PMI | Africa IRS (AIRS) Project

Indoor Residual Spraying (IRS 2) Task Order Four

PRESIDENT'S MALARIA INITIATIVE BMP MANUAL

BEST MANAGEMENT PRACTICES (BMP) FOR INDOOR RESIDUAL SPRAYING (IRS) IN VECTOR CONTROL INTERVENTIONS

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PRESIDENT'S MALARIA INITIATIVE BMP MANUAL

BEST MANAGEMENT PRACTICES (BMP) FOR INDOOR RESIDUAL SPRAYING (IRS) IN VECTOR CONTROL INTERVENTIONS

Spray Team ready for spray operation in Ghana.

PREFACE

Malaria prevention and control are major foreign assistance objectives of the U.S. Government. In May 2009, President Barack Obama announced the Global Health Initiative (GHI), a six-year, comprehensive effort to reduce the burden of disease and promote healthy communities and families around the world. Through GHI, the United States will help partner countries improve health outcomes, with a particular focus on improving the health of women, newborns, and children.

The President's Malaria Initiative (PMI) is a core component of the GHI, along with HIV/AIDS and tuberculosis. PMI was launched in June 2005 as a five-year, $1.2 billion initiative to rapidly scale up malaria prevention and treatment interventions and reduce malaria-related mortality by 50% in 15 high-burden countries in sub-Saharan Africa. With passage of the 2008 Lantos-Hyde Act, funding for PMI was extended and, as part of GHI, the goal of PMI was adjusted to reduce malaria-related mortality by 70% in the original 15 countries by the end of 2015. Programming of PMI activities follows the core principles of GHI.

Consistent with this strategy and the increase in annual appropriations supporting PMI, four new sub-Saharan African countries and one regional program in the Greater Mekong Subregion of Southeast Asia were added in 2011.The contributions of PMI, together with those of other partners, have led to dramatic improvements in the coverage of malaria control interventions in PMI-supported countries, and all 15 original countries have documented substantial declines in all-cause mortality rates among children less than five years of age.

IRS and ITN activities involve the use of pesticides and hence are subject to USAID's 22 CFR 216 regulations, particularly the implementation of the monitoring and mitigation requirements of the 2012 update to the Programmatic Environmental Assessment (PEA) of the Integrated Vector Management (IVM) Programs for Malaria Vector Control, and the development and application of standard procedures and best environmental management practices.

This manual is comprised of the Best Management Practices (BMPs) that cover the range of activities associated with pesticide use in IRS:

1. Environmental Assessment
2. Worker and Resident Health and Safety
3. Pesticide Storage, Stock Control and Inventory
4. Pesticide Transport
5. Spraying Techniques
6. Effluent Waste Disposal
7. Solid Waste Disposal
8. Spill Response
9. DDT Special Considerations
10. Water Crossings

To ensure that these best practices have been properly implemented, a series of BMP assessment checklists has been developed to be completed during field inspections. The checklists are divided into chronological activities and include the following:

- Pre-spray Environmental Compliance Assessment and Inspection
- Pre-Contract Transportation Vehicle Inspection
- Water Crossings
- Morning Mobilization and Transportation Vehicle Inspection
- Home Owner Preparation and Spray –Operator Performance
- End of Day Cleanup
- Storekeeper Performance
- Post-IRS Environmental Compliance Inspection

To fill out the forms, one selects the appropriate response, either yes or no, to each question and then has the option to include a comment to help explain the response, or enters a date for corrective action if the activity is not following BMP guidelines. These checklists will be used to generate field reports that will be delivered to PMI staff and will help guide forthcoming IRS activities in environmental compliance.

