INJECTION (At Bed Forming Operation):** VAPAM HL may be injected during the bedding or row building process, or to pre-formed beds, using one of the following delivery systems: (1) single narrow knife blade (2) a series of narrow knife blades set no more than 5 inches apart, (3) a spray blade, (4) tiered shanks, (5) spray rake or (6) similar equipment that places VAPAM HL in contact with the pest to be controlled or suppressed. The use rate for the above operations is 37.5 to 75 gallons per treated acre (or see crop-specific considerations in the Additional Information section of this label). Reduced rates will vary depending upon the actual width of the treated band desired (see "Method of Determining Fluid Ounces per 100 Feet of Linear Row" section). Apply the VAPAM HL at the desired depth in the soil and follow immediately with the soil capping operation, bedding process, or roller/packer to seal the fumigant into the soil.

**SOIL COVERING METHOD (Bed-Over Methods):** VAPAM HL may be sprayed in a bed wide band onto the soil immediately ahead of bed shaping equipment. Cover the VAPAM HL with soil to a depth of 3 to 6 inches. The soil should be rolled and compacted immediately. Apply at the rate of 37.5 to 75 gallons per acre of treated soil (or see crop-specific considerations in the Additional Information section of this label) or 11 to 22 fluid ounces per 100 linear feet of row (12-inch bed). If a narrower or wider bed is to be treated, adjust the fluid ounces/100 linear feet of row to reflect the actual treated acres (see "Method of Determining Fluid Ounces per 100 Feet of Linear Row" section).

**DRENCH APPLICATION ON BEDS OR ROWS:** VAPAM HL may be applied to finished beds for control of shallow seeded weeds. Cultivate the area to be treated and pre-irrigate in accordance with Use Directions. Apply 37.5 to 75 gallons of VAPAM HL per treated acre (or see crop-specific considerations in the Additional Information section of this label) in a band or bands in enough water to soak at least 2 inches deep (see "Method of Determining Fluid Ounces per 100 Feet of Linear Row" section). To avoid contamination by untreated soil, do not disturb the treated area.

**ROTARY TILLER OR POWER MULCHER:** Spray VAPAM HL immediately in front of the tiller or mulcher, set to the depth to where control is desired. Use 37.5 to 75 gallons per treated acre (or see crop-specific considerations in the Additional Information section of this label) (see "Method of Determining Fluid Ounces per 100 Feet of Linear Row" section). Follow immediately with a roller, power roller or bedshaper to seal soil surface. Light watering or a tarp after rolling may be used to help prevent fumigant escape.

#### Method of Determining Fluid Ounces per 100 Feet of Linear Row

1. Determine width of treated band in feet by dividing width of band in inches by 12 (e.g.: 8 in. band = 8 in. ÷ 12 in/ft. = 0.666 ft)
2. Determine square feet in 100 linear feet of band by multiplying the width of the band by 100 (e.g.: 0.666 ft. x 100 ft. = 66.66 sq. ft.)
3. Determine the treated acres per 100 linear feet of band by dividing the square feet by 43,560 (square feet in an acre) (e.g.: 66.66 sq. ft ÷ 43,560 = 0.0015)
4. To determine the fluid ounces per 100 linear feet.
  - a) 1 gal = 128 fl. oz.; 50 gals = 6400 fl. oz.; 100 gals = 12,800 fl. oz.
  - b) Multiply fluid ounces by acres. Example: 50 gals. = 6400 fl. oz. x 0.0015 = 9.6 fl. oz. per 100 linear feet row.

## ADDITIONAL INFORMATION

**SEED TREATMENT:** A suitable fungicide should be used to treat all crop seed being planted into the treated soil.

**PEANUTS:** For suppression and/or control of *Cylindrocladium Black Rot* (CBR) and nematodes, apply VAPAM HL at the rate of 7.5 gallons per treated acre (6.61 fl. oz. per 100 linear feet of row). Use with partially resistant cultivators (NC-10C or others as designated by your local Agricultural Extension Service) in cases of severe disease pressure. Plant other varieties only in cases of light CBR pressure.

