

GOVERNMENT OF ZAMBIA

STATUTORY INSTRUMENT NO. 83 OF 2001

The Plant Pests and Diseases Act
(Laws, Volume 7, Cap. 233)**The Plant Pests and Diseases (Fumigation)
Regulations, 2001**

IN EXERCISE of the powers contained in sections *four* and *twenty-nine* of the Plant Pests and Diseases Act, the following Regulations are hereby made:

- | | |
|---|--------------------------------|
| 1. These Regulations may be cited as the Plant Pests and Diseases (Fumigation) Regulations, 2001. | Title |
| 2. (1) These Regulations shall apply to any and all fumigations of bagged commodities, carried out as a commercial or non-commercial activity, by any person or company. | Application and interpretation |
| (2) In these Regulations, unless the context otherwise requires— | |
| “ fumigation ” means the disinfection of commodities by the use of a fumigant; | |
| “ fumigant ” means phosphine or methyl bromide gas that is used for the purpose of killing invertebrate pests in stored products during the process of fumigation and shall include such other gases as the Minister may by statutory order designate for such purpose; | |
| “ fumigator ” means a person having been registered as such with the Service; | |
| “ gas-proof sheet ” means a sheet made of polythene, polyvinyl chloride, polypropylene, or laminates thereof which are suitable for the purpose of fumigation, or a sheet of another type and quality as may be designated by the Minister for such purpose; | |
| “ sealed ” means gas-tight based on minimum gas-loss rates and | |

gas concentrations achieved during the exposure period and prior to aeration or ventilation; and

“Service” means the Plant Quarantine and Phytosanitary Service of the Ministry of Agriculture Food and Fisheries.

Where fumigation can be used

3. Fumigation shall be used only in condition where gas-tight conditions under gas-proof sheets can be met.

Who can fumigate

4. (1) No person who is not a fumigator shall carry out or supervise a fumigation.

(2) Any person who conducts or supervises fumigation without having been registered by the Service commits an offence and is liable on conviction to a fine not exceeding ten thousand penalty units.

Registration of fumigators

5. The Service shall register fumigators who meet the requirements set out in regulation 6.

Requirements for registration as fumigator

6. (1) Any person wishing to be a fumigator under these Regulations shall—

(a) have been certified competent in fumigation practices by a recognised training institution or authority on the subject of fumigation; or

(b) Have—

(i) been working for a period of not less than six successive calendar months with a person being certified to be competent in fumigation practices;

(ii) assisted in not less than 15 fumigations, to be verified by the plant Quarantine and Phytosanitary Service during this period;

(iii) completed such period of attendance at an approved course of instruction; and

(iv) reached the required standard during written examinations and practical performance testing set and supervised by an examiner nominated by the Service;

(c) provide all relevant particulars or information as prescribed under subsection (1);

(d) demonstrate to have in possession or have access to the equipment specified in the Third Schedule which equipment shall be in sufficient quantity and quality to perform any and all fumigations in accordance with the code of practices as specified in the Fourth Schedule.

7. (1) Any application for registration as a fumigator shall be made to the Service in the form set out in the Second Schedule.

Application
for registra-
tion as
fumigator

(2) Any application for registration as a fumigator shall be accompanied by a non-returnable fee specified in the First Schedule.

(3) As soon as practicable after the receipt of such application the Service shall—

(a) if it is satisfied that the applicant complies with the requirements set out in regulation 6, register the applicant as a fumigator and issue the certificate of registration in the form set out in the Second Schedule;

(b) If it is not satisfied that the applicant complies with the requirements, set out in regulation 6 or if the applicant presents any false or misleading particulars or information regarding qualifications of the applicant or fumigation personnel, or it is of the opinion that by registering the applicant as a fumigator, the life of the applicant or other person will be in jeopardy, refuse to register the applicant as a fumigator.

4. The refusal of an application for registration as a fumigator shall not prevent the making under these regulations of a fresh application for registration as a fumigator by the same person at any subsequent time.

5. The registration of fumigator by the Service shall be subject to such terms and conditions as the Service may determine.

8. (1) Where an application is made for registration as a fumigator and the business to be sought is of a partnership, or company—

Registration
as fumigator
in case of
partnership,
or company

(a) the partners shall nominate one member of the partnership or;

(b) the company shall nominate one employee, who shall upon the application being granted by the Service, be registered as a fumigator in respect of the partnership or the company, as the case may be.

(2) Registration as a fumigator under these regulations shall not be construed as affecting or limiting any present or future liability existing or arising between such partners, or between employee and company, as the case may be, or between them and any third person.

9. A certificate of registration as a fumigator shall be the property of the person to whom it is issued, and shall not be transferable.

