

## CHAPTER 2

### IN-TRANSIT FUMIGATION --VESSELS

<b>Section Number</b>	<b>Section</b>	<b>Page Number</b>
2.1	POLICY	2-1
2.2	DEVELOPMENTAL HISTORY	2-1
2.3	SCOPE	2-2
2.4	PROCEDURES	2-8
2.5	CERTIFICATION	2-13
2.6	QUESTIONS & ANSWERS	2-16
2.7	FUMIGATION CHECKLIST	2-19

- Attachment 1 Vessel Suitability Statement  
Attachment 2 Statement of Pre-fumigation Notice Compliance  
Attachment 3 Statement of Fumigant Application Compliance  
Attachment 4 Fumigant Application Methods for Various Cargo Hold Depths, and Mandatory Minimum Exposure Time

## 2.1 POLICY

Section 800.86(d)(1) of the regulations under the United States Grain Standards Act, and applicable provisions of the Agricultural Marketing Act of 1946, as amended, require that an applicant be promptly notified when bulk grains or certain other commodities loaded aboard certain types of oceangoing vessels are found to be infested. The applicant will then have one of the following options:

- a. Continue loading, in which case, a separate inspection certificate will be issued for the quantity of grain determined to be infested and all other grain in common stowage with the infested grain;
- b. Unload the quantity of grain determined to be infested and an additional amount of other grain in common stowage with the infested grain; or
- c. Continue loading and fumigate the grain under official personnel observation and the provisions of this chapter. If the applicant chooses this option, an inspection certificate will be issued without the special grade designation “infested”, or the designation of U.S. Sample Grade, which only applies to Brown rice for processing.

The applicant may elect to use the procedures outlined in this instruction when in-transit fumigation is required by the buyer or seller or to fulfill phytosanitary requirements even though the grain or commodity is not found to be infested. Additionally, an applicant may request that official personnel witness these fumigations.

## 2.2 DEVELOPMENTAL HISTORY

Since 1975, FGIS, in cooperation with the Agricultural Research Service (ARS) and the grain, fumigant, and maritime industries, has been involved with research studies to develop safe, effective, and economical fumigation methods for bulk grain loaded aboard oceangoing vessels.

Based on the data obtained from these studies, ARS has provided FGIS with recommendations for the safe and effective in-transit fumigation of bulk grain aboard several types of vessels. Accordingly, FGIS has issued policies and procedures encompassing the in-transit fumigation of bulk grain aboard certain carriers using metal phosphide<sup>1/</sup> fumigant formulations registered by the U.S. Environmental Protection Agency (EPA).

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<sup>1/</sup> Metal phosphide is the fumigant formulation, while phosphine is the toxic gas evolved from the formulation.

## 2.3 SCOPE

FGIS approves in-transit fumigation of bulk grain and rice in vessels only within the following parameters:

a. Acceptable Vessels.

The vessel types approved for in-transit fumigation are:

- (1) Bulk dry-cargo vessels including oceangoing barges.
- (2) Tanker-type vessels (not applicable for tubing or recirculation method).
- (3) Liquefied natural gas (LNG) carriers that have been converted to bulk carriers.
- (4) Lakers or tween deck vessels with the same structural characteristics as bulk dry cargo vessels.

These vessel types are acceptable only when a certified applicator <sup>2/</sup> states that the vessel has been inspected and found to be suitable for fumigation. Acceptable vessels must contain no interior bulkheads, structures, or decks within the tanks or holds that could impede the penetration of the phosphine gas throughout the grain mass. For example, a tween decker with decks made of steel grating may be fumigated provided the vessel is otherwise suitable for fumigation. In addition, wing tanks on acceptable vessels may be fumigated under this chapter. If the wing tanks have bleeder holes connected to the main hold or tank and the bleeder holes remain open, the main hold or tank connected to the wing tank must also be fumigated.

Tween deck vessels officially classified as “Freedom Mark II” or “Flush” are acceptable for in-transit fumigation, provided, all tween decks are retracted fully and remain in that position during loading. Some vessels classed as “multipurpose” may also meet the carrier requirements, provided, the stowage space is configured to approximate that of a bulk carrier. A listing of tween deckers currently approved by FGIS is maintained on the GIPSA/FGIS website at:

[http://www.gipsa.usda.gov/fgis/insp\\_weigh/stow\\_fumi.html](http://www.gipsa.usda.gov/fgis/insp_weigh/stow_fumi.html)

For consistency of review and compliance, tween deckers can only be assessed and approved at FGIS headquarters level.

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<sup>2/</sup> A certified applicator is any individual who is certified to use or supervise the use of any restricted use pesticides covered by their certification in the CFR (40 CFR 171.2(h).)

- (5) Self-unloading vessels require special attention. Every opening in the bottom of each hold must be capable of holding a gas-tight seal to ensure the fumigant does not escape into the common work area below the holds. Gas-tight partitions with doors may also have to be permanently designed, built and installed in the work area to contain any escaping fumigant during transit.

b. Acceptable Bulk Commodities.

Commodities that are acceptable for in-transit fumigation are barley, canola, corn, flaxseed, mixed grain, oats, rice, rye, sorghum, soybeans, sunflower seed, triticale, and wheat.

c. Acceptable Fumigant Formulations.

EPA-registered metal phosphide formulations (either solid or granule) are the only approved formulations for in-transit fumigation.

d. Acceptable Fumigant Application Methods.