**Soil Preparations:** Before applying VAPAM HL, all residues from the previous crop should be decomposed (enhance by fall discing) and plowed under in the spring with a moldboard plow. Soil incorporated pre-plant herbicides must be applied prior to the application of VAPAM HL.

**Application:** Apply 8 to 10 inches below seed placement with injector shank or coulter type applicator placed in front of a bedshaper to mark rows. Soil temperatures must be in the range of 60°F to 90°F at a 3-inch depth at time of treatment.

**Tillage and Planting After Application:** Do not mix untreated soil with treated soil by tillage or other cultural practices. Plant the peanuts in the center of the treated beds no earlier than 14 days following the application of VAPAM HL. An at-planting nematocide treatment will be necessary in fields with heavy infestations of *Root Knot*, ring and/or sting nematodes.

**MINT (SUPPRESSION OF VERTICILLIUM WILT):** When infestation is limited to small spots in a field, the spread of *Verticillium* can be reduced by treating the infected spots. Apply at the rate of up to 75 gallons of VAPAM HL per treated acre using injector blade or thin shank injector rig. Follow directions for "Field Application Where Entire Area Is Being Treated".

**POTATOES:** For suppression of potato pests such as nematodes, weed seeds and *Verticillium dahliae* (Early Maturity Disease):

For soil injection, apply a minimum of 37.5 gallons to a maximum of 75 gallons of VAPAM HL per treated acre following the directions for "Field Application Where Entire Area Is Treated". VAPAM HL may also be applied at the rate of 50 to 75 gallons per treated acre using a Noble Plow Blade set to 12 to 14 inches deep with spray nozzles spaced every 6 inches apart to give uniform coverage plus a surface application using a disc to immediately incorporate the VAPAM HL placed on the surface.

**Early Maturity Diseases Of Potatoes In The Pacific Northwest:** Apply 40 gallons VAPAM HL per treated acre using the soil injection method as described in the "Field Application Where Entire Area Is Being Treated" section.

#### TREATMENT OF TREE REPLANT SITES IN COMMERCIAL ORCHARDS:

After removing dead or diseased trees and as much of the root system as possible, make a shallow basin over the planting site. Add VAPAM HL to the stream of water while filling the basin. Use 3/4 qt. of VAPAM HL per 100 sq. ft. in sufficient water (depending on the soil type) to penetrate at least 6 ft. For control of *Oak Root Fungus*, use a basin of at least 20-ft. x 20-ft., increase dosage to 1-1/2 quarts per 100 sq. ft. in sufficient water to penetrate to the depth of the root system. If water is tanked to the planting site, add VAPAM HL to the water and mix before filling the basin.

**ESTABLISHMENT OF TRANSPLANT ORCHARDS AND VINEYARDS:** Apply 50 to 75 gallons of VAPAM HL per broadcast acre to properly prepared fields by chemigation in sufficient water (e.g. 3 to 18 acre inches) to place the VAPAM HL in contact with the target pest in the treated zone and to penetrate the desired root zone (to 6') of the crop to be transplanted. The percent field capacity of the soil prior to irrigation will help determine the amount of water to use to penetrate the desired zone. A lethal concentration of VAPAM HL must be present while the target species is actively respiring. VAPAM HL should be placed at or slightly below the soil level of the target pest. Deep-soil ripping is recommended prior to treatment.

**SYMPHYIID SUPPRESSION:** Soil should be in good seedbed condition to a depth of 8 to 10 inches. Maintain adequate moisture during the spring season to bring symphyliids to the upper soil surface. Treat during July to August when symphyliids are in the upper soil surface. Apply a minimum of 15 gallons of VAPAM HL per treated acre (0.3 pts. / 100 sq. ft. of treated soil) using blade or thin blade chisel injectors spaced 5 inches apart. Inject below the level of symphyliid concentration, usually 6 to 8 inches. Pack soil immediately after the application.

**TOBACCO PLANT BEDS:** Fall applications are recommended whenever possible. Read and follow the use directions carefully.

**DRENCH METHOD:** Apply 1.875 gallons VAPAM HL in 150 to 200 gallons of water per 100 square yards. Application may be made with sprinklers, sprayers with nozzles or any suitable equipment. Follow directions given above for "Field Applications Where Entire Area is Being Treated" section.

