



Ministry of Health  
National Malaria Control Centre

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# Guidelines for Sound Management of IRS Insecticides

## Indoor Residual Spraying

04



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National Malaria Control Centre



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## 1.0 Introduction

### 1.1 Scope

Insecticides are an integral part of Indoor Residual Spraying (IRS) and those used for IRS, such as dichlorodiphenyltrichloroethane (DDT), are potent. If managed carelessly, they could contaminate the environment and cause perennial harm to plants, animals, and human beings. If, however, they are managed carefully, any potential harm can be averted. These guidelines outline the standard management of IRS insecticides that minimize environmental contamination and avert potential harm. They were developed to guide environmental health practitioners and others involved in procuring, transporting, storing, or using IRS insecticides.

### 1.2 Purpose

These guidelines are intended to ensure that IRS insecticides are managed in strict compliance with local regulations and international convention so that their potential adverse effects on the environment are averted.

### 1.3 Regulation

IRS insecticides are regulated locally by the Environmental Protection and Pollution Control Act of 1990. The act defines and mandates sound management of pesticides in its subsidiary, the Pesticides and Toxic Substances Regulations of 1994. Internationally, the insecticides are regulated by the Stockholm Convention on Persistent Organic Pollutants (POPs),

which Zambia ratified in 2006. The convention seeks to phase out the use of POPs (of which IRS insecticide DDT is one) and, currently, has limited their use solely to IRS in malarial countries.

## 2.0 Procurement

Current policy mandates that the Ministry of Health (MOH) procures all IRS insecticides and distributes them to districts as needed for all IRS programmes.

### 2.1 Distributors

Currently, all IRS insecticides are distributed as needed by local distributors licensed by the Environmental Council of Zambia (ECZ) and working in conjunction with the MOH through the National Malaria Control Centre (NMCC). They are required to submit detailed plans for IRS insecticide and waste management and ensure that all the IRS insecticides they distribute are used solely for IRS. If they transport IRS insecticides themselves, they must meet the transport requirements outlined in section 3.1. Otherwise, they must provide the names of transporters whom they use who meet those requirements. All IRS insecticides must be procured through them.

## 3.0 Transport

### 3.1 Pre-Departure

Most damage to IRS goods is inflicted during transportation by vehicle, so before IRS insecticides are transported anywhere, both the driver and his vehicle must be checked for requisites necessary to carefully carry such harmful goods.

Meeting the requirements outlined below should ensure that the driver and his vehicle have these requisites and can transport the insecticides with minimal risk and damage even in case of emergency.

#### 3.1.1 Driver

Any driver who transports IRS insecticides is required, by law, to have:

- (a) A driver's license which qualifies him to transport Dangerous Goods
- (b) A ECZ permit to transport Pesticides and Toxic Substances

In addition, a driver should also carry and know how to use:

- (c) A Transport Emergency Card (Tremcard)
- (d) Material Safety Data Sheets

These documents are useful in case of accident. They contain a list of emergency phone numbers, information on toxicology, and guides on administering first aid and containing chemical spills.

#### 3.1.2 Vehicle

Any vehicle that transports IRS insecticides should:

- (a) Have a fitness certificate
- (b) Be ideal for transporting IRS insecticides
- (c) Be clearly labelled with hazard warning signs
- (d) Not transport food or other consumer goods
- (e) Be loaded carefully

### 3.2 Post-Arrival

Recipients of shipments of IRS insecticides

## **“Most damage to IRS goods is inflicted during transportation by vehicle”**

should follow a standard procedure for reception. The procedure should ensure that all goods shipped are accounted for and moved safely to the storeroom. At minimum, the procedure should include:

- (a) Checking the transport vehicles for spills (if found, the spills should be documented and the vehicles decontaminated)
- (b) Recording the goods received along with their manufacture and expiration dates on a stock record sheet
- (c) Obtaining a “Goods Received Note” from the transporter
- (d) Comparing the goods received with what was sent
- (e) Carefully and promptly unloading and moving the goods to the storeroom
- (f) Storing the insecticide boxes as outlined in 4.10

## **4.0 Storage**

### **4.1 Licensing**

Due to the hazardous nature of IRS insecticides, all storage facilities need to be licensed by ECZ. To qualify, the storeroom, and the structure and compound that house it, should be designed and managed in accordance with the guidelines below. This should ensure that insecticide exposure to the environment is minimized and safety and security is maximized.