(1) Surface Treatment.

(a) Spread the fumigant (packaged to retain residual dust; i.e., belts, ropes, blankets, strips, sleeves, etc.) on the exposed grain surface. If possible, anchor packages to prevent shifting during transit.

(b) Uniformly spread, scatter, or step pellets or tablets into the exposed grain surface.

(2) Subsurface Treatment (Trench-in).

Place fumigant (packaged to retain residual dust) or uniformly spread, pellets or tablets in a shallow trench approximately 0.3 meters (1 foot) deep and cover with grain. When using a package product, ensure that only the two ends of the package fumigant remain visible above the grain surface.

(3) Recirculation System.

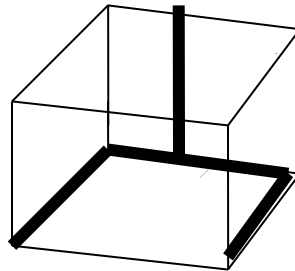
This method uses a combination of tubing and an explosion proof blower motor. The blower is used to aid fumigant distribution by re-circulating phosphine gas throughout the hold, and therefore must have the capability of moving the fumigant at a minimum rate of 300 cubic feet per minute. During transit, the blower forces high gas concentrations in the head space to lower parts of the hold.

The fumigant industry has demonstrated the effectiveness of the Recirculation System. Additionally, USDA's Agricultural Research Service tested the Recirculation System aboard the M/V Gamal Abdul Nasser in December 1987.

- (a) Install a 4-inch (minimum) corrugated slotted/perforated tubing in a pattern(s) on the hold bottom that will provide for the uniform distribution of the fumigant throughout the hold.

(Figure 1 below illustrates suggested installation configuration of the tubing for the recirculation system. Notice the tubing runs from corner to corner).

FIGURE 1



- (b) Complete the wiring of the explosion proof motor with the blower.

**NOTE: Official personnel are not responsible for checking wiring diagrams or performing any electrical test on the blower. The fumigator is responsible for demonstrating the operation of the blower to official personnel.**

- (c) Place the blower motor inside the manway opening and attach tubing to the motor housing securely using a semi-permanent method such as a bolt, screw, clamp, etc. **Tape is not allowed for the purpose of attaching the tubing to the blower housing, but tape may be used to help seal the joint between the blower housing and the tubing.**
- (d) From the output side of blower motor insert the 4-inch (minimum) solid tubing down through the manway opening and attach it to the slotted tubing (minimum 4 inch) on the hold bottom. Attach the 6-inch perforated/slotted tubing to the input side of the blower motor housing using a semi-permanent method such as a bolt, screw, clamp, etc. **Tape is not allowed for the purpose of attaching the tubing to the blower housing, but tape may be used to help seal the joint between the blower housing and the tubing.**

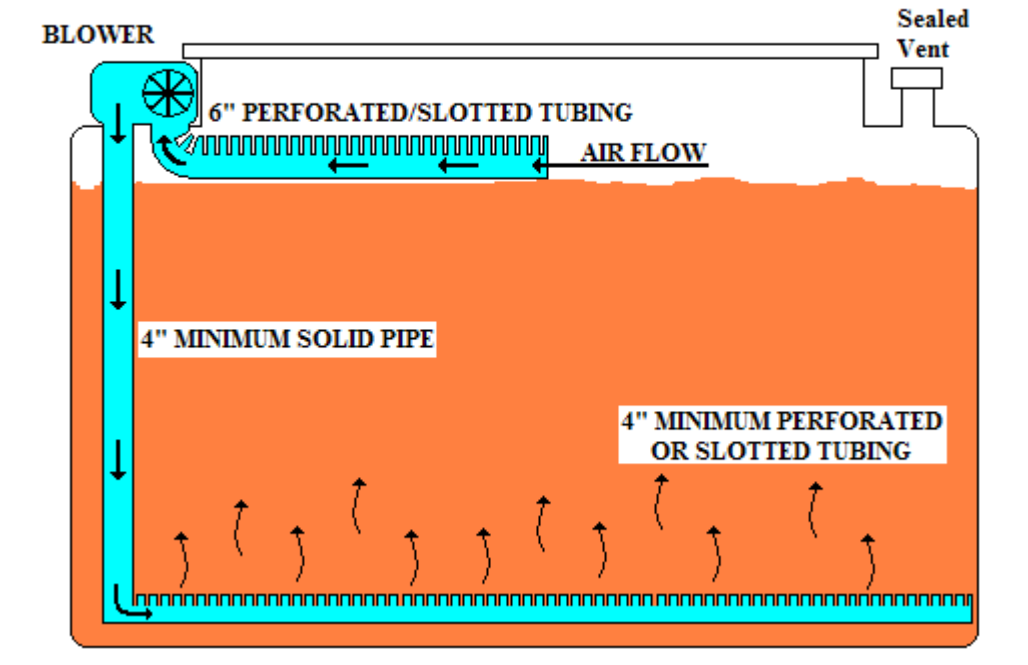
- (e) After the loading is completed, stretch the 6-inch perforated/slotted tubing, onto the surface of the grain.

**Note: If the hold is loaded “slack” the 6-inch tubing is not installed.**

- (f) Official personnel must verify that the blower is operational and the air flow is moving in the correct direction. The air must be pulled from the top (input side) and pushed down (output side) through the tubing to the bottom of the hold. Figure 2 below illustrates the correct direction of the air flow, and placement of the solid and slotted tubing.
- (g) Apply fumigant using surface or subsurface method.