Ownership
of certificate
of registra-
tion as
fumigator

Period of validity	10. A certificate of registration as a fumigator shall be valid for a period not exceeding one calendar year.
Renewal of registration as fumigator	11. (1) Any person registered as a fumigator under these regulations, may apply for renewal of registration as fumigator to the Service in the form set out in the Second Schedule, not more than three months and not less than one month before the expiry of such registration. (2) An application for renewal of registration as a fumigator shall be accompanied by the fee set out in the First Schedule.
Cancellation of registration as fumigator	12. A registration as a fumigator may be cancelled by the Service at any time when the fumigator— (a) presents any false or misleading particulars or information on the qualifications of the fumigator and fumigation personnel; (b) by malpractice, fails to carry out a fumigation to standards set out in the code of practice in the Fourth Schedule; (c) fails to demonstrate at any time that the fumigator has in possession or has access to the equipment specified in the Third Schedule; or (d) misrepresents facts or particulars relating to any fumigation (2) In case of a member of a partnership or an employee of a company having been registered as a fumigator, the registration as a fumigator shall be cancelled automatically if such partnership or company is dissolved, or the employee is no longer employed by the firm or company, as the case may be. (3) Notification of cancellation of a registration as a fumigator shall be in the form set out in the Second Schedule, and shall state the reasons for the cancellation. (4) The cancellation of registration as a fumigator shall not prevent the making of a new application for registration as fumigator by the same person at any subsequent time.
Appeal to Minister	13. (1) Any applicant for registration as a fumigator whose application has been refused by the Service under regulation 7, and any registered fumigator whose registration has been cancelled by the Service under regulation 12, may within one month after receipt of notice such refusal, or cancellation appeal in writing to the Minister against the decision of the Service.

(2) In determining an appeal under this regulation the Minister may consult with the service and may affirm the decision of the Service, or may order the Service—

- (a) to register the applicant as fumigator;
 - (b) to restore the registration as a fumigator;
- and the service shall comply with such order.

14. (1) Any person carrying out fumigations under these regulations shall, at all times, have in possession or have access to the equipment specified in the Third Schedule.

Equipment

(2) The equipment referred to in sub regulation (1) shall be of sufficient quantity and quality to perform properly any and all fumigations in accordance with the code of practice specified in the Fourth Schedule.

15. Any person carrying out fumigations under these regulations shall comply with the code of practice specified in the Fourth Schedule.

Code of Practice

16. (1) Any person that carries out the practice of fumigation shall keep a record of every fumigation, giving details of date and place where the fumigation was carried out, what commodity was exposed to the gas and dosage used in grams of gas per cubic metre or per metric tonne.

Record of fumigation

(2) The record referred to in subregulation (1) shall include any other pest control measures undertaken in relation to that fumigation.

17. (1) Any person carrying out fumigation under these Regulations shall submit, within fourteen days after having been registered as a fumigator, to the Service a specimen copy of the company's certificate of fumigation in accordance with the form set out in the Second Schedule, showing the company's letterhead, company stamp, and signature of the fumigator.

Certificate of fumigation

(2) A certificate of fumigation shall be issued by any person carrying out any fumigation, on completion of such fumigation to the owner of the commodity fumigated.

18. (1) Upon application for registration or renewal of registration of a fumigator, the Service may, if it considers it necessary for the purpose of its consideration of an application for registration or renewal of registration, cause an inspector to inspect and report on —

Powers of Service regarding registration of fumigators

- (a) Whether the person conducting fumigations under these regulations meets with the requirements set out in regulation 6; or

(b) Whether the equipment specified in the Third Schedule is to be used or is being used for fumigation

(2) The Service may, if it considers it necessary for any fumigator, cause an inspector to inspect and report on—

(a) Whether the equipment which the fumigator is using is in accordance with these regulations;

(b) Whether the fumigator is adhering to the code of practice specified in the Fourth Schedule; or

(c) the record of fumigations.

(3) If the Service is not satisfied that a fumigator is carrying out fumigations in accordance with these regulations, or if it is of the opinion that such person may place in jeopardy the life or health of fumigation personnel or other persons, it may—

(a) order the fumigator to discontinue the fumigation; or

(b) order the fumigator to put in place any measures as it may consider necessary in order to ensure that such person complies with the provisions of these regulations.

Inspectors

19. (1) There shall be inspectors of the Service for the purpose of inspection of fumigations, who shall be appointed by the Minister.

(2) Inspectors appointed under this regulation shall have their names notified in the *Gazette*.

(3) Where a person is appointed inspector under this regulation the inspector shall, at all times, be answerable to the Service for any decisions taken by the inspector in matters of fumigation.

(4) The Minister shall cause a certificate of appointment to be issued to an inspector.

(5) An inspector shall produce for inspection the certificate of appointment of that inspector upon the demand of any person affected by the exercise of any powers by the inspector under these regulations.