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ACRONYMS

ACT	Arteminsinin-based Combination Therapy
BEO	Bureau Environmental Officer
BMP	Best Management Practices
COP	Chief of Party
CDC	U.S. Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
COR	Contracting Officer's Representative
ECO	Environmental Compliance Officer
ECSM	Environmental Compliance and Safety Manager
FAO	U.N. Food and Agricultural Organization
EIA	Environmental Impact Assessment
IPT	Intermittent Preventive Treatment for Pregnant Women
ITN	Insecticide Treated Bed Net
IRS	Indoor Residual Spraying
IVM	Integrated Vector Management
MEO	Mission Environmental Officer
MOH	Ministry of Health
NMCP	National Malaria Control Program
OHS	Occupational Health and Safety
PEA	Programmatic Environmental Assessment
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
SEA	Supplemental Environmental Assessment
TOT	Training of Trainers
USAID	U.S. Agency for International Development
WHO	World Health Organization
WHOPES	World Health Organization Pesticide Evaluation Scheme

ACKNOWLEDGEMENTS

Abt Associates prepared this update to the BMP manual through a task order with the US Agency for International Development, Bureau for Global Health (USAID/GH/HIDN) (Task Order No. 04). Peter Chandonait coordinated the revision of this manual and contributed technically to its contents.

Abt Associates has implemented IRS in Africa since 2010.

International Resources Group (IRG) prepared the original BMP manual through an Environmental Policy and Institutional Strengthening (EPIQ) Indefinite Quantities task order (Environmental Monitoring and Capacity Building) with the US Agency for International Development, Bureau for Global Health (USAID/GH/HIDN) (Task Order No. 12). Susan Anderson and Jeanne Chabrier coordinated the development of that manual and contributed technically to its contents.

The guidance draws on decades of experience in pesticide management and vector control activities by the following key organizations: World Health Organization (particularly the World Health Organization Pesticide Evaluation Scheme), United Nations Food and Agricultural Organization, and Crop Life.

We appreciate the guidance of the USAID/GH Bureau, including Allison Belemvire, Christen Fornadel, Kristen George, Rachel Dagowitz, and Elissa Jensen. We would also like to thank the staff and contractors of the USAID Missions in the PMI countries - especially Regional and Mission Environmental Officers - for their continued efforts to ensure the safe and judicious use of insecticides in vector control.

BMP 1: Environmental Assessment

Purpose and Scope

This Best Management Practice (BMP) establishes a uniform approach for the environmental assessment of Indoor Residual Spraying activities intended to ensure compliance with USAID and host country environmental regulations. It also describes the content requirements of the Supplemental Environmental Assessment (SEA).

The Programmatic Environmental Assessment (PEA) for Integrated Vector Management Programs for Malaria Vector Control, updated in September 2012, details the pathways of risk associated with IRS through various media (e.g., inhalation, oral, etc.) and activities (e.g., mixing pesticides, spraying, etc.); evaluates human health risks associated with WHOPES-approved IRS pesticides; and contains an Annex C outlining the sections for Supplemental Environmental Assessments that includes a sample narrative for each section. The annex outlines a process by which individuals could then evaluate and document site specific impacts of IRS campaigns via an SEA.

This BMP establishes requirements for the following activities:

- Responsibilities for Environmental Assessments
- Contents of Supplemental Environmental Assessments (SEA) and Host-country Environmental Impact Assessments (EIA)
- Determining scope of the project
- Procedures for processing Supplemental Environmental Assessments

Supplemental Environmental Assessment

The general purpose of a Supplemental Environmental Assessment is to provide Agency and host country decision makers with full display of environmental effects to consider during the decision making process. Therefore, an SEA is initiated early, ideally six months prior to spraying.

The collection of baseline data, analysis of impacts and consideration of alternatives should be done in collaboration with the host nation to help build institutional capacity as well as gain a solid understanding of the local environmental conditions.

Annex C is the definitive guidance on SEA preparation, but the following is a concise description. The chapters of the SEA are:

- Table of Contents
- Acronyms
- Summary
- Background and Purpose
- Alternatives Including the Proposed Action, and the No Action alternative
- Affected Environment

- Environmental Consequences
- Pesticide Procedures
- Safer Use Action Plan
- Preparation Methodology
- Bibliography
- Appendices

Scoping Environmental Impact

Defining the Purpose and Need (22 CFR 216.6 (C) (2))

The assessor needs to define the existing conditions that are driving the need for vector control such as the malaria burden in country and vector densities. The assessor then describes the PMI team goals and objectives. This section becomes the basis for how decisions on alternatives will be made. Those alternatives which meet the goals will be considered.

