SRI LANKA STANDARD 973 : PART 3 : 1994

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CODE OF PRACTICE FOR FUMIGATION OF AGRICULTURAL PRODUCE
PART 3 : METHYL BROMIDE

SRI LANKA STANDARDS INSTITUTION

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Sri Lanka.

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This standard does not purport to include all the necessary provisions of a contract.

SRI LANKA STANDARD

CODE OF PRACTICE FOR FUMIGATION OF AGRICULTURAL PRODUCE

PART 3 : METHYL BROMIDE

FOREWORD

This Standard was finalized by the Sectoral Committee on Cereals, Pulses and their products and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 1994-03-31.

Fumigants are toxic and chemically reactive material.Therefore considerable care is required in handling and application of fumigants to assure the safety of personnel exposed to them.Thus, Part 1 of this standad covers general safety requirements in handling and application of fumigants. Other parts will cover the selection, safety and application techniques of commonly used fumigants.

Methyl bromide is toxic to a wide range of common storage insects at all stages of development. Its ability to penetrate quickly and deeply into sorptive material at atmospheric pressure and to dissipate rapidly makes it an effective fumigant for soil, storage structures and commodities. The fact that many living plants are tolerant to this gas in insecticidal treatments too makes it an useful fumigant for quarantine purposes. But fumigation time and dosage should be kept to a minimum as phytoxicity has been reported in nursery stock and seed.

Methyl bromide is non flammable and non explosive under ordinary circumnstances and may be used without special precautions against fire. But it breaks down quickly into hydrobromic acid in the presence of a flame. The acid is highly corrosive to metals and destructive to plant and plant material. Further, the absence of specific antidotes for methyl bromide poisoning emphasizes the importance of adopting sound fumigation practices.

This standard should be used in conjuction with specific codes of instructions or regulations applicable to fumigation with methyl bromide.

In the preparation of this code, the valuable assistance derived from the following publications is greteful ly acknowledged :

IS 7247 : 1974 Indian Standrard Code of practice for fumigation of agricultural produce
Part 1 : Methyl bromide

MONRO, H.A.U, Manual of fumigation for insect control, 2nd ed., published by FAO, Rome, 1969.

1 SCOPE

This standard prescribes the practices to be adopted in fumigation using methyl bromide. It includes general information on methods of fumigation and precautions to be observed in handling and use of methyl bromide.

2 REFERENCES

SLS 910 Limits for pesticide residues in food.
SLS 973 Fumigation of agricultural produce
Part 1 : General Safety Requirements.

3 GENERAL PROPERTIES

Chemical formula	CH_3Br
Molecular weight	94.94
Boiling point	3.6 °C at 760 mm Hg pressure
Freezing point	-93 °C
Specific gravity	
of liquid	1.732 at 0°C
of gas	3.27 at 0°C
Vapour density	3.956 kg/m³
Volume per kilogram	577.36 ml
Mass per litre	1.732 kg
Latent heat of vaporization	61.52 cal/g
Amount required to saturate 1000 m³ at 25°C	3.88 kg
Limits of flammability in air	13.5 to 14.5 (non flammable)
Colour	Colourless
Odour	Odourless at low concentrations; strong musty/sickly sweet at high concentrations
Solubility	Readily soluble in mineral oils
Corrosive action	Caustic to skin
Penetration power	High
Detection	By halide lamp

4 AVAILABILITY

Methyl bromide may be 100 per cent methyl bromide of technical grade or methyl bromide containing 2.0 per cent chloropicrin as a warning agent and is supplied in the following two types of containers.

4.1 Steel cylinders

The cylinders have sihphons and at normal temperature the natural vapour pressure of the fumigant is sufficient to discharge from the cylinder. When large quantity is neeced it may become necessary to keep the cylinder in the sun while discharge is in progress.

4.2 Cans

Small capacity, non corroding cans weighing about 400 g to 500 g are available. As the gas is under considerable pressure and for safety reasons, cans should only be punctured with the special puncturing applicators. These are connected to a length of flexible tubing with a samll orifice. Make shift puncturing device should never be used.

5 MATERIAL TO BE FUMIGATED

Methyl bromide may be employed with advantage for container fumigation of cereals, pulses, fresh fruits and vegetables and similar other agricultural commodities. There is no danger in fumigating commodities rich in fat. Milled products and dry fruits rich in protein should not be fumigated with methyl bromide urtil it is made sure that there is no development of taint and the residue left behind is free of hazard. Seed material should not be fumigated with methyl bromide if the moisture content exceeds 13 per cent.

6 DOSAGE AND DURATION OF EXPOSURE

The minimum dosage is 16 g/m^3 or 0.5 kg can per 28.3m^3. The recommended dosage varies from 16 g/m^3 to 48 g/m^3 depending on whether the stacks are on cement or less gas-tight floors. Follow labels and manufacturer's brochures for treatment of specific commodities. If it is necessary to complete the fumigation operation within 24 hours, the dosage recommended for normal conditions should be increased by 50 per cent. When temperature is likely to be below 10°C, the exposure period should be not less than 48 hours.

7 PRECAUTIONS

7.1 General safety requirements as prescribed in SLS 973 : Part 1 should be followed.

7.2 Fumigation with methyl bromide should be undertaken only by responsible and technically competent persons having a knowledge of the nature of the gas and necessary precautions. No untrained persons should handle this fumigant. Two operators (or more when necessary) wearing gas masks should always work together. The threshold limit for a 8 hour daily exposure in 5 days week is 0.3 mg/kg. The threshold limit value time weighed average (TLV - TWA) is 5 mg/kg at 25 °C or approximately 20 mg/m^3.