Functions of
an Inspector

20. An inspector shall—

(a) inspect whether equipment used for the purpose of carrying out fumigations is in accordance with the requirements of these regulations

(b) inspect and monitor fumigations carried out by any person or company to ensure that these comply with the code of practice set out in the Fourth Schedule;

(a) measure gas concentrations during fumigations to ascertain that the correct dosage of gas is being applied to kill all stages of invertebrate pests infesting the commodity under fumigation;

- (b) ensure that the fumigation is being carried out safely;
- (c) give courses in fumigation practices to persons or companies carrying out fumigations under these regulations, as and when required;
- (d) set both practical and theoretical examinations on fumigation;
- (e) act as examiners during examinations set out under this regulation.

21. An inspector in the course of official duties shall have the right of entry, at all reasonable times, to any premises or place which the inspector believes a fumigation may be taking place.

Right of
entry of an
Inspector

22. (1) A fumigator shall give a minimum of two days prior notice to the Service of any fumigation to be carried out.

Notification
of fumiga-
tion

(2) Any fumigator who fails to give the appropriate prior notice to the Service of any fumigation to be carried out commits an offence and shall be liable upon conviction to a fine not exceeding five hundred penalty units.

23. Any person who—

Offences

- (a) obstructs or impedes an inspector in the exercise of any powers conferred upon the inspector by or under these regulations;
- (b) refuses to furnish to an inspector, on request, any particulars or information to which the said inspector is entitled by or under these regulations;
- (c) wilfully or recklessly gives to an inspector any false or misleading particulars or information with respect to any fact or particular to which the said inspector is entitled by or under these regulations;
- (d) fails to demonstrate at any time that the person has in possession or has access to the equipment specified in the Third Schedule;
- (e) by malpractice fails to carry out a fumigation in accordance with the standards specified in the code of practice set out in the Fourth Schedule; or
- (f) for all purposes misrepresents facts or particulars relating to any fumigation; commits an offence and shall be liable upon conviction to a fine not exceeding fifty thousand penalty units.

FIRST SCHEDULE (Regulations 7. and 11)

PRESCRIBED FEES

	<i>Fee units</i>
1. Application for registration as a fumigator	1000
2. Annual renewal of registration as a fumigator	500

SECOND SCHEDULE

Prescribed Form

Form No. 1

(Regulations 7 and 11)

Republic of Zambia
The Plant Pests and Diseases (Fumigation) Regulation, 2001
Application for Registration as Fumigator

The Permanent Secretary
Ministry of Agriculture, Food and Fisheries
Mount Makulu Central Research Station
Plant Quarantine and Phytosanitary Service
(Fumigation Regulations)
Private Bag 07
Chilanga

I,

(State full names)

of.....

(state postal and residential address, including telephone/fax number)

employed by.....

(state full names of company and attach a company profile if applicable)

of.....

(state postal and residential address, including telephone/fax numbers)

hereby wish to (delete as applicable):

1. apply for registration as a fumigator
2. renew my registration as a fumigator

APPLICANT

Highest qualification attained:.....

(state institution and date, attach documents to this application)

Institutional training in fumigation.....

(state institution(s), duration and date (s), and attach documents)

In-service training in fumigation.....

(state number and type of fumigations assisted in, and with whom-give contact address, including telephone/fax number)

Reference: (1).....

(2).....

(state full name, postal/residential address, and telephone/fax numbers)

EMPLOYEES ASSISTING IN FUMIGATIONS

Training in fumigation received

*(Give full details for each employee, and attach relevant documents)***ASSETS**

Fumigation sheets.....

(state type and numbers)

Gas masks.....

(state type and number)

Canisters.....

(state type and numbers)

Gas detection equipment.....

Sand snakes or layflats tubing:.....

Repair materials:.....

(give full details)

Safety equipment:.....

(give full details)

Miscellaneous other essential equipment:.....

(give full details)

The listed equipment is owned by (delete as applicable):

(a) The applicant

(b) The Company by which the applicant is employed.

I hereby declare that all the information provided in this application for registration as a fumigation is true.

Date.....

Place:.....

*(Signature of applicant)***NOTES:**

1. If the registration is for a partnership or firm for a company, one member of the partnership firm or one employee of the company, as the case may be, must be nominated who will be registered as the fumigator for the purpose of these Regulations. This person must also sign the application form.
2. Under Regulation 6 of these Regulations, the applicant may be required to sit for written examinations and/or submitted to a practical performance testing to demonstrate his competence to fumigate.
3. Under Regulation 18 of these Regulations, the Plant quarantine and Phytosanitary Service may wish to have the applicant's premises inspected for the presence of the prescribed equipment.

Form No. 2
(Regulation 7)

Republic of Zambia
The Plant Pests and Diseases (fumigation) Regulations, 2001
Certificate of Registration as a Fumigator

No.:.....