Defining the Proposed Action and Alternatives (22 CFR 216.6 (C) (3))

The assessor uses interactions with the PMI team to understand the various alternatives that were considered when determining the preferred proposed action. These variations may be based on geography, pesticide choice etc. These various actions should be outlined in this section and their impacts also should be assessed along with the "no action alternative". The "no action" alternative is defined as if the project were not to be implemented.

Assessing Impact

Defining the Affected Environment (22 CFR 216.6 (C) (4))

Succinctly describe the potentially affected environments. A list of species of concern, such as local threatened and endangered species and local habitats of concern should be included, if available, as well as a map of local special habitats and reserved lands, as IRS will not be conducted in core protected lands (such as parks, preserves, national forests etc.). This section should include a brief description of regulatory classifications, soil types, prominent water bodies relevant to the project area, and special habitats, fisheries, agricultural zones in IRS areas. As with the rest of the SEA, the level of detail should be commensurate with the potential effects on the environment.

Assessing the Environmental Consequences (22 CFR 216.6 (C) (5))

This section describes the environmental and human health impact of the alternatives including the proposed action and any adverse effects that cannot be avoided, should the proposed action be implemented (22 CFR 216.6 (c)(5)). This section discusses the direct and indirect effects of the action, the cumulative effects, as well as any irreversible commitment of resources.

The Safer Use Action Plan (SUAP)

This section describes the mitigation measures and conditions required to avoid, minimize, and/or offset environmental impacts from IRS. Conditions must include avoidance of spraying within 30 m of a water body, wetland, or other sensitive receptor, use of personal protective equipment by workers, and clearing of houses of personal items prior to spraying. The SUAP details the conditions and protocols required for the PMI-sponsored IRS.

Processing the SEA

Preparations of SEA/EIA reports should occur 4-6 months before the beginning of spray operations, coordinating with both the country PMI Mission and the project COR team, and on-site evaluation of proposed operational sites. The drafting of the SEA is the last step in the environmental planning and impact assessment process. It is at this step in the process that the assessment in analyzed to determine the preferred action, alternatives, conditions and mitigation measures.

The SEA is reviewed by PMI COR, USAID environmental officers (MEO, REA, BEO), and the PMI in-country Mission. Once the reviewers' comments are incorporated into the document the SEA is briefed to the Mission Director for his/her signature and then re-submitted to the USAID Global Health and Africa Bureau Environmental Officers for signature.

FIGURE 1: SEA DEVELOPMENT AND APPROVAL PROCESS

Document	Timeframe at least:	To Whom:
1st Draft SEA	8 weeks prior to procurement	COR, MEO, PMI Advisor, BEOs for concurrent review
2nd Draft SEA	4 weeks prior to procurement	BEOs, Mission Director, Health Office Director
Final SEA	1 week prior to procurement	BEOs sign

Country Hosts EIA

Most of the countries receiving support under the President's Malaria Initiative have national laws that require environmental assessments for any public or private program with potential environmental and human health impacts. National regulations may require a separate Environmental Impact Assessment (EIA) that meets specific guidelines for scope and contents, or it may be possible to satisfy national requirements simply by requesting that national officials review and approve the SEA prepared for USAID. Governments frequently require that the applicant pay a fee for the EIA or SEA review.

Without fail, IRS activities, including procurement of pesticides and equipment, cannot be initiated until the SEA has been approved by USAID and the host country environmental protection agency where applicable.

As a proof of USAID and host government approval of the reports, evidence of approval by way of signatures must be provided by:

- EIA Approval Certificate from environmental authority
- Provision of certificate to Global Health BEO

RESOURCES AND REFERENCES

- USAID Integrated Vector Management Programs for Malaria Vector Control: (2012 Update) Programmatic Environmental Assessment USAID
- US Code of Federal Regulations (CFR) 22 CFR 216 USAID Environmental Procedures

BMP 2: Worker and Resident Health and Safety

Purpose and Scope

This Best Management Practice (BMP) is intended to provide acceptable safety standards and practices for the handling, storage, transportation and use of pesticides used in Indoor Residual Spraying (IRS) of the PMI program, to minimize the risk for human exposure. It is drawn largely from guidelines from the World Health Organization and (WHO) Food and Agricultural Organization (FAO).