FIGURE 2

**AIR FLOW DIAGRAM**



- e. FGIS In-transit Fumigation Procedure.

This certification of efficacy by FGIS requires adherence to all applicable procedures in this chapter of the Fumigation Handbook.

f. Contract Variance.

FGIS will, upon request, witness the contract specified fumigation procedure and issue a letterhead statement. Official personnel will indicate on the work record that the lot was fumigated in accordance with contract procedures.

g. FGIS Witness of Fumigation.

Upon request, FGIS observes a lot being fumigated, but does not guarantee the efficacy. This service is provided when fumigation is requested per contract terms; when a vessel does not qualify for FGIS in-transit fumigation because the vessel is not an approved type vessel; when the cargo is not an acceptable bulk commodity (e.g. bulk soybean meal), or when the cargo is in sacks. See Section 2.3 SCOPE, for vessels and commodities that qualify for in-transit fumigation.

h. Acceptable Separation Materials.

Bulk grain above or below a permeable material separation, such as burlap or woven polypropylene, may be fumigated. Bulk grain below impermeable separation materials, such as plastic, cardboard, or wood can only be fumigated in-transit by the recirculation method. However, grain under wood separation material may be fumigated without using the in-transit recirculation method, if the wood material is made permeable using the procedures in this section under (1) Plywood, below.

Typically, separations are composed of 4 feet by 8 feet plywood sheets, burlap, polypropylene-weave or polyethylene, layered singularly or in combination with one or both of the other types. When a rigid plywood layer is not used in building a separation, plywood sheets (splash boards) may be placed on top of the flexible separation to protect it from damage resulting from grain hitting the surface of the separation. Sometimes, the type of separation is specified in the contract(s).

When fumigation of the hold(s) is required upon completion of loading, each separation within a hold must be permeable to facilitate sufficient gas dispersal to guarantee the efficacy of the treatment. To achieve this permeability, either of the following procedures must be used.

(1) Plywood.

- (a) Permeable Drilled/Cut Plywood. After the lot is loaded, a burlap or polypropylene-weave cover is placed over the reasonably leveled grain in the hold. A layer of plywood sheets covering the entire surface area is then placed on top of the cover.

Each plywood sheet must have three rows of one-inch (25mm) *minimum* diameter holes spaced lengthwise approximately 19 inches (475mm) apart (See Figure 3 below) or have three rectangular vertical openings of 1.5 inches (38mm) minimum by 24 inches (610mm) spaced lengthwise and indented 12 inches from each end.

The middle opening is to be centered approximately 33.75 inches (857mm) from each of the two end slots (see Figure 4 below). Holes/openings are required regardless of the method of fumigation.

When plywood is requested as a separation in the hold and the grain below the separation must be fumigated, either of the following patterns may be used to cut holes in each plywood sheet to allow fumigant gas dispersal:

FIGURE 3

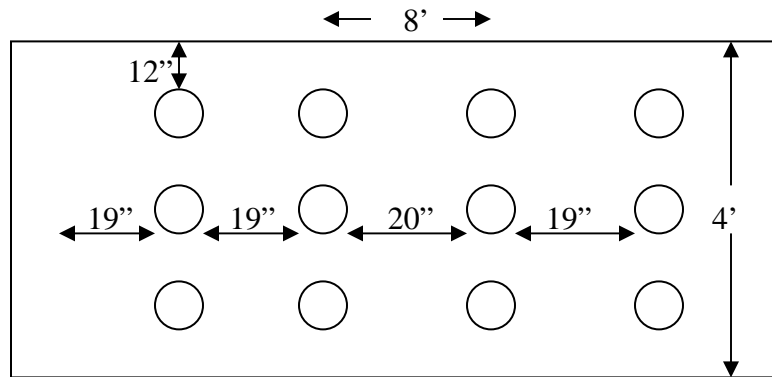
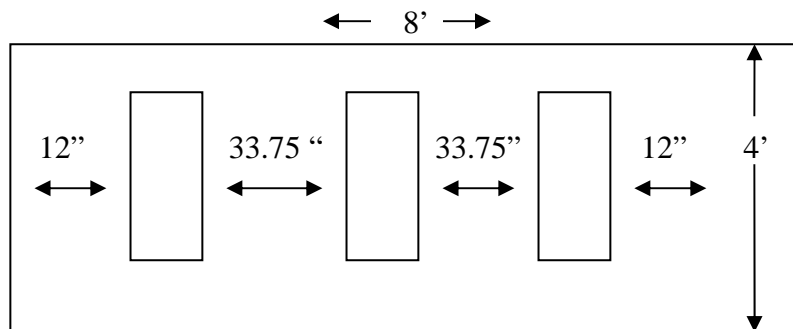


FIGURE 4





- (b) Splash Boards. After the lot is loaded, a burlap or polypropylene-weave cover is placed over the entire surface of the grain in the hold. Multiple 4 feet x 8 feet plywood/particle board sheets may be scattered over the cover to hold it place. The loading spout(s) is then placed over the splash boards. Pouring grain above the boards continues at a reduced rate until the spout stream builds a grain mass of sufficient size to anchor the separation before resumption of loading at a faster rate. The splash boards do not need holes. As the surface area of the hold increases the number of boards may also increase; however, the coverage shall not exceed approximately 50 percent of the surface area to accommodate fumigation, if needed.
- (2) Flexible Separations. Burlap, polypropylene-weave, and polyethylene may be used singularly or combined with the other two to form a separation. Since polyethylene is not permeable to the fumigant, it should only be used if neither lot in the hold is to be treated or if only the lot portion above the separation is to be fumigated. However, if the portion below the polyethylene separation needs to be fumigated, then the recirculation method is to be used and tubing must be in place before the grain is loaded.