7.3 The cylinders of the fumigant should be kept in a ventilated room and should be checked for leakages from time to time. Hissing noise may be associated with leakages. Since the gas has a very faint odour, its leakage is not easily detectable. No reliance should, therefore, be placed on smell for detection of the gas.

7.4 The fumigant should be stored and transported only in the supplier's cylinders. Before transporting it is recommended to check the valves with a halide lamp. The dosage for an operation should be applied directly from cylinders taking care that their valves are operated with a minimum force and that outlets are kept clean and undamaged.

7.5 The outlets of the cylinders should remain capped and valves should be protected. The valve head may be slightly oiled when the cylinders are stocked.

7.6 The fumigant should never be stored in cylinders containing any appreciable amount of metallic aluminium.

7.7 Contact with the liquid fumigant or its spillage on clothings and footwear should be avoided. The parts touched should be washed immediately with water and soap, if spilled.

7.8 The permissible limit of the residues varies according to commodity (Refer SLS 910) and for cereals and pulses it is 50 mg/kg as inorganic bromide.

8 FUMIGATION IN GODOWNS

8.1 The stacks to be fumigated should be covered with gas-proof covers. As good sealing is critical for fumigation, the cover should be made perfectly airtight by sand snakes. The covers should be checked for any possible leakage before undertaking the fumigation.

8.2 The operators should wear gas-masks and rubber gloves before starting the fumigation work. The respirator canisters should be discarded after only one exposure of the fumigant or after a service life of two hours cumulative exposure, whichever is earlier.

8.3 The gas should be introduced from the cylinder or the can directly through a rubber or plastic tube by connecting one end of the tube to the cylinder or the can and inserting the other end into the central inlet tube of the cover on the top. For large scale treatment a branched system of piping with a number of nozzles attached along each branch at intervals is required. The branches should be arranged in a symmetrical pattern about the point of connection of the main delivery pipe. The cylinder should be placed on a platform weighing scale or beam balance and the required dose should be introduced by opening the cylinder valve slowly.

8.4 Satisfactory arrangements should be made to ensure uniform distribution of the fumigant.

8.5 Fumigation should be so organized that time taken for opening of cylinders inside the godown should not exceed 10 minutes, with the cylinder furthest from exit being opened first. Alternatively, the cylinders could be placed outside the building and a compressor used to force the liquid bromide through the delivery system. Fumigation time and dosage should be kept to a minimum, as phytoxicity has been reported in nursery stock and seed.

8.6 Leakage of the gas, if any, from the cylinder or cover should be tested by means of the halide lamp. A green flame indicates the presence of bromide vapours. At increasing concentrations, the colour of the flame changes from green to greenish blue/blue.

8.7 On completion of fumigation, exit doors should be sealed from outside and warning signs should be posted.

8.8 In the case of warehouses and mills, at the end of the exposure period, if possible, a few windows should be opened from outside. After about an hour, two operators, wearing gas masks, should enter and open all the windows and doors of the storage structure for aeration. A halide lamp should be used to ascertain the completion of aeration.

In the case of stack fumigation, at the end of the exposure period, two operators wearing gas masks, should partially remove the covers to allow the fumigated material to air for 2 hours to 3 hours. At the time of complete removal of the cover, the halide lamp should be used for detecting the presence of vapours. The cover should be left on the top of the stack for 6 hours to 8 hours to allow the vapours to escape.

8.9 The gas-mask should be tested for air-tightness before use. It should be thoroughly cleaned after use.

8.10 It is of utmost importance to ensure that the canister used is of the right type and is not damaged or has not exposed out its life. Black canisters with orange strips are to be used for methyl bromide.

9 SYMPTOMS OF POISONING

9.1 The cutaneous route (skin, mucous membrane and eye) has a high potential in contributing to the overall exposure of workers, particularly if a significant area of the skin is exposed for a long time, though masks have been used to prevent inhalation exposure. Also direct contact of the skin may lead to severe burns.

9.2 Early symptoms of serious methyl bromide poisoning are malaise, headache, disturbance of vision, nausea and vomitting. As the exposure is usually through the respiratory tract, pulmonary oedema may commonly occur. It is important to note that the onset of symptoms may be delayed for periods upto 48 hours after exposure.

9.3 Most of the symptoms of chronic or low-grade methyl bromide poisoning are related to the central nervous system with the exception of frequent skin irritation. Disturbance in speech, gait and mentation are common. Sometimes complicated neurological abnormalities may also occur.

10 FIRST-AID TREATMENT

On experiencing the symptoms given in 9, the affected person should immediately abstain from further contact with methyl bromide and should report immediately to a physician.

10.1 At the first sign of any of the symptoms, the following first-aid treatment should be given :

a) Remove the patient to fresh air and keep him warm;
b) Remove contaminated clothing;
c) Do not administer alcohol;
d) Call physician or take the patient to a physician; and
e) Administer oxygen, if available.

10.2 In case somebody complains of illness due to exposure, it is advisable for the entire crew working under the same conditions to stop work immediately. The affected person should be treated as in 10.1. Further, he should not carry out fumigation work until he has received the approval of a physician.

10.3 Prolonged contact of liquid methyl bromide with the skin produces severe blisters. The parts of skin affected should be washed with soap and water immediately.

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The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLSI *which includes surveillance inspection of the factory, testing of both factory and market samples.*

Further particulars of the terms and conditions of the permit may be obtained from the Sri *Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.*

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SRI LANKA STANDARDS INSTITUTION

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The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

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