This BMP was developed for all spray personnel, (supervisors, storekeepers, drivers, washers, and spray operators) during the handling, storage, transportation and spray operations, and the beneficiaries of the IRS program, and covers the following areas:

- Personal Protective Equipment (PPE)
- Workers' Safety During and After Spraying
- Safety of Women Spray Personnel
- Transportation of Spray Operators to and from the Field
- Residents' Safety
- Pesticide Exposure and Treatment

Definitions

- Exposure: The condition of being unprotected from the effects of pesticides
- Contamination: The presence of impuritiy(ies) in a solid, liquid, or gaseous substance

Personal Protective Equipment (PPE)

Adapted from: WHO Manual for IRS: Application of Residual Spraying for Vector Control, 5th edition.

In accordance with WHO health and safety regulations, all persons working on IRS must be adequately protected against potential harm due to exposure from pesticides. All persons with potential direct contact or exposure to pesticides during handling, transportation, storage, use and cleaning of pesticides or pesticide contaminated materials must wear appropriate personal protective clothing in accordance with the safety instructions on the product label or material safety data sheet (MSDS). The following guidelines should be followed:

- Overalls should be made of cotton and of a weight and thickness appropriate for the climate. Local preferences, such as two-piece overalls for women, may be followed, as long as they afford the same degree of protection.
- Have a distribution of sizes for coveralls, gloves and boots that are appropriate for the specified work force (women's sizes and men's sizes). There must be extra gloves, boots, face shields, and helmets to mitigate for breakage and loss.
- Spraying staff must have two uniforms minimum to allow for frequent changes.
- Paper filter masks must be replaced each day for spray operators.
- Gloves should be examined carefully before use for any signs of wear or tear, particularly in the areas between the fingers. If there is any doubt about their protectiveness, they should be replaced. At the end of each day's use, gloves must be washed inside as well as outside before they are used again.
- Overalls must be changed daily for spray operators using carbamates, pyrethroids, or organophosphates; every two days for spray operators using DDT (to minimize effluent waste).
- Overalls must be changed immediately when a direct spill occurs onto the overalls.
- Overalls should be worn over boots, not tucked into them.

FIGURE 2: PERSONAL PROTECTIVE EQUIPMENT FOR SPRAY OPERATORS

- Washers should wear their long gloves over sleeves, with the last inch of sleeve turned down to catch drippings when operators' arms are raised (as in spraying).
- Neck protection must be worn to prevent pesticide from falling on sensitive skin while spraying overhead areas.
- All supervisors and senior staff shall ensure that all workers wear protective clothing.

FIGURE 3: MINIMUM PPE REQUIRED FOR WORKERS

Role	Minimal PPE Required
Store Manager & All Workers handling equipment and pesticides	• Boots and overalls at all times • Gloves and filter mask when handling • Goggles when cleaning up dry or wet pesticide spills
Washers	• Overalls, pesticide apron, boots • Filter mask • Nitrile rubber, neoprene, PVC or butyl rubber gloves long enough to cover forearm and very flexible to use in washings, without inside lining (lining can retain pesticide and increase dermal exposure for staff routinely exposed to pesticide-contaminated water); for more comfortable protection, disposable polyethylene gloves can be used
Site Managers/ Supervisors	• Overalls, boots, gloves, and filter mask (when entering houses to supervise spray operations) helmet and face shield
Spray Operators	• Filter masks (as identified in the MSDS for the pesticide being used), overalls, face shield, nitrile rubber, neoprene, PVC or butyl rubber gloves, broad-rimmed helmet (protects head, face and neck from spray droplets) • Face shield or goggles (face shield preferable -protects face and eyes against spray fall-out) • 2 or 3 cotton long-sleeved overalls per spray operator (keep overalls outside of boots) • Rubber boots or heavy canvas boots that are unlined and can be easily rinsed • Helmet • Neck protection
Drivers	• Boots, gloves, filter mask (when washing vehicle after a spill)