This is to certify that:.....

(state full name)

of:.....

employed by:.....

(state full name of company)

of:.....

(state postal and residential address)

Has been registered as a fumigator with the Plant Quarantine and Phytosanitary
Service, Ministry of Agriculture, Food and Fisheries, for the purpose
of

Phosphine fumigation of bagged commodities

This certificate is valid for the period200..... to200.....

Date:.....



Name:.....

Signature:.....

Plant Quarantine and Phytosanitary Service

This Certificate should be displayed in a prominent place on the premises.

Form No. 3
(Regulation 12)

Republic of Zambia
The Plant Pests and Diseases (Fumigation) Regulations, 2001
Cancellation of Registration as a Fumigator

To:.....

(state full name)

of:.....

(state full name)

employed by:.....

of:.....

(state postal and residential address)

I wish to inform you that your Registration as a Fumigator No..... has been
revoked in terms of Regulation 12 of the Plant Pests and diseases (Fumigation)
Regulations with effect from the date below for the following reason (s):

.....
.....
.....

Should you comply with the above requirements, you may re-apply for registration
as a fumigator.



Date:.....

Name:.....

Signature:.....

(Seal)

Plant Quarantine and Phytosanitary Service

Republic of Zambia
The Plant Pests and Diseases (Fumigation)
Regulations, 2001

Form No. 4
(Regulation 17)

Company Name:.....

CERTIFICATE OF FUMIGATION NO.....

This is to certify that:

Commodity:.....Quantity.....

(State quantity in m3 or MT).

Location:.....Tele/Fax:.....E-mail:.....

Client:.....

has been fumigated in compliance with the Code of Practice.

Type of fumigant:.....

Dosage:.....

(state dosage in gram per m3 MT, or number of tables, pellets or
sachets per m3 MT)

Final gas concentration:.....

(state in mg/l or ppm)

Exposure period from:to:.....

(State date and time) (State date and time)

Number of hours:.....Ambient Temperature:.....

Fumigator:.....

(State name and company)

Registration No.:.....

Assisting Personnel:.....

Any other control measure applied:.....



Company Stamp

Place of issue:.....

Date:.....

Name:.....

Signature:.....

**FOR VERIFICATION BY PLANT QUARANTINE AND
PHYTOSANITARY SERVICE**

Inspector:.....

PHI No.:.....

Signature:.....

THIRD SCHEDULE (Regulations 6 and 14)

PRESCRIBED EQUIPMENT

Gas proof sheets made of polythene, polvinyl choloride, polypropylene, or laminates thereof, or of another type and quality as from time to time may be designated by the Minister, suitable for the purpose of fumigation.

Gas proof
sheets

Sheets must be in good condition and free from holes. Any repairs carried out must have been done to an acceptable standard using gas materials.

Full face type respirators with canisters suitable for the gases being used (type B or type CC for phosphine; type A for methyl bromide). Gas respirators should be in good condition and held in sufficient numbers so that all persons concerned with the fumigation will be protected.

Gas masks
or other
respiratory
protection

Self contained breathing apparatus in good condition, where desired, may be used as an alternative to gas masks, but in any event, should be available at the-ready fumigation in case of unforeseen hazards and emergencies.

Canisters both used unused shall be within their expiry dates. Unused canisters must have their seals intact until they are opened for use. When not in use canisters, of which the seal has been broken, shall be removed from the masks and shall be resealed with the originally supplied top and bottom seals. Canisters that are not used within six months of breaking the bottom seal, shall be discarded, even if there has been no exposure to fumigant.

Canisters

Enough of approved gas detecting apparatus to measure the quantity of gas present in the air and within the sealed enclosure. Minimum requirements:

Gas detection
equipment

Phosphine

Appropriate gas monitoring apparatus and capillary lines.

If detector tubes are being used, they should be in the following range:

- 0.1-4.0 ppm or equivalent
- 50.0-1000 ppm or equivalent

Methyl bromide

Gas detector (halide) lamp in good working order.

- gas detector tubes (5 ppm and below) for monitoring Threshold Limit Values (TLV)
- Gas monitor and tubing for monitoring gas concentrations in the fumigation enclosure.