**TANK MIX WITH TILLAM® 6E HERBICIDE (TOMATOES ONLY):** A tank mix of VAPAM HL soil fumigant plus TILLAM 6E herbicide may be used to provide the additional benefit of residual weed control. The mixture must be applied pre-plant to tomatoes if all directions and precautions pertaining to both VAPAM HL and TILLAM 6E are followed. Apply through a spray blade, by shank injection, low pressure boom sprayer or (Western Region only) through solid set sprinkler systems. Maintain constant agitation of the mixture throughout the filling and application. Use in accordance with the more restrictive of label limitations and precautions. No label dosage rates should be exceeded. This product cannot be mixed with any product containing a label prohibition against such mixing. Do not tank mix with other chemicals unless prior use has proven compatibility.

## PACIFIC NORTHWEST (IDAHO, NEVADA, OREGON AND WASHINGTON)

**CARROTS:** Apply a broadcast application of 37.5 to 75 gallons per treated acre of VAPAM HL for the suppression of *Root Knot* Nematodes or 30 to 75 gallons for pre-plant suppression of soil-borne diseases.

**MINT (including Peppermint and Spearmint):** Apply a pre-plant broadcast application of 37.5 to 75 gallons per treated acre of VAPAM HL for the suppression of *Root Knot* Nematodes and *Verticillium dahliae*.

**ONIONS:** Apply a broadcast or banded application of 37.5 to 75 gallons per treated acre of VAPAM HL for the suppression of *Root Knot* Nematodes or 30 to 75 gallons for suppression of soil-borne diseases.

**POTATOES:** Apply a broadcast sprinkler application of 37.5 to 75 gallons per treated acre of VAPAM HL for the suppression of *Root Knot* Nematodes and *Verticillium dahliae*. Apply a broadcast soil application of 37.5 to 75 gallons per treated acre VAPAM HL for the suppression of *Verticillium dahliae*.

**SUGAR BEETS:** Apply a broadcast or a banded application of 37.5 to 75 gallons per treated acre VAPAM HL for the suppression of soil-borne disease. A fall application of RO-NEET® herbicide followed by or tank mixed with VAPAM HL in a broadcast application or band application will enhance the overall weed control.

**ORCHARD RE-PLANT:** Apply a broadcast application rate of 56 to 75 gallons per treated acre of VAPAM HL in a minimum of 1-acre inch of water through a sprinkler system, or a row treatment of 56 to 75 gallons broadcast equivalent to the future tree row using a weed sprayer by applying multiple passes of VAPAM HL while the sprinklers are running until the desired rate has been applied for the treatment of specific orchard replant disease. Trees should not be replanted into the replant site for at least 21 days after treatment. Check for fumes in the soil before planting. VAPAM HL may also be applied at the rate of 50 to 75 gallons per treated acre using a Noble Plow Blade set 12 to 14 inches deep with spray nozzles spaced every 6 inches apart to give uniform coverage with a surface application using a disc to immediately incorporate the VAPAM HL placed on the surface.

**WHEAT AND BARLEY:** Apply VAPAM HL at a rate of 1.88 to 7.5 gallons per treated acre 14 to 21 days prior to planting for the suppression of certain early season soil fungi which cause root diseases of small grains. VAPAM HL may be diluted with water or, if compatible, non-acidic liquid fertilizers (see "Application in Tank Mix with Liquid Fertilizer" section) and injected into moist soil 5 to 8 inches before planting.

**IN THE PACIFIC NORTHWEST, IF THE FIELD HISTORY OR SOIL SAMPLING SHOWS HIGH POPULATIONS OF NEMATODES, FUMIGATION USING BOTH VAPAM HL AND TELONE® II SHOULD BE USED. CONSULT YOUR AMVAC OR DOW AGRSCIENCES LLC REPRESENTATIVE FOR ADDITIONAL INFORMATION.**

**NOTE:** Read the label affixed to the container of TELONE II before applying. Carefully follow all precautionary statements and applicable use directions. Except as specified in this section, the labels affixed to the containers for TELONE II and VAPAM HL are subject to all user precautions and limitations imposed.