WASHING PPE

The following are the steps to be taken when cleaning spray pumps and PPE at the end of the day:

- Contaminated protective clothing should be thoroughly washed using industrial grade detergent followed by several rinsings.
- Wash overalls daily for spray operators using carbamates, pyrethroids, or organophosphates; every two days for spray operators using DDT (to minimize effluent waste).
- Protective clothing should only be washed in designated wash areas (see BMP #6, Effluent Waste Disposal). Gloves and goggles should be worn when washing protective clothing.
- Washed clothes should be hung to dry in the soak pit or storage tank wash area. It is not necessary for the drippings to go into the soak pit, as the clothes will have been fully washed. As it is sometimes necessary for several people to use the wash areas at once, it is important to have the flexibility to dry the overalls elsewhere.
- Where there is a large patch of fabric that has been contaminated by toxic concentrates and replacement clothing is available, it is best to dispose of the clothing as contaminated waste.

FIGURE 4: WASHING OVERALLS

Workers' Safety During and After Spraying

During spray operations, scrupulous attention to personal hygiene is essential for the safe use of pesticides. For spray staff, safety precautions will depend largely on personal hygiene, including washing and changing clothes. The following guidelines should be followed:

TIP :

During spray operations, scrupulous attention to personal hygiene is essential for the safe use of pesticides. For spray staff, safety precautions will depend largely on personal hygiene, including washing and changing clothes.

- Smoking is forbidden while on duty.
- Eating and drinking during a day of applying pesticides must be strictly regulated. IRS operations can be physically demanding under harsh environments and may tempt spray operators to eat or drink without taking the proper precautions. It is strongly advised to feed spray operators a large meal in the morning before they conduct spray operations.
- Spray operators should be encouraged to hydrate frequently, and ideally, drinking water will be provided via cup and straw by homeowners. Unless the homeowner assists the spray operator such that he/she does not have to use his/her hands, spray operators should take off gloves and wash hands with soap and water before drinking any liquids.
- Spray operators must wash off immediately with soap and water if the skin or clothing is contaminated with pesticide; if pesticide gets into the eyes they should immediately flush with plenty of water. In case of ingestion, see the PESTICIDE EXPOSURE AND TREATMENT section of this BMP).
- In general, spray operators work only 5-6 hours a day.
- Apply pesticide in the early, cooler hours of the day when it is more comfortable to wear protective equipment.
- Additional water breaks may be required if day extends beyond six hours. Washing of hand and face are required prior to drinking, unless assisted by homeowners as described above. Wash face and hands after spraying or handling pesticides and equipment.
- After spray operations, spray personnel should wash their faces and hands at a minimum. If showers are available/appropriate, then spray personnel should shower, although this is often not feasible.

Safety of Women Spray Personnel

It is inadvisable for pregnant women and nursing mothers to handle or be in the proximity of pesticides. Therefore, pregnant women and nursing mothers are prohibited from handling pesticides in the course of PMI IRS work. When recruiting spray operators, pregnancy tests must be conducted during a normal medical exam to ensure that pregnant women are not hired into positions involving any pesticide contact. For spray campaigns lasting longer than 30 days, the pregnancy tests should be repeated once every month during the campaign. In the event that a pregnancy is discovered on a follow-up test, the person will be reassigned for the remainder of the campaign to work that does not involve any contact with insecticide.

As the literature regarding early exposure to DDT and its impact on fetal development is under review, it is advised, as an extra precaution, that countries using DDT exclude women as spray operators and instead use women in other capacities, such as mobilizers.