Sand snakes	Made up of a suitable material to hold sand or soil, in sufficient numbers to completely surround any fumigation being carried out, with a 10 cm overlap of each sand snake, and with double layering at corners. If layflats tubing is used, it should be of not less than 12 cm diameter, in sufficient quantity to make the number of sand snakes required.	
Repair materials	—	Repair kits for gas proof sheets
	—	masking and sealing tape
	—	Mastic or Joining compound
	—	Paste and repair
	—	Cement and Sand
Safety Equipment	—	Warning notices of sufficient number and size (at least 50cm x 40cm)
	—	Overalls and gloves
	—	First aid kit.
Miscellaneous equipment	—	Measuring tape 50 metre
	—	Rope (10 metres)
	—	Tools (as necessary depending on type of fumigation)
	—	Broom, bucket, shovel
	—	Fumigation register/card index
	—	Sampling spear(s)
	—	Thermometer (probe type)
	—	Samples bags
Special equipment	—	Cylinder fittings: on-off valve, pressure gauge Schrader valve, filter couplings
For methyl bromide fumigation	—	Heavy duty foot pump
	—	Scale capillary gas sampling line
	—	Nylon capillary gas sampling line
	—	Methyl bromide vaporizer with manifold and hose

FOURTH SCHEDULE

(Regulation 6 and 15)

CODE OF PRACTICE:

Fumigation of Bagged Commodities under gas Proof Sheets
(Phosphine)

1. All fumigation shall be carried out by full trained personnel and supervised by a licensed Fumigator -in - charge. Personnel carrying out fumigations shall at all times wear protective clothing appropriate for the work they are carrying out. They shall also observe all safety measures that are necessary to protect themselves and others during a fumigation.

2. All areas where a fumigation will take place, shall be inspected before the fumigation to ensure that it can be carried out safely and effectively. A minimum distance of 100meters shall be observed from the fumigation area to the nearest public area or dwellings.

3. Where there is any doubt about safety, or the ability to make a complete seal between the floor and sheet, fumigation shall not take place.

4. Store managers and operational personnel shall be informed well in advance when the fumigation will take place.

5. In the case of small stores, when operations commence all personnel not concerned with the fumigation procedures shall be cleared from the store.

In larger stores they shall be confined to an area considered safe by the Fumigator -in-charge.

6. Stacks to be fumigated shall be built on dunnage. Size of the stacks shall be commensurate with available gas-proof sheets. It is advisable that stacks are of a size that can be covered with a single sheet.

Stacks to be fumigated shall have one metre of clear space from walls, at least one metre over the top, clear of roof-trusses, and two metres of clear space between stacks.

7. The floor on which the stack is to be fumigated shall be smooth, clean and free of spilled grain. If a suitable gas-proof floor is not available, stacks shall be constructed on gas-proof floor-sheet.

8. Unsafe stacks shall be rebuilt and made safe.

9. Only fumigation sheets of a type and quality approved by the Plant Quarantine and Phytosanitary Service, shall be used.

10. Approved sheets used during fumigation shall always be in good state of repair.

11. Stacks to be fumigated shall be completely covered by the sheets(s), with at least one metre of sheet on the floor all round the stack.

12. Where more than one sheet is used to cover a stack, they shall be joined by rolling or folding at least one metre of the respective sheets together along the whole length of the joint.

13. The joint(s) shall be held firmly in place with fumigation clamps along the entire length of the rolled joint(s). Sand snakes may be used for ensuring a good seal of rolled joints on top of the stacks only.

14. Sheets shall be sealed to the floor with sand snakes of a suitable weight and width to give at least 15cm ground contact. The ends of each sand snake shall overlap when laid in position. A double row of sand snakes shall be used on each corner of the stack. sheets shall be checked for any holes or other damage. Any holes or damaged parts shall be sealed or repaired, using pieces of discarded sheet material and glue suitable for the purpose.

15. Prior to the application of the gas, the Fumigator-in-charge shall double-check that everything is satisfactory and warning notices shall be placed in prominent positions.

16. Phosphine generating formulations such as pellets and tablets, shall be laid on disposable cardboard trays or other suitable containers to aid the complete removal of residues at the end of the fumigation exposure period. Phosphine generating formulations in the form of sachets can be conveniently used by hanging them from between bags on the vertical sides of the stack.

17. Aluminum phosphide tablets when placed on trays shall be separated from one another and not placed in piles. Piling the tablets is a dangerous practice, and shall be avoided. Magnesium phosphide preparations are not recommended for Zambia due to rapid gas evolution rated on exposure to high ambient air temperatures and as such posing high risk to the staff carrying out the fumigation.

18. Application of phosphine:

- (a) before sheeting up, all spillage around the stack shall be removed. Spillage shall either be destroyed or bagged and put on the side of the stack to be fumigated;

- (b) cover the stack with fumigation sheets, close the sheeting, seal the joints and corners, and put the sand snakes in position. Put out warning notices. In larger stores, erect a safety barrier;
- (c) estimate the weight or volume of the commodity and calculate the dosage to be applied at the appropriate rate;
- (d) determine where trays will have to be placed;
- (e) open the appropriate number of tins of aluminium phosphide preparation. Wearing rubber or plastic gloves, place the calculated dosage of aluminium phosphide onto the trays. Insert the trays and put the last sand snakes in position;
- (f) the entire contents of non-resealable tins or tubes should be used; Check and dispose of empty containers by crushing and burying at a depth of 50 cm or more in a safe location away from public areas and waterways;
- (g) clean gloves in detergent solution after the formulation has been inserted and final sealing has been completed.