## 2.4 PROCEDURES

The metal phosphide fumigant formulations may be applied to the grain aboard acceptable vessels only after the loading of the grain into the hold or tank is completed. Partially loaded or slack holds or tanks may be fumigated provided that no additional grain is subsequently loaded into that hold or tank.

When another lot of grain is to be loaded at a different elevator on top of a previous lot, the fumigant formulation may be applied only after the completion of loading all grain into the hold or tank. Certification of the first lot is withheld pending the proper application of the fumigant after completing the loading of the grain in the second lot.

The fumigated holds or tanks must remain closed for the entire voyage, unless an emergency situation exists, such as structural damage, fire, etc. Appropriate respiratory protection equipment and fumigant gas detection equipment must be on board the vessel and at least two crew members must be trained in their use.

### a. Applicant's Responsibilities.

The applicant for inspection must:

- (1) Make the necessary arrangements to secure the service of a certified applicator from fumigation firm.

- (2) Follow the procedures outlined in this chapter and verify that the certified applicator follows the EPA-registered label requirements for metal phosphide fumigant formulations and the U.S. Coast Guard regulations regarding shipboard fumigation in the CFR (46 CFR 147A) and applicable State and local laws or regulations.
- (3) Immediately notify the certified applicator and FGIS of change to the loading/stowage plan. A change could affect the suitability to fumigate the lot.

b. Certified Applicator's Responsibilities.

The certified applicator must:

- (1) Inspect or cause to be inspected by qualified individuals the holds or tanks for suitability to retain the fumigant gas for the entire voyage. This inspection may be conducted any time prior to fumigation. FGIS recommends that the inspection be done prior to loading when the holds or tanks are empty. The vessel inspection must consider all aspects which relate to the vessel's ability to retain the fumigant for the entire voyage. Structures and systems to evaluate include, but are not limited to, the following:
  - (a) Integrity of hatch covers, vents, manholes, and other openings to the holds or tanks. Special attention should be given to the condition of gaskets on all openings.
  - (b) Structural or other systems that may allow the fumigant to leak from one area to another, such as coffer dams, pumping systems, all-weather tunnels, keel ducts, bilges, smoke/fire detection or suppression systems, electrical systems, deck lockers, and bulkheads and decks.
- (2) Identify the holds or tanks which cannot be fumigated because of their inability to retain the fumigant. Extra care must be exercised in inspecting holds or tanks that extend under the vessel's housing structure or with a common bulkhead to living quarters to ensure that no fumigant can leak into these areas.
- (3) Provide a written statement on the company's letterhead to FGIS or agency personnel indicating which holds or tanks are suitable for fumigation and which are not, including the reason for unsuitability. This statement must be signed by the certified applicator conducting the inspection and the officer in charge of the vessel. See Attachment 1 for an example of this type of statement.

- (4) Determine the fumigant application method and the amount of fumigant to be applied to each hold or tank (refer to Attachment 4).
- (5) Conduct a pre-fumigation conference with the officer-in-charge of the vessel in the presence of FGIS or agency personnel and provide each party with a copy of the EPA-registered label from the metal phosphide fumigant formulation.

If the certified applicator typically uses the same fumigant for multiple cargoes official personnel may waive the requirement for furnishing a specimen label for each fumigation. However, the certified applicator must provide the label specimen to official personnel when there has been a change in labeling, a new fumigant is used, or when requested specifically by official personnel.

Additionally, the certified applicator must prepare a written statement on company letterhead (see Attachment 2) signed by the certified applicator and the officer in charge of the vessel, specifying the following information:

- (a) The identification of the holds or tanks to be fumigated.
- (b) The method of application of the fumigant formulation.
- (c) The safety precautions to be followed by the vessel's crew during the voyage, symptoms of exposure to the fumigant, and the first-aid procedures to be followed in the event of accidental exposure.
- (d) That personal respiratory protection and gas detection equipment for phosphine are on board the vessel, and at least two crew members have been trained in their use.
- (e) A listing of areas on the vessel that are judged to be safe and areas judged not to be safe during the fumigation.
- (f) A checklist of areas that must be monitored at daily for fumigant leaks.
- (g) Instructions for aerating the holds or tanks. The instructions must specify that the holds or tanks must not be aerated at sea unless an emergency situation exists.
- (h) Instructions for the retrieval and disposal of fumigant formulation residue and its accompanying packaging, such as sachets, bag blankets, or sleeves, upon arrival at the destination port.

- (6) When the recirculation method is used, attach the 6-inch perforated/slotted tubing to the input side of the blower motor housing with a semi-permanent method such as a bolt, screw, clamp, etc. **Tape is not allowed for the purpose of attaching the tubing to the blower housing, but may be used to help seal the joint between the blower housing and the tubing.**

Prior to attaching the tubing demonstrate to FGIS personnel that each blower is moving air in the proper direction.