### **4.2 Location**

The structure should be located in an

area:

- (a) Neither highly populated nor heavily farmed
- (b) With a low water table and not subject to flooding
- (c) Easily accessible to vehicles including those that, like delivery and fire-fighting vehicles, are quite large (ideally, fire-fighting vehicles should have access to at least three sides of the structure)

## **“Maintenance of the storage structure, should be considered annually”**

### **4.3 Structure**

The structure should be able to withstand and contain damage caused by accidents such as fires, storms, floods, and spills. It should also be well ventilated to prevent insecticide vapours from building-up and temperatures from getting too high. To ensure all this, the integrity of the structure must be maintained, and maintenance should be considered annually.

#### **4.3.1 Roof**

The roof of the structure should be:

- (a) Well maintained to prevent leaks
- (b) Made of incombustible materials, preferably concrete
- (c) Adequately ventilated for smoke and fumes
- (d) Able to withstand severe storms

#### **4.3.2 Walls**

The walls of the structure should be:

- (a) Furnished with gutters that direct waste into a sump
- (b) Smooth and free from cracks and



ridges

- (c) Lined from the floor to a height of 14 cm with an impermeable material

#### 4.3.3 Floor

The floor of the structure should be:

- (a) Made of impermeable materials, preferably concrete
- (b) Smooth and free from cracks and ridges
- (c) Raised at the edges to keep spills in and rain out

#### 4.4 Layout

The storeroom should be dedicated solely to the storage of IRS materials. It should not, for example, double as the

storeroom manager's office. It should have:

- (a) Enough space to store all IRS materials including empty containers and expired stock
- (b) About 15% extra empty space to allow for movement of materials and expansion
- (c) Access directly to the outside (that is, not via intermediate rooms)
- (d) An insecticide dispensing area that is not too close to the entrance
- (e) An area dedicated to storing empty insecticide containers and sachets

- (f) An uncluttered floor with marked, 1 m wide aisles between storage and work areas that allow ease of movement and airflow

#### 4.5 Lighting

The storeroom should be well lit by both natural and artificial light so that insecticide labels are easily read. Artificial lighting should:

- (a) Provide an illumination intensity of at least 200 lx
- (b) Use mineral insulated or armoured electrical cables, which are both flame and dust proof

#### 4.6 Temperature

The storeroom temperature of should be maintained between 20 and 25 °C at all times. There should be a thermometer and temperature should be monitored at least twice daily: once in the morning, and once in the afternoon. The readings should be recorded on a chart kept within the storeroom.

**“Temperature should be monitored at least twice daily”**

#### 4.7 Security

To ensure security, the compound the structure is within should be:

- (a) Surrounded by an embankment and wall that is fitted, if possible, with wall-top electric fencing (at the entrance the embankment should be fortified with concrete ramps to slow wear and tear)
- (b) Protected by a security guard stationed in a guardhouse at the entrance

- (c) Posted with notices forbidding illegal trespassing
- (d) Protected by an alarm system
- (e) Equipped with a means of communication in case of emergency

The storeroom itself should display notices denying unauthorized entry.

#### 4.8 Fire Safety

The storeroom should be equipped with smoke detectors and at least two fire extinguishers, one of water and one of carbon dioxide. All personnel working in the compound should be trained on their use and regularly subjected to fire drills.