#### **USE DIRECTIONS FOR SEQUENTIAL GROUND APPLICATION OF TELONE II AND VAPAM HL**

Sequential application of TELONE II and VAPAM HL for suppression of *Verticillium dahliae* and control of *Root Knot* and *Lesion* nematodes in soils to be planted to potatoes in the Pacific Northwest.

The following use directions provide information for a sequential treatment program of applications of TELONE II soil fumigant and VAPAM HL soil fumigant. For best results, apply both TELONE II and VAPAM HL in the fall. Alternative treatment schedules include a fall application of TELONE II followed by a spring application of VAPAM HL, a fall application of VAPAM HL followed by a spring application of TELONE II, or a spring application of both products. Due to time constraints resulting from varying weather conditions, a spring application may result in delayed planting.

#### **APPLICATION DIRECTIONS FOR TELONE II**

Soil conditions at the time of application of TELONE II that allow rapid diffusion of the fumigant as a gas through the soil normally give best results. Compacted soil layers within the desired treatment zone must be fractured before or during application of the fumigant. Soil temperature must be between 40°F and 80°F at the depth of injection, moist from 2 inches below the soil surface to at least 12 inches deep as determined by the feel method, free of clods, and with crop residue thoroughly incorporated into the soil at least at the time of application and sealing.

Apply TELONE II as a broadcast treatment at the minimum rate of 15 gallons per treated acre (44.3 fl oz/1000 feet of row/outlet based on 12-inch centers) using either chisel (shank), Noble Plow (sweep) or modified Para Till application equipment. Chisel equipment must have ripper-type shanks. Para Till equipment must be modified so that outlet spacing is evenly distributed under the tool bar. With chisel and Para Till equipment, a shank spacing of 12 to 24 inches is recommended. Do not exceed a shank spacing of 24 inches. Outlet depth should be at least 18 inches below the final soil surface. Noble Plow equipment may be used only when either shallow soils (those less than 18 inches deep) or soils containing excessive live root material such as alfalfa or corn stubble prevents the use of shank application. Noble Plow outlet spacing should not exceed 12 inches and application should be made to a depth of at least 15 inches. Fumigant penetration may be limited if a plow pan exists below the depth of the Noble blade. Do not use plow-sole application. Immediately after application of TELONE II, use a disc, paddle wheel or similar device to uniformly mix the top 4-6 inches of soil to effectively eliminate chisel traces. Then follow immediately with a ring roller or multi-packer to seal the soil surface. Little or no crop residue should be exposed at the surface following the sealing operation. Any remaining crop residue should lie flat following sealing. Following application and sealing, leave soil undisturbed for 7-14 days. The longer undisturbed interval may be necessary if the soil is or becomes cold or wet during this period.

#### **APPLICATION DIRECTIONS FOR VAPAM HL**

Soil conditions at the time of application of VAPAM HL must be between 40°F and 90°F in the treated zone and at 60% to 80% field capacity. If necessary, pre-irrigate about a week prior to treatment to adjust soil moisture to desired levels. Immediately before application, cultivate lightly if the soil has crusted.

Apply VAPAM HL either by chemigation or by soil injection or surface incorporation as a sequential application with TELONE II. When VAPAM HL is used prior to TELONE II, allow a minimum of 7 days between treatments. When TELONE II is applied prior to VAPAM HL, allow a minimum of 7 days before disturbing the soil or beginning any pre-irrigation for the application of VAPAM HL.

For chemigation, apply VAPAM HL at the minimum rate of 30 gallons per treated acre in a minimum of 0.5 acre-inch of water to the desired depth of treatment. Heavier soils may require a higher amount of water. Use only those sprinkler systems that give large water droplets to prevent excessive fumigant loss. If for any reason chemigation is interrupted prior to completion (e.g., excessive wind, equipment malfunction, etc.), back the system up prior to restarting to ensure full application to the area affected prior to shutting down the system and to allow full distribution of the VAPAM HL solution throughout the irrigation system prior to moving over untreated soil. After application is completed, flush equipment until all VAPAM HL is eliminated from the system.