19. Phosphine shall be applied at a rate not less than 1.5 grams of phosphine per cubic metre of space under fumigation for a period of not less than one hundred and twenty hours (5 days). This dosage equates to 2 grams of phosphine per tonne of bagged maize.

Storage factors for other bagged commodities will be different due to different bulk densities.

20. In small stores where a stack is under fumigation, all doors and windows shall be kept locked during the period of fumigation to prevent the entry of unauthorized persons.

21. In large stores where stacks are under fumigation and it is necessary to work, the working area shall be given the Maximum ventilation possible during the period that work is continuing. This is best achieved by ensuring that all adjacent doors and windows are kept opened to ensure a maximum air flow.

22. With fumigations using phosphine generating formulations a check for leaks shall be made within one hour of final sealing and again within a 4-12 hour period after the insertion of the formulation, using approved gas detection apparatus as an indicator of an excessive leakage or potential hazard. Any leaks found after insertion of the formulation and final sealing shall be sealed, using pieces of discarded sheet material and glue suitable for the purpose.

In large stores where stacks are under fumigation and it is necessary to work, additional regular checks shall be made. If at any time gas is detected in quantities greater than the daily Threshold Limit Value (TLV) for phosphine (0.3 ppm), such stores shall be evacuated immediately. At all times respirators shall be worn when checking for any leakages.

23. Monitoring of phosphine concentrations in stacks during treatments will greatly assist in determining the effectiveness of the fumigation treatment. In all fumigations, a concentration of no less than 0.2mg/l (ca. 150ppm) of phosphine shall remain in a fumigation stack 120 hours after fumigation application.

24. After the prescribed fumigation period under gas (120 hours for phosphine), removal of the gas/aeration should commence. Final reading of gas concentrations shall be taken at this stage, and recorded. In the event that final gas concentrations are below the minimum level, fumigation shall be considered a failure and shall have to be repeated.

25. In small stores, by-standers or any other non-concerned personnel shall be evacuate from the vicinity of the store prior to ventilation. In large stores, by-standers or any other non-concerned personnel shall be evacuated from the vicinity of the Stack under fumigation, prior to ventilation.

26. Ending of a phosphine fumigation:

- (a) put on a respirator fitted with the appropriate cannister, or a self-contained breathing apparatus;
- (b) open all doors and windows in the store;
- (c) check for the presence of gas using an appropriate gas testing device (detector tubes);
- (d) remove the sand snakes, raise the corners of the sheet(s) open the rolled joints on the vertical sides if more than one sheet has been used, and quickly leave the area;
- (e) leave for two hours;
- (f) still wearing a respirator, return to open the sheet(s) still further, and again leave for a similar period
- (g) check on the safety of the area with detector tubes;
- (h) if the area is considered safe (ppm reading of 0.3 or less), remove the sheets, take away, check for any damage, repair if necessary and fold the sheet(s) for the next fumigation;
- (i) after another period of at least two hours, but preferably overnight, remove the spent residues and dispose of them by burial at a depth of 50cm or more in a safe location away from public places and waterways;
- (j) leave for 24 hours for ventilation;
- (k) remove all warning notices; visually inspect the external surfaces of the stack for any live insects;

- (l) complete a written record of the fumigation in a register and attach a copy of the record to the stack;
- (m) a withholding period of two days after ventilation shall be observed before a fumigated commodity is used for human consumption or stock feed.

The above description presumes that the sheets are required for another fumigation. If they are required, and if the grain is thoroughly dry, the sheets may be left in position, as to act as a physical barrier to cross-infestation.

27. The fumigation shall be recorded in a register by the Fumigator-in-charge giving date, fumigation used, dosage, period under gas, type of commodity and any other treatments that may have been carried out.

28. For all commercial and quarantine fumigations a fumigation certificate in the prescribed form shall be issued to the owner of the commodity.

CODE OF PRACTICE:

FUMIGATION OF BAGGED COMMODITIES UNDER GAS PROOF SHEETS (Methyl bromide)

Methyl bromide shall be used for *quarantine purposes only*. All methyl bromide fumigations shall be supervised by an inspector.

1. All fumigations shall be carried out by fully trained personnel and supervised by a licenced Fumigation-in-charge.

Personnel carrying out fumigations shall at all times wear protective clothing appropriate for the work they are carrying out. They shall also observe all safety measures that are necessary to protect themselves and others during a fumigation.