#### 4.9 Hazard Warnings



*“Hazard warning signs, including, at minimum, one displaying skull and crossbones, should be prominently displayed both inside and outside the storeroom”*

Hazard warning signs, including, at minimum, one displaying skull and crossbones, should be prominently displayed both inside and outside the storeroom and should follow the conventions laid out by the key in annex II. Such a key should also be displayed in storeroom. In addition, all warning text should be displayed in the local languages as well as in English.

#### 4.10 Stock

Insecticide stock should be stored in an area separate from personal protective equipment (PPE) and managed in the following manner:

- (a) The oldest stock should always be used first. To facilitate this, the stock should be arranged sequentially in such a way that both the oldest stock is easily removed and the newest stock is easily added
- (b) Stock should always be stacked on pallets, not directly on the floor
- (c) Each insecticide should have its own stock control card that is updated daily
- (d) Pyrethroids should be stored in an area separate from DDT
- (e) All shortage of and damage to insecticide stock must be reported to ECZ
- (f) All personnel entering the storeroom must put on protective clothing
- (g) The stock should be checked daily for leaks, spills, caking powder, sedimentation, gelling, and discoloration (note that shelf-life declines rapidly if stock containers are left partially open)
- (h) Damaged or expired stock should be transferred to the area designated for empty stock

- containers and sachets
- (i) All transfers of stock to another storage facility should be documented
- (j) All accidents and theft must be reported
- (k) Insecticides should not be committed to the field for more than a week at a time, and on their return, usage figures must be documented and reported weekly to the NMCC

#### 4.11 Water

The storeroom must have access to clean, adequately running water. It is needed to supply both the storeroom and operations in the field where availability of clean water may be inadequate. In case of water shortage, a backup supply should be kept in drums. If a water bowser is used to store and transport water during field operations, this water should be used solely for mixing chemicals.

**“In case of water shortage, a backup supply should be kept in drums”**

#### 4.12 Facilities

By law, the structure must have washing facilities, water closets, showers, and separate change rooms for men and women. Related materials such as bath soap, washing powder, and towels must also be supplied.

## 5.0 Spraying

### 5.1 Personal Protective Equipment (PPE)

Each spray operator should be provided

with PPE that they are required to wear while working. PPE consists of the following:

- (a) Gumboots
- (b) Clear goggles



- (c) A respirator
- (d) Cotton overalls
- (e) Elbow-high polyvinyl chloride (PVC) gloves
- (f) Stockings
- (g) A hard hat
- (h) A mutton cloth
- (i) Towels

In addition, each spray operator, along with supervisors and support staff, will be provided the following cleaning materials for washing themselves off and for maintaining the PPE. All washing should be done in the storeroom and the water used should be disposed of as outlined in section 6.3:

- (a) Washing powder
- (b) Bath soap
- (c) Petroleum jelly

PPE should be washed if it either comes in contact with insecticides or becomes otherwise soiled. When it is not in use, it should be stored in lockers in the storeroom.

## 5.2 Food

Spray operators should only eat before work, before putting on their PPE, and after work, after taking off their PPE. They should never eat during their work day.

**“Spray operators should never eat during their work day”**

# 6.0 Waste Management

## 6.1 Legislation

Because the type of waste IRS activities

generate is hazardous to environmental and public health, legislation has been passed to regulate its disposal. Adherence to the guidelines below should ensure adherence to the law and safe, environmentally friendly waste disposal.

## 6.2 Water Disposal

The storeroom should be equipped with an evaporation tank (dry pan) and all water used for IRS activities should be disposed of in it. Water should never be disposed of via the main drainage system or the environment. The drainage system should be designed accordingly:

- (a) PVC pipes should channel all water to the evaporation tank
- (b) The base of the evaporation tank should be lined with concrete and inclined to facilitate sedimentation
- (c) The top of the evaporation tank should be covered with wire gauze
- (d) The evaporation tank should be raised at least 1 m above the ground
- (e) The evaporation tank itself should be 2 m long, 1 m wide, and no

more than 30 cm deep. Such a shallow depth is critical for effective evaporation

- (f) There should be grating where water enters the evaporation tank
- (g) The evaporation tank should be secured under lock and key

**“Water should never be disposed of via the main drainage system or the environment”**

## 6.3 Spray Pumps

Spray pumps should be washed in the storeroom and the water used should be piped to the evaporation tank per usual. They should be kept separate from insecticides.