- (7) Apply the fumigant formulation at the dosage prescribed on the EPA-registered label.
- (8) Close and seal all un-sealed openings to the hold or tank after application of the fumigant formulation is completed.
- (9) Verify that the fumigant is being contained within the hold or tank and is not a hazard to the vessel's crew.
- (10) Install warning placards on all entrances to all fumigated holds or tanks. Placards must be placed on the **outside** of each manway. Each placard must exhibit the hazardous material symbol for poisonous gas (skull and crossbones symbol) and include the fumigation date, fumigant formulation used, the minimum fumigant retention period as indicated in attachment 4, and that the fumigated hold or tanks are not to be aerated until arrival at the destination port. When possible, placards in the principal language of the crew and English should be used.
- (11) Provide a written statement on company letterhead (see attachment 3) to the officer-in-charge of the vessel and official personnel, signed by the certified applicator, indicating:
- (a) The date of the fumigant formulation application.
  - (b) That the application of the fumigant formulation was in accordance with EPA, U.S. Coast Guard, and FGIS regulations and instructions.
  - (c) The holds or tanks treated.
  - (d) The type and quantity of fumigant formulation used in each hold or tank including the cubic capacity and the depth of each hold or tank.

- (e) The method of fumigant formulation application.
- (f) The destination of the vessel and the estimated voyage time.
- (g) That the openings to all fumigated spaces were closed and placarded and checked to ensure no fumigant was leaking at the time of the vessel's departure.

c. Official Personnel Responsibilities. Official personnel must:

- (1) Obtain a written statement on company letterhead from the certified applicator indicating which holds or tanks are suitable for fumigation based on the certified applicator's inspection as required in item 2.4b (3) of this section.
- (2) Verify that the metal phosphide fumigant formulation has an EPA-registered label for in-transit fumigation for the type of grain to be treated.
- (3) Attend the pre-fumigation conference conducted by the certified applicator and obtain a copy of the signed statement containing the information required by item 2.4b. (5) of this section.
- (4) Observe the application of the fumigant formulation to verify that the dosage, method of application, sealing of the holds or tanks, and the placement of warning placards are as specified in this chapter.
- (5) Verify that the metal phosphide fumigant formulation was removed from a **factory-sealed container**. For products not always distributed in factory-sealed containers (e.g., tablets and pellets), verify that the containers are removed from sealed cartons and contain the appropriate formulation.

**Note: Due to flash fire possibility, do not stand in close proximity to the containers while they are opened.**

- (6) Obtain from the certified applicator a signed letterhead statement containing the information required in item 2.4b. (11) of this section.
- (7) Verify that all fumigated holds are closed and sealed prior to vessel departure.
- (8) Review all letterhead statements to ensure they contain the required information.
- (9) Attach a copy of all fumigation related documents to the Inspection Log (Form FGIS-921) to have on file.

- (10) When the **recirculation** method is used Official Personnel must:
- (a) Before vessel loading begins, verify that the tubing and blower motor are of the recommended size and are in correct placement in the hold;
  - (b) Have the certified applicator demonstrate the fan/blower is moving air in the proper direction (see section 2.4 b (6)); and
  - (c) Ensure that the 6 inch perforated/slotted tubing is attached to the input side of the blower motor housing securely with a semi-permanent method such as a bolt, screw, clamp, etc. **Tape is not allowed for the purpose of attaching the tubing to the blower housing, but tape may be used to help seal the joint between the blower housing and the tubing.**

## 2.5 CERTIFICATION

a. Grain.

If the quantity of grain initially determined to be infested is treated in accordance with this chapter, the certificate representing that quantity of grain will be issued as if the “infested” designation had never been assigned.

b. Rice.

If a lot of Rough rice or Brown rice for processing was determined to be infested and downgraded to U.S. Sample Grade, and then treated according to FGIS procedures, the certificate will be issued as if the infestation did not occur and the U.S. Sample Grade designation will be removed. No method of fumigation will remove the U.S. Sample grade designation from Milled rice if the rice is U.S. Sample grade due to live or dead insects.

c. APHIS-FGIS Cooperative Agreement.

When insects that are prohibited by the destination country are identified during the official inspection, when the lot is graded “infested” or U.S. Sample Grade, as applicable because of insects, or when fumigation is a quarantine requirement, the vessel may be fumigated under the provisions of this chapter. After the fumigant formulation application is completed, FGIS will inform the Animal and Plant Health Inspection Service (APHIS) that the fumigation was conducted in accordance with FGIS procedures. APHIS will then issue a phytosanitary certificate denoting that the grain was fumigated. Additional information is in the APHIS-FGIS Cooperative Agreement found in FGIS Directive 9180.35.

d. In-Transit Fumigation.

FGIS has established minimum requirements for in-transit fumigation when fumigation is required to remove the special grade “infested” from the official certificate when insect infestation is found during loading, or eliminate the “U.S. Sample Grade” designation, as applicable, or when fumigation is required to satisfy the phytosanitary inspection certification of the cargo, or when official personnel are requested to observe fumigation of a lot and certify that the fumigation was done according to official procedures.

If FGIS requirements for fumigation are satisfied, official personnel will indicate on the work record/ship log:

“This (grain/commodity) was fumigated according to official procedures.”

The above statement can also be applied to the Insects in Grain Report, FGIS 921-2, the inspection certificate for grade, or on letterhead stationery.

e. Witness of Fumigation.