2. All areas where a fumigation will take place, shall be inspected before the fumigation to ensure that it can be carried out safely and effectively. A minimum distance of 100 metres shall be observed from the fumigation area to the nearest public area or dwellings.

3. Where there is any doubt about safety, or the ability to make a complete seal between the floor and sheet, fumigation shall not take place.

4. Store managers and operational personnel shall be informed well in advance when the fumigation will take place.

5. In the case of small stores, when operations commence all personnel not concerned with the fumigation procedures, shall be cleared from the store. In large stores they shall be confined to an area considered safe by the Fumigator-in-charge.

6. Stacks to be fumigated shall be built on dunnage.
Stacks to be fumigated shall have one metre of clear space from walls, at least one metre over the top, clear of roof-trusses, and two metres of clear space between stacks.
7. The floor on which the stack is to be fumigated shall be smooth, clean and free of spilled grain.
If a suitable gas-proof floor is not available, stacks shall be constructed on a gas-proof floor-sheet.
8. Unsafe stacks shall be rebuilt and made safe.
9. Only fumigation sheets of a type and quality approved by the Plant Quarantine and Phytosanitary Service, shall be used.
10. Approved sheets used during fumigation shall always be in a good state of repair.
11. Stacks to be fumigated shall be completely covered by the sheet(s), with at least one metre of sheet on the floor all round the stack.
12. Where more than one sheet is used to cover a stack, they shall be joined by rolling or folding at least one metre of the respective sheets together along the whole length of the joint.
13. The joint(s) shall be held firmly in place with fumigation clamps along the entire length of the rolled joint(s). Sand snakes may be used for ensuring a good seal of rolled joints on top of the stacks only.
14. Sheets shall be sealed to the floor with sand snakes of a suitable weight and width to give at least 15 cm ground contact. The ends of each sand snake shall overlap when laid in position. A double row of sand snakes shall be used on each corner of the stack.
Sheets shall be checked for any holes or other damage. Any holes or damaged parts shall be sealed or repaired, using pieces of discarded sheet material and glue suitable for the purpose.
15. Prior to the application of the gas, the Fumigator-in-charge shall double-check that everything is satisfactory and warning notices shall be placed in prominent positions. In places near public areas a watchman shall be employed to keep people away from the fumigation area.
16. Application of methyl bromide:
 - (a) estimate the weight or volume of the commodity to be fumigated and calculate the dosage to be applied at the dosage rate appropriate for the commodity and the temperature;
 - (b) ensure that there is sufficient methyl bromide in the cylinder;

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16. Application of methyl bromide:

- (a) estimate the weight or volume of the commodity to be fumigated and calculate the dosage to be applied at the dosage rate appropriate for the commodity and the temperature;
- (b) ensure that there is sufficient methyl bromide in the cylinder;

- (c) prepare the stack for fumigation and make channels or pits in the top of the stacks for placing piping system outlets.
- (d) calculate the number of outlets required and choose a suitable piping layout;
- (e) place the piping, arrange the jets and connect up to the filter, cylinder fittings and cylinder;
- (f) cover the stack with fumigation sheets, close the sheeting, seal the joints and corners, and put the sand snakes in position;
- (g) make a final thorough check on the area around for possible hazards;
- (h) put out warning notices. In larger stores, erect a safety barrier. Inform management and other concerned and issue appropriate instructions.
- (i) light halide lamps and put on respirators, fitted with appropriate canisters. Rubber gloves should not be worn;
- (j) pressurize the cylinder to between 80 and 100 psi (550 to 690 kN/m²) with a foot pump or compressor;
- (k) record the weight of the cylinder;
- (l) open the cylinder valve and check for any leaks. Introduce a small quantity of methyl bromide, about 10 percent of the full dose, by opening the side valve for a short period;
- (m) check for, and seal off, any leaks around the stack;
- (n) re-open the side valve and introduce the methyl bromide until the scales indicate that the full dose has been given;
- (o) repeat the check for leaks;
- (p) uncouple the cylinder after blowing out the lines with the pump;
- (q) leave for not less than 24 or 48 hours;
- (r) methyl bromide concentrations in the fumigation enclosure shall be monitored at not less than 6 hour intervals during the fumigation period, using gas sampling lines which shall be fitted before application of the fumigant.

In the event of an emergency, for example if a delivery pipe becomes broken or disconnected and a leakage of fumigant is possible, one of the fumigators, wearing appropriate breathing apparatus, shall close the main cylinder valve and then withdraw from the risk area. All other fumigators should withdraw at once. After a period of ventilation a fumigator shall check the concentration of the fumigant in the risk area whilst continuing to wear respiratory protective equipment. When the concentration is below the Short-Term Exposure Limit (STEL) he may then carry out the necessary adjustments or repairs.