## 6.4 Empty Insecticide Sachets and Containers

Empty containers and sachets should be kept in their designated area in the storeroom. They should never be reused for any purpose. The NMCC itself will facilitate their eventual disposal.

## i. Essential Materials for a Storeroom

- (a) Wooden pallets
- (b) Entrance ramps to contain spills and water
- (c) Door locks to prevent unauthorized entry
- (d) Bars to bar windows and ventilators to prevent unauthorized entry
- (e) Sand
- (f) A long-handled brush with stiff bristles
- (g) A short-handled brush and pan
- (h) Water
- (i) Soap
- (j) A shovel
- (k) Detergent
- (l) Fire extinguishers
- (m) Fire proof blankets
- (n) Protective clothing
- (o) Self-adhesive warning labels
- (p) First aid kit
- (q) Eye wash set
- (r) Stretcher
- (s) Blanket
- (t) Stock record sheets
- (u) Stock cards for spray pumps and spares

## ii. Hazard Warning Signs

HAZARD LABEL		HAZARD CLASS	METHOD OF STORAGE
HAZARD LABEL		<p><b>Class 2: Flammable Gas</b> Gases which ignite on contact with an ignition source  (Red background)</p>	<p>Segregate  Explosion-proof equipment or open-air storage required</p>
HAZARD LABEL		<p><b>Class 3: Flammable Liquid</b> Liquids with a flashpoint no higher than 55 °C  (Red background)</p>	<p>Quantity stored should not exceed 250 tonnes unless fire-protected</p>
HAZARD LABEL		<p><b>Class 4.1: Flammable Solid</b> Solid substances that are easily ignited and readily combustible  (Vertically striped red and white background)</p>	<p>Quantity stored recommended not to exceed 250 tonnes</p>
HAZARD LABEL		<p><b>Class 4.2: Spontaneously Combustible</b> Solid substances that ignite spontaneously  (Red lower half, white upper half)</p>	<p>Segregate  Open-air storage recommended</p>
		<p><b>Class 4.3: Dangerous When Wet</b> Solid substances that emit a flammable gas when wet or react violently with water  (Blue background)</p>	<p>Segregate  No sprinkler  Protect from rain</p>



## HAZARD CLASS

## METHOD OF STORAGE

**Class 5: Oxidizing Agent**  
Substances that yield oxygen and enhance the combustion of other substances

Separate from flammables and combustibles

(Yellow background)



**Class 6.1: Poison**  
Toxic substances which are harmful to human health

Legally, may demand segregation if highly toxic (LD50 oral < 25 mg/kg)

(White background)



**Class 8: Corrosive**  
Corrosive substances are substances that can dissolve organic tissue or severely corrode certain metals

Separate from insecticides packed in metal

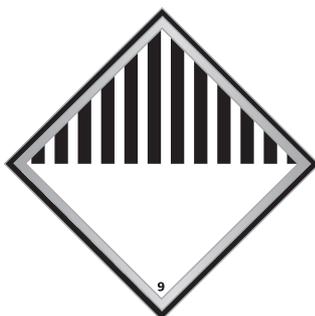
(Black lower half, white upper half)



**Class 4: Harmful Material**  
Substances to be kept away from foodstuffs

Stow away from foodstuffs

(White background)



**Class 9: Miscellaneous**  
Hazardous substances that do not fall into the other categories

No guidelines

(White lower half and vertically striped black and white upper half)

If non-combustible, use as a barrier for separating other materials