For soil injection, apply VAPAM HL at the minimum rate of 30 gallons per treated acre using either shanks, sweep blades, double-winged shanks, or a Noble Plow Blade combined with a surface application. Single shanks should be spaced no more than 6 inches apart with either single injection outlets no more than 6 inches deep or dual injection outlets spaced at 6 and 12 inches deep. Single sweep blades should be spaced no more than 12 inches apart with sweeps 12 inches wide and a spray nozzle that will provide broadcast coverage from sweep tip to sweep tip. Double-winged shanks should be spaced no more than 12 inches apart with no more than 9 inches between adjacent wings and with spray nozzles that provide uniform coverage. The Noble Plow blade should have spray nozzles spaced 6 inches apart to give uniform coverage, an injection depth set at 12 to 14 inches deep, and be combined with a surface application using a disc to immediately incorporate the VAPAM HL placed on the surface. Follow all the above applications immediately with a roller/packer to smooth and compact the soil surface.

For surface incorporation, apply VAPAM HL at the minimum rate of 30 gallons per treated acre as a broadcast application to the soil surface immediately in front of soil covering equipment such as rotary tillers, discs, etc., to a minimum depth of 6 inches using a single-pass incorporation followed immediately by a roller/packer to smooth and compact the soil surface.

**SOIL FUMIGATION INTERVAL:** Planting may take place only after odors of either TELONE II or VAPAM HL are no longer present within the zone of fumigation. If VAPAM HL follows TELONE II and is applied in the spring with the Noble Plow Blade, apply all fertilizers at least 7 days after the application of VAPAM HL. Thoroughly aerate the soil 5 to 7 days after the application of VAPAM HL by shallow plowing and/or discing to allow the fumigant odors to dissipate. Wait 14 to 21 days after the application of VAPAM HL before planting the crop. Use the 21-day interval if soil temperatures are below 60°F regardless of any other precautions that may have been taken. In addition to waiting 21 days, set indicator plants (e.g., tomato seedlings) in various places in the treated field and cover the plants with a "hot cap", plastic sheeting, bucket, etc., to trap and confine any fumes present. Leave the plants undisturbed for a minimum of 24 hours; then examine for injury before planting the crop. Do not plant the crop if injury to indicator plants is observed. If fumes are noticeable at time of planting, stop planting and rework the soil. If TELONE II follows VAPAM HL and is applied in the spring, wait at least one week for each 10 gallons of TELONE II applied beyond the initial undisturbed period before planting the crop. If fumigant odors are present at planting, thoroughly aerate the soil following shallow ripping and/or discing to allow fumigant odors to dissipate. Do not till the soil so deep as to move untreated soil from below the treated zone into the treated soil.

#### **Special Considerations and Precautions:**

- Use of this sequential application program of reduced rates of TELONE II and VAPAM HL does not guarantee pest-free potatoes at harvest.
- Use of TELONE II and VAPAM HL according to these use directions will control *Root Knot* and *Lesion* nematode populations present within the fumigated zone at the time of fumigation. The fumigated zone can vary depending upon a number of factors such as fumigant rate, application methods used, depth of fumigant application, soil moisture, soil type, soil temperature and soil tilth (including soil compaction and soil porosity). The sequential combination of reduced rates of TELONE II and VAPAM HL will not control or prevent re-infestation subsequent to the treatments. Subsequent pest populations may infest the fumigated zone from irrigation water, equipment, potato seed or other sources of contamination or may invade the fumigated zone from surrounding untreated soil such as from beneath the fumigated zone or from non-fumigated pockets within the fumigated zone.
- In fields with a history of severe *Columbia Root Knot* nematode problems, the maximum Federal label rate of 20 gallons TELONE II per treated acre is recommended in sequential combination with a minimum of 37.5 gallons VAPAM HL per treated acre per these label directions.
- If the application of TELONE II occurs in the fall and the application of VAPAM HL is not planned until spring, a cover crop such as wheat or grass can be planted following the undisturbed soil interval associated with the application of TELONE II to reduce the potential for over-winter soil erosion.
- Refer to the product labels affixed to the containers for both TELONE II and VAPAM HL for recommended soil conditions, product performance can be expected to improve as the soil conditions move toward optimum. Use of this sequential application program of TELONE II and VAPAM HL under soil conditions outside the recommended range of soil conditions can be expected to yield less than satisfactory performance.