17. Methyl bromide shall be applied at 32 grams per cubic meter of space under fumigation for a fumigation (exposure) period of not less than 24 hours. Dosage shall be reduced to 20 grams per cubic meter if a 48 hour exposure period is possible.

18. In small stores where a stack is under fumigation, all doors, and windows shall be kept locked during the period of fumigation to prevent the entry of unauthorized persons.

19. In large stores where stacks are under fumigation and it is necessary to work, the working area shall be given the maximum ventilation possible during the period that work is continuing. This is best achieved by ensuring that all adjacent doors and windows are kept opened to ensure a maximum air flow.

20. With fumigations using methyl bromide, immediate and periodic checks for leaks shall be made, using approved gas detection apparatus as an indicator of any excessive leakage or potential hazard. Any leaks found after introduction of the fumigant, shall be sealed using pieces of discarded sheet material and glue suitable for the purpose.

In large stores where stacks are under fumigation and it is necessary to work, and if at any time gas is detected in quantities greater than the daily Threshold Limit Value (TLV) for methyl bromide (5ppm), the store shall be evacuated immediately.

21. After the prescribed fumigation period under gas (24 or 48 hours for methyl bromide), removal of the gas/aeration should commence. Final reading of gas concentrations should be taken at this stage, and recorded.

22. In small stores by-standers or any other non-concerned personnel shall be evacuated from the vicinity of the store prior to ventilation.

In large stores, by-standers or any other non-concerned personnel shall be evacuated from the vicinity of the stack under fumigation, prior to ventilation.

23. Termination of a methyl bromide fumigation:

- (a) put on a respirator fitted with the appropriate cannister, or a self-contained breathing apparatus;
- (b) Open all doors and windows;
- (c) remove the sand snakes, open up the stack at the corners and at the rolled joints on the vertical sides if more than one sheet has been used, and quickly leave the area;
- (d) leave for one hour
- (e) still wearing a respirator, return and open up the sheet (s) still further;

- (f) leave for a period of two hours;
- (g) still wearing a respirator, return to check on the safety of the area using a halide lamp or an appropriate gas detecting apparatus;
- (h) If the area is considered safe (when using a gas detecting apparatus, ppm reading shall be 5 or less), remove the sheet(s) from the stack, take away, check for any damage, repair if necessary and fold the sheet(s) for the next fumigation.
- (i) leave the stacks for several hours, but preferably overnight;
- (j) check with a halide lamp or detector tubes and leave for further ventilation, if necessary;
- (k) when the area is clear of gas, remove the piping and jets;
- (l) remove the warning notices;
- (m) visually inspect the external surfaces of the stack for any live insects;
- (n) check all equipment for damage and repair before storing or using again;
- (o) complete a written record of the fumigation in a register and attach a copy of the record to the stack.

24. The fumigation shall be recorded in a register by the Fumigator-in charge giving date, fumigant used, dosage, period under gas type of commodity and any other treatments that may have been carried out.

25. All quarantine fumigations shall be certified by an inspector. A fumigation certificate in the prescribed form shall be used to the owner of the commodity.

CODE OF PRACTICE FOR THE FUMIGATION OF COMMODITIES IN
SEALABLE ENCLOSURES
(phosphine)

It shall be observed that the use of phosphine for fumigation of cotton seed, linseeds and other oil seeds is not recommended due to excessive adsorption rates.

CODE OF PRACTICE FOR THE FUMIGATION OF COMMODITIES IN SEALED
WAREHOUSES
(phosphine)

It shall be observed that the use of phosphine for fumigation of cotton seed, linseeds and other oil seeds is not recommended due to excessive adsorption rates.

CODE OF PRACTICE: FUMIGATION OF COMMODITIES IN SEALED
STORAGE STRUCTURES
(*phosphine*)

It shall be observed that the use of phosphine for fumigation of cotton seed, linseeds and other oil seeds is not recommended due to excessive adsorption rates.

CODE OF PRACTICE: FUMIGATION OF COMMODITIES IN SEALED
RAILWAY WAGONS
(*phosphine*)

It shall be observed that the use of phosphine for fumigation of cotton seed, linseeds and other oil seeds is not recommended due to excessive adsorption rates.

CODE OF PRACTICE: FUMIGATION OF COMMODITIES IN SEALED
TRANSPORT CONTAINERS
(*phosphine*)

It shall be observed that the use of phosphine for fumigation of cotton seed, linseeds and other oil seeds is not recommended due to excessive adsorption rates.

CODE OF PRACTICE: FUMIGATION OF COMMODITIES IN SEALED
ENCLOSURES
(*Methyl Bromide*)

Methyl bromide shall be used for quarantine fumigation only.
All methyl bromide fumigations shall be supervised by an inspector.

LUSAKA
27th July, 2001

M. M. CHIINDA,
*Minister of Agriculture Food
and Fisheries*