For fair and equal treatment of women and to ensure their safety on spray teams, Training of Trainer (TOT) and cascade trainings should include a gender component covering such issues as:

1. General guidelines for respecting your co-worker in a gender-sensitive context.
2. What constitutes sexual harassment?
3. Construction of appropriate facilities for sanitary and privacy needs of women and men,
4. Observation of protocols regarding shared and gender-specific sanitary facilities.
5. Respect for privacy at operations sites when cleaning up, and,
6. What investigative/corrective/punitive measures will be taken if sexual harassment is discovered or reported?
7. The formation of all-women teams, if appropriate.

Above all, women and men must feel free to propose and/or advocate for policies and provisions that are critical for their safety and reasonable comfort, without fear of retribution, marginalization or other undue adversarial reactions.

TIP :

To further encourage women to participate in spray teams it may be advisable, due to weight considerations to use Goizper pumps for women, because they are lighter and easier to carry for long hours. Taking the necessary actions to ensure the availability of the correct sizes of PPE for women is also required.

Transportation of Spray Operators To and From the Field

The quality of the vehicle is an important requirement in assuring the safety of the spray operators while en route to spray sites. The Environmental Compliance Officer must inspect proposed vehicles prior to the signing of a leasing contract to be sure that they meet all BMP requirements. To avoid vehicle substitution during the spray season, the ECO will issue a certificate for each approved vehicle with the vehicle model and plate number. During the spray season, when implementing partner staff are supervising in the field, they may request to see this certificate to be sure that only approved vehicles are being used for operator transport. Spray personnel are typically transported via pickup truck or mini bus. Sufficient seating must be provided, and spray pumps should be placed between operators' legs to minimize the risk of spillage. Ideally in the case of pickup truck transport where spray operators sit in the back compartment of the vehicle, it is recommended to retrofit this compartment with side hand bars on the periphery, and to install benches lining the middle and the sides of the back (see photo below). While vehicle accident insurance is costly, if possible, it would be recommended to obtain this. In addition, it is also required to consult and abide by the health and safety worker regulations of the host country. For example, in some countries it is required to offer the spray operators health insurance.

FIGURE 5: VEHICLE OUTFITTED FOR SAFE SPRAY OPERATOR TRANSPORT

Special Cases

In some countries, road access is very limited and/or poor. In many cases, these roads can only be accessed by foot or by smaller motorized vehicle such as a moped or even in certain cases, donkeys and bicycles. It is advised that this form of transport be used with caution and special care to avoid pesticide spills. This type of transportation should be authorized by the host country.

RESIDENTS' SAFETY

Informational campaigns and mobilization are critical to ensure the safety of residents. The following safety actions must be completed *before spraying* can commence:

- Clear homes of mats or rugs, furniture, cooking implements and all foodstuffs prior to spraying.
- Move all furniture that cannot be moved from the home to the center of the room and cover it with a tarpaulin or polythene sheet.
- If persons are unable to be removed from the house, prohibit spraying.
- Move any beehives at least 30 meters from any house to be sprayed.
- Move all animals outside the home and tether or cage away from the house during spraying, and for two hours after spraying.
- Advise residents to keep children away from the house during spraying.
- Advise residents not to prepare food in close proximity to the house during spraying.
- Advise occupants to stay outside the home during spraying and for at least two hours after spraying.

FIGURE 6: IMPROPER PREPARATION OF HOUSEHOLD BEFORE SPRAYING (ALL HOUSEHOLD ITEMS SHOULD BE REMOVED OR COVERED)

- Residents must sweep floors free of residual pesticide and insects killed from the spraying and drop them in latrine pits, or in lieu of a latrine pit, dig a hole and bury the swept material. Pregnant women and children must not perform this task, nor should children or animals be allowed inside until this has been completed.
- Advise residents not to plaster or paint walls after walls have been sprayed.
- If skin itches after re-entrance into the home, wash with soap and water; for eye irritation, flush eyes with water; for respiratory irritation, leave the home for fresh air; if ingested, go immediately to nearest health facility, who should contact program.

When spillage has occurred, restrict access and cover the spill with earth, sand, etc.; no attempt should be made to wash away the spill with water or other liquids. (See the Spill Response BMP #8).