**NOTE:** Read the label affixed to the container of TELONE II before applying. Carefully follow all precautionary statements and applicable use directions. Except as specified in this section, use of TELONE II or VAPAM HL is subject to all use precautions and limitations imposed by the labels affixed to the containers for TELONE II and VAPAM HL, respectively.

## USE DIRECTIONS FOR SIMULTANEOUS GROUND APPLICATION OF TELONE II AND VAPAM HL

Simultaneous application of TELONE II and VAPAM HL for suppression of *Verticillium dahliae* and control of *Root Knot* and *Lesion* nematodes in soils to be planted to potatoes in the Pacific Northwest.

The following use directions provide information for simultaneous ground application of TELONE II soil fumigant and VAPAM HL soil fumigant. For best results, a fall application is recommended. Due to time constraints resulting from varying weather conditions, a spring application may result in delayed planting.

Note: When TELONE II and VAPAM HL are applied simultaneously, the most restrictive personal protective equipment, worker notification and re-entry restrictions specified on labels for each product must be followed.

### Soil Conditions

Soil temperature must be between 40° F and 80°F in the treated zone.

### Application Methods And Equipment

Use a dual equipment setup to apply TELONE II and VAPAM HL during a single pass. Calibrate equipment for simultaneous application of each product. Because of shallower product placement and the need to disrupt chisel traces from application of TELONE II, mount equipment for application of VAPAM HL behind that of TELONE II.

Apply TELONE II as a broadcast treatment at a minimum rate of 15 gallons per treated acre (44.3 fl oz/1000 feet of row/outlet based on 12 inch centers) using either chisel (shank), noble (sweep) or modified Para Till application equipment. Chisel equipment must have ripper-type shanks. Para Till equipment must be modified so that outlet spacing is evenly distributed under the tool bar. With chisel and Para Till equipment, a shank spacing of 12 to 24 inches is recommended. Do not exceed a shank spacing of 24 inches. Outlet depth should be at least 18 inches below the final soil surface. Noble plow outlet spacing should not exceed 12 inches and application should be made to a depth of at least 15 inches. Fumigant penetration may be limited if a plow pan exists below the depth of the noble blade. Do not use plow sole application.

**For soil injection**, apply VAPAM HL as a broadcast treatment at a minimum rate of 30 gallons to a maximum rate of 75 gallons of VAPAM HL per treated acre using either shanks, sweep blades or double winged shanks. Single shanks should be spaced no more than 6 inches apart with either single injection outlets any more than 6 inches deep or dual injection outlets spaced at 6 and 12 inches deep. Single sweep blades should be spaced no more than 12 inches apart with sweeps 12 inches wide and a spray nozzle that will provide broadcast coverage from sweep tip to sweep tip. Double-winged shanks should be spaced no more than 12 inches apart with no more than 9 inches between adjacent wings and with spray nozzles that provide uniform coverage.

**For surface incorporation**, apply VAPAM HL at the minimum rate of 30 gallons per treated acre as a broadcast application to the soil surface immediately in front of soil covering equipment such as rotary tillers, discs, etc., set to a minimum depth of 6 inches.

### Sealing The Soil After Application

Immediately after application the soil must be sealed to prevent fumigant loss and ensure that an effective concentration of fumigant is maintained within the soil. Chisel traces resulting from the TELONE II application must be disrupted to a depth of at least 4 to 6 inches. This may be accomplished with the VAPAM HL applicator or with a disc or similar device.

As a final step to compact the soil surface and help maximize soil sealing, all above applications must be followed with a ring roller or culti-packer.