This service only certifies that the vessel/cargo was fumigated; it does not certify the accuracy or the efficacy of the fumigation and does not remove the special grade “infested” or eliminate the “U.S. Sample Grade” designation, as applicable.

One or more of the following statements may be shown on a letterhead:

- (1) “Hold(s) No. \_\_\_\_\_ was/were observed being fumigated with (quantity of fumigant) of (type of fumigant) after lot was loaded into the carrier but the lot was not sampled and examined after fumigation.”
- (2) “It is the responsibility of (name of fumigator) to ensure the above named vessel was fit to be fumigated, the proper fumigant dosage was applied, the fumigant is effective, and that all appropriate federal, state, and local laws and regulations were followed.”
- (3) “Hold(s) No. \_\_\_\_\_ was/were observed being fumigated per contract terms using (type of fumigant) after the lot was loaded into the carrier.”

The wording of the above statements may be modified to meet the need of the applicant, provided after modification the statement remains factual.

- f. Contracted Fumigation Procedures. If shipments are fumigated according to contract requirements and those requirements do not meet the guidelines for FGIS In-transit fumigation, FGIS will allow the fumigation to take place. However, only FGIS In-transit fumigation procedures can remove the special grade "infested" and official personnel will not provide a statement indicating that the fumigation was performed according to the official procedures.

Official personnel, however, may provide a statement on the certificate, upon request, if official personnel witness the fumigation process. The following statement will certify the fumigant dosage and the method of application.

"This (grain/commodity) was observed being fumigated with (quantity of fumigant used) of (type of fumigant) using (application method)."

## 2.6 QUESTIONS AND ANSWERS

The following questions and answers are designed to aid FGIS and agency personnel in interpreting the procedures contained in this chapter on in-transit shipboard fumigation of grain.

**Question 1:** What fumigants can be used under FGIS in-transit shipboard fumigation procedures?

**Answer:** Metal phosphide fumigant formulations registered with the U.S. Environmental Protection Agency.

**Question 2:** Grain being loaded aboard a bulk carrier is determined to be infested. A certified fumigator is called out to determine vessel suitability for in-transit fumigation. Can this vessel be fumigated under FGIS in-transit fumigation procedures?

**Answer:** Yes. The vessel must be inspected by a certified fumigator and found to be suitable for in-transit fumigation.

**Question 3:** Can bagged wheat or rice be officially fumigated in transit under FGIS procedures?

**Answer:** No. Only bulk commodities can be fumigated in transit under FGIS procedures.

**Question 4:** A vessel registered as a 'tween decker contains car decks made of steel grating. Can this vessel be fumigated in transit under FGIS procedures?



**Answer:** Yes. Car decks made of steel grating will not impede the penetration of the phosphine gas. Vessels with internal decks constructed of solid steel plating or solid wood cannot be fumigated under FGIS procedures.

**Question 5:** Infested grain is loaded into a wing tank aboard a bulk carrier. Can the grain in the wing tank be fumigated?

**Answer:** Yes, if the wing tank has bleeder holes connected to the main hold or tank and the bleeder holes remain open, the main tank or hold must also be fumigated. If the wing tank has no bleeder holes or the bleeder holes are closed, only the wing tank has to be fumigated.

**Question 6:** The dosage for metal phosphide is based on the amount of grain in the hold or tank. Is this a correct statement?

**Answer:** No. The dosage for metal phosphide is always based on the cubic capacity of the hold or tanks regardless of the amount of grain actually loaded. The minimum dosage for passive fumigant application such as the surface and subsurface (trench-in) method is 45 grams per 1,000 cubic feet of storage space. The minimum dosage for the recirculation method is 33 grams per 1,000 cubic feet of storage space or a pellet formulation at the dosage rate of 45 grams of aluminum phosphide or 30 grams of magnesium phosphide per 1,000 cubic feet of stowage space.

**Question 7:** Is it permissible under the provisions of this chapter to fumigate grain in one hold while loading is being completed in other holds?

**Answer:** Yes, providing that no additional grain is to be loaded into that fumigated hold, and the hold is sealed immediately after fumigant application. Under these situations, there is no safety hazard for official personnel. However, in many locations, longshoremen will not allow the application of the fumigant until the completion of loading of all grain aboard the vessel.

**Question 8:** A lot of grain is loaded into Hold Nos. 1, 2, 3, 4, 5 at Elevator A. The grain in Hold Nos. 3, 4, 5 is infested. A second lot of grain is to be loaded at Elevator B on top of this first lot, without separation. How is the fumigation conducted?

**Answer:** Fumigation takes place after loading of all grain into Holds No. 3, 4, 5. Certification of the first lot is withheld pending proper application of the fumigant after the completion of loading the grain in the second lot. Where more than one agency or field office is involved, the agency or field office performing the inspection of the first lot must inform the agency or field office that will be inspecting the second lot that infested grain is aboard the vessel and certification for the first lot is being withheld pending proper fumigant application after the completion of loading all grain into the holds or tanks in question.

**Question 9:** The applicant for fumigation asks (in person or in the load order document) that FGIS witness the fumigation of the lot loaded. What do you do?