FIGURE 7: IMMOVABLE HOUSEHOLD FURNITURE COVERED WITH A PROTECTIVE TARPAULIN BEFORE SPRAYING TAKES PLACE

FIGURE 8: UPON COMPLETION OF SPRAYING RESIDUAL MOSQUITOES AND OTHER INSECTS SHOULD BE SWEPT AND DISPOSED OF IN A LATRINE PIT

PESTICIDE EXPOSURE AND TREATMENT

All public health facilities near the spray sites should be stocked with the following recommended medications for use in case of accidental poisoning or dermal or eye exposure. If the recommended medications are not at the designated health facilities, the implementing partner or NMCP should provide them prior to the spray campaign.

The health officers, spray operators, supervisors, and drivers will also receive training on treatment for emergency cases of critical exposure and poisoning before the spraying occurs. In case of extreme exposure (such as direct spills on spray operators), remove contaminated clothing and wash the affected skin with clean water and soap, and flush the affected area with large quantities of clean water. Keep the patient calm and in quiet, shaded conditions and transfer to nearest health clinic.

BASIC LIST OF MEDICINES BY CLASS OF PESTICIDE - TO BE ADMINISTERED BY A MEDICAL PROFESSIONAL AT THE HOSPITAL:

Pesticide Class	Treatment Medicine(s)
Organochlorine (ddt):	Activated Charcoal (priority) Diazepam or Lorazepam (for seizure) Phenobarbital Cholestryamine resin
Organophosphates	Atropine sulfate or Glycopyrolate (priority treatment) Furosemide (less critical) Diazepam or Lorazepam (for seizure)
Carbamates	Cholestryamine Atropine (priority) Furosemide (less critical) Diazepam (for seizure)
Pyrethroids:	

Name of Drugs	Active Ingredient(s)
Promethazine	Promethazine Hydrocloride
Panadol	Paracetamol
Lorazepam	Lorazepam
Calamine cream	Calamine, zinc oxide, glycerol, phenol, purified water, sodium citrate, betonite
Vit E	Tocopherol, fragrance, mineral oil, deionized water, sodium hydroxide, stearic acid
Hydrocortisone cream	1% hydrocortisone
Salbutamol	Salbutamol 100 mcg, suspended inert aerosol
Salbutamol tablets	Salbutamol sulphate 4 mg
Activated Charcoal	Activated Charcoal

First Aid Kits

The following are minimum requirements of a first aid kit:

- Band-Aids
- Gauze
- Antibiotic Cream
- Eye wash
- Hydrocortisone Cream/Calamine
- Aspirin

Keep first aid kits at all storage facilities *not co-located with a health center*, and in transport vehicles.

HEALTH WORKER TRAINING

Health workers should be trained in recognizing and treating pesticide exposure symptoms. In some countries this is done during the course of medical training, in other countries, additional training will be needed. Health institutions within the country can provide this training, or USAID can support such training. All training should be consistent with the exposure treatment guidelines that are available through the Ministry of Health. If such guidelines are not available or need supplementary material, exposure treatment guidelines are included in Annex I of USAID's Integrated Vector Management Programs for Malaria Vector Control: Programmatic Environmental Assessment (PEA)(2012 update).

RESOURCES AND REFERENCES

- USAID Indoor Residual Spraying (IRS) for Malaria Control Indefinite Quantity Contract (IQC) Task Order 1: IRS Training Guide for Spray Operations.
- WHO Application of Residual Sprays for Vector Control, WHO Communicable Disease Control, Prevention and Eradication WHO Pesticide Evaluation Scheme, 2002
- USAID Integrated Vector Management Programs for Malaria Vector Control: Programmatic Environmental Assessment. USAID: September 2012
- FAO Guidelines for Personal Protection When Working with Pesticides in Tropical Climates: March 1990
- WHO *Manual for Indoor Residual Spraying: Application of Residual Sprays for Vector Control, 2003*

BMP 3: Pesticide Storage, Stock Control and Inventory

Purpose and Scope

This Best Management Practice (BMP) manual provides guidance on the