### Soil Fumigation Interval

Planting may take place only after the odors of both TELONE II and VAPAM HL are no longer present. Following application and sealing leave the soil undisturbed for 7 to 10 days. The longer undisturbed interval may be necessary if the soil is or becomes cold or wet during this period. For spring applications, thoroughly aerate the soil after the initial undisturbed interval by shallow plowing and/or discing to allow the fumigant odors to dissipate. Allow 21 days prior to planting. In addition to waiting 21 days, place indicator plants (e.g., potted tomato seedlings) in various places in the treated field and cover the plants with a "hot cap", plastic sheeting, bucket, etc., to trap and confine any fumes present. Leave the plants undisturbed for a minimum of 24 hours then examine for injury before planting the crop. Do not plant the crop if injury to indicator plants is observed. If fumes are noticeable at time of planting, stop planting and rework the soil.

### Special Considerations And Precautions:

- Use of this simultaneous application program of reduced rates of TELONE II and VAPAM HL does not guarantee pest-free potatoes at harvest.

- Use of TELONE II and VAPAM HL according to these use directions will control *Root Knot* and *Lesion* nematode populations present within the fumigated zone at the time of fumigation. The fumigated zone can vary depending upon a number of factors such as fumigant rate, application methods used, depth of fumigant application, soil moisture, soil type, soil temperature and soil tillth (including soil compaction and soil porosity). The simultaneous combination of reduced rates of TELONE II and VAPAM HL will not control or prevent re-infestation subsequent to the treatment. Subsequent pest populations may infest the fumigated zone from irrigation water, equipment, potato seed or other sources of contamination, or may invade the fumigated zone from surrounding untreated soil such as from beneath the fumigated zone or from within non-fumigated pockets within the fumigated zone.
- In fields with a history of severe *Columbia Root Knot* nematode problems, the maximum Federal label rate of 20 gallons of TELONE II per treated acre is recommended in simultaneous combination with a minimum of 37.5 gallons to a maximum of 75 gallons of VAPAM HL per treated acre, per these label directions.
- With fall applications, a cover crop such as wheat or grass may be planted following the undisturbed soil interval associated with this application to reduce the potential for over-winter soil erosion.
- Refer to the product labels affixed to the containers for both TELONE II and VAPAM HL for further recommendations and precautions for optimum fumigant performance. Within the range of recommended soil conditions, product performance can be expected to improve as the soil conditions move towards optimum. Use of this simultaneous application program of TELONE II and VAPAM HL under soil conditions outside the recommended range of soil conditions can be expected to yield less than satisfactory performance.

NOTE: The "Use Directions for the Pacific Northwest" may be used in other areas of the country, if not prohibited elsewhere on the label. Consult your local Sales Representative or extension personnel for further directions or recommendations.

### STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

**STORAGE:** Do not expose to extreme temperatures. Do not stack more than four drums high. Leaking or damaged drums should be placed in overpack drums for disposal. Spills should be absorbed in sawdust or sand and disposed of in a sanitary landfill. Keep container closed when not in use.

**PESTICIDE DISPOSAL:** Pesticide wastes are toxic. Improper disposal of excess pesticide spray mixture or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Protection Agency or the Hazardous Waste representative at the nearest EPA Regional office for guidance.

### CONTAINER DISPOSAL:

**Nonrefillable container.** Do not reuse or refill this container. Offer for recycling if appropriate. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank. Repeat this procedure two more times.

**Refillable container.** Refill this container with sodium or potassium methylthiocarbamate only. Do not reuse this container for any other purpose. To clean the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container about 10 percent full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times.

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## LIMITED WARRANTY AND DISCLAIMER

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The manufacturer warrants (a) that this product conforms to the chemical description on the label; (b) that this product is reasonably fit for the purposes set forth in the directions for use, subject to the inherent risks referred to herein, when it is used in accordance with such directions; and (c) that the directions, warnings, and other statements on this label are based upon responsible experts' evaluations of reasonable tests of effectiveness, of toxicity to laboratory animals and to plants and residues on food crops, and upon reports of field experience. Tests have not been made on all varieties of food crops and plants, or in all states or under all conditions.

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**AMVAC offers this product, and Buyer accepts it, subject to the foregoing Limited Warranty which may be varied only by agreement in writing signed by an authorized representative of AMVAC.**

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