**Answer:** Explain to the applicant the difference between “witness of fumigation” and “FGIS in-transit fumigation” and then determine which procedure is to be used. “Witness of fumigation” is a service provided, upon request, whereby FGIS will observe the lot being fumigated but the efficacy is not guaranteed. This service is usually requested when the lot does not qualify for FGIS in-transit fumigation, i.e., unapproved vessels, bagged rice or grain, bagged commodities, or soybean meal. “FGIS In-transit Fumigation” is a procedure used to fumigate qualifying shipments whereby the carrier may sail before the results are verified. The efficacy of the treatment is assumed to be accomplished; provided, all the carrier criteria and treatment requirements contained in Chapter 2 of this Handbook are met and verified by FGIS personnel. “FGIS In-transit fumigation” is required to remove the special grade “infested” from the official certificate when insect infestation is found during loading, or eliminate the “U.S. Sample Grade” designation, as applicable, or when fumigation is required to satisfy the phytosanitary inspection certification of the cargo, or when official personnel are requested to observe fumigation of a lot and certify that the fumigation was done according to official procedures.

**Question 10:** Can a shipment of Dried Distiller Grains (DDG) be certified as being fumigated according to official FGIS procedures?

**Answer:** No, there are no FGIS procedures for processed commodities; however the applicant may request that FGIS witness the fumigation. Commodities that are acceptable for FGIS fumigation are barley, canola, corn, flaxseed, mixed grain, oats, rice, rye, sorghum, soybeans, sunflower seed, triticale, and wheat.

## 2.7 FUMIGATION CHECKLIST

FGIS /agency personnel must complete and sign the following checklist to indicate that they have fulfilled their responsibilities under this chapter. Field Office Manager may modify to suit needs however the items below must be covered.

FGIS FUMIGATION CHECKLIST			
ITEM		YES	NO
<b>1</b>	<b>STATEMENT OF VESSEL SUITABILITY</b>		
1a	Did you obtain a written statement from the certified fumigant applicator that the vessel is suitable for fumigation?		
<b>2</b>	<b>PRE-FUMIGATION CONFERENCE</b>		
2a	Did you attend the pre-fumigation conference conducted by the certified fumigant applicator? and:		
	(1) Did you receive a copy of EPA-registered label for the fumigant to be used?		
	(2) Did the certified fumigant applicator identify holds or tanks to be fumigated?		
	(3) Did the certified fumigant applicator state the intended fumigant dosage to be applied?		
	(4) Did the certified fumigant applicator describe the method of fumigant application?		
	(5) Did officer in charge of the vessel state voyage length?		
2b	Did the certified fumigant applicator discuss safety precautions including:		
	(1) Symptoms of fumigant exposure.		
	(2) First aid procedures.		
	(3) Instruct two crew members in the use of respiratory protection equipment and phosphine detection equipment?		
	(4) List of areas that are judged to be safe and those judged to be unsafe for crew members during the voyage.		
	(5) Checklist of areas that must be monitored daily for phosphine leaks.		
	(6) Holds or tanks under fumigation must be closed for the entire voyage length.		
2c	Did the certified fumigant applicator provide the officer in charge of the vessel instructions for aerating the holds or tanks upon arrival at the discharge port?		
2d	Did the certified fumigant applicator provide the officer in charge of the vessel instructions for the retrieval and disposal of residue retention device (bags, belts, ropes) at the discharge port?		
<b>3</b>	<b>IF RECIRCULATION METHOD IS USED (See section 2.3d(3))</b>		
3a	Did you verify that the blower motor has the capability to move the fumigant at a minimum rate of 300 cubic feet per minute?		
3b	Did you have the certified applicator demonstrate the fan/blower is moving air in the proper direction? (See section 2.4 b (6)).		

3c	Did you verify that the 4 inch (minimum) solid tubing is securely attached to the output side of the blower motor housing with a semi-permanent method such as a bolt, screw, clamp, etc.?		
3d	Did you verify that the 4 inch perforated/slotted tubing was placed on the bottom of the hold and attached to the 4 inch (minimum) solid tubing?		
3e	Did you verify that the 6 inch perforated/slotted tubing is securely attached to the input side of the blower motor housing with a semi-permanent method such as a bolt, screw, clamp, etc.?		
<b>4</b>	<b>OBSERVING FUMIGANT APPLICATION</b>		
4a	Did you observe the application of the fumigant?		
4b	Did you verify accurate fumigant dosage was applied?		
4c	Did you verify that certified fumigant applicator removed fumigant from factory sealed containers?		
4d	For fumigant not in factory-sealed containers (e.g., tablets and pellets), did you verify that the certified fumigant applicator removed the containers from sealed cartons and contain the appropriate formulation?		
4e	Did the certified fumigant applicator apply the fumigant by the method stated in the pre-fumigation conference?		
<b>5</b>	<b>CLOSING AND SEALING OF OPENINGS</b>		
5a	Were all openings to holds or tanks closed and sealed after application of the fumigant including main hatch or tank openings, man ways, wing tank openings, butterworth plates, weep bales, and vent openings?		
<b>6</b>	<b>INSTALLING WARNING PLACARDS</b>		
6a	Did the certified fumigant applicator install or have warning placards installed on all entrances to the fumigated holds or tanks?		
6b	Did each warning placard contain the following information: date of fumigant application, fumigant formulation used, the minimum fumigant retention period as indicated in attachment 4, and the holds or tanks must be kept closed for the entire length of the voyage?		
<b>7</b>	<b>STATEMENT OF FUMIGANT APPLICATION COMPLIANCE</b>		
7a	Did you receive a written statement of fumigant application compliance from the certified applicator as required by 2.4b(11) of the Fumigation Handbook? See attachment 3		

Remarks - Indicate in the space below any remarks regarding the fumigation process.

Signed: \_\_\_\_\_  
(FGIS/agency fumigation observer)

EXAMPLE OF  
VESSEL SUITABILITY STATEMENT

Captain or Officer In Charge of \_\_\_\_\_ (vessel name) .

I hereby certify that I have personally inspected the holds or tanks aboard the above named vessel on (date) and found the following to be true regarding the suitability of the holds or tanks for in-transit fumigation:

<u>Hold/Tank Number</u>	<u>Suitable</u>	<u>Not Suitable</u>	<u>Reason Not Suitable</u>
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Signed: \_\_\_\_\_  
(Certified Applicator)

Acknowledged: \_\_\_\_\_  
(Vessel captain or Person in Charge of Vessel)

EXAMPLE OF  
**STATEMENT OF PREFUMIGATION NOTICE COMPLIANCE**

TO: Person In Charge Of (vessel name)

This is to notify you that metal phosphide fumigant (brand name) will be applied to the grain in Hold No(s). (hold nos.) between the hours of (hours) on (date). The fumigant will be applied as (fumigant formulation) by (method of application).

In accordance with applicable federal, state, and local laws, the following information is provided. (information is to be supplied by the certified applicator covering the following topics.)

- Safety precautions during voyage.
- Symptoms of exposure.
- First aid procedures.
- Checklist of areas to be monitored for fumigant leaks.
- Instructions for aerating holds or tanks.
- Instructions for retrieval and disposal of fumigant formulation residue and its accompanying packaging at the destination port.

I certify that appropriate personal respiratory protection and fumigant detection equipment for phosphine are on board the vessel and at least two crew members have been instructed in their use.

In general, the following areas of the vessel may be considered as safe during the fumigation:  
(list of areas)

The following areas of the vessel are not safe during the fumigation: (list of areas)

Signed: \_\_\_\_\_  
(Certified Applicator)

Acknowledged: \_\_\_\_\_  
(Vessel Captain or Person in Charge of Vessel)

EXAMPLE OF  
STATEMENT OF FUMIGANT APPLICATION COMPLIANCE

TO: Captain or Officer in Charge of \_\_\_\_\_ (vessel name) .

I hereby certify that metal phosphide fumigant formulation was applied to the grain on the above referenced vessel on (date). I further certify that the fumigant formulation application was made in accordance with U.S. Environmental Protection Agency, U.S. Coast Guard, and applicable State and local laws and regulations and applicable Federal Grain Inspection Service instructions.

The grain in the following holds or tanks was treated:

<u>Hold/Tank Number</u>	<u>Hold/Tank Depth</u>	<u>Type and Quantity of Fumigation Formulation Used</u>	<u>Cubic Capacity of Hold/Tank</u>	<u>Method of Application</u>
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It is my understanding that the above named vessel is destined for (country) with an estimated voyage time of (days).

I certify that immediately following application of the fumigant formulation all openings to the fumigated space were closed and placarded with appropriate warning signs. I further certify that all openings to the fumigated space have been checked and no fumigant gas was leaking at the time of the vessel's departure.

Signed: \_\_\_\_\_  
(Certified Applicator)

Acknowledged: \_\_\_\_\_  
(Vessel Captain or Person in Charge of Vessel)

The following mandatory procedures apply only when fumigation is required to: (1) remove the special grade designation “infested” from the official inspection certificate when insect infestation is found during loading, or eliminate the “U.S. Sample Grade” designation, as applicable; (2) when fumigation is required to satisfy phytosanitary inspection certification of the cargo; (3) when official personnel are requested by contract to observe fumigation of a lot and certify that the fumigation was done according to official procedures.

<b>Application Method with Minimum Fumigant Dosage Rate and Exposure Time in Days by Cargo Hold Depth*</b>				
<b>Application Method and Minimum Dosage Rate Per 1,000 Cubic Feet of Storage Space</b>	<b>CARGO HOLD DEPTH IN METERS</b>			
	<b>&lt; 6</b>	<b>6 – 12</b>	<b>&gt;12 – 20</b>	<b>&gt;20</b>
<b>FUMIGANT EXPOSURE TIME IN DAYS</b>				
Surface Application 45 grams of metal phosphide per 1,000 cu. ft	9	15	<b>Not Acceptable</b>	<b>Not Acceptable</b>
Subsurface / Trench-in Application 45 grams of metal phosphide per 1,000 cu. ft	8	15	18	<b>Not Acceptable</b>
Recirculation Application – Method A 33 grams of metal phosphide per 1,000 cu. ft	4	7	9	9
Recirculation Application – Method B 45 grams of aluminum phosphide pellets per 1,000 cu. ft or 30 grams of magnesium phosphide per 1,000 cu. ft	3.5	3.5	3.5	3.5

\* Cargo Hold Depth is the length from the bottom of the hold to the top of the combing.

**Note: It is recommended that fumigated holds remain closed during entire voyage even if the mandatory minimum exposure time is met or exceeded.**

Fumigating Slack Holds and Slack Tanks of Vessels

- a. When the grain or commodity is less than or equal to 12 meters in depth, the surface application may be used with the mandatory minimum dosage rate of 45 grams of metal phosphide per 1,000 cu. ft.
- b. When the grain or commodity is greater than 12 meters in depth, the application method (e.g. subsurface, recirculation) as specified in the chart above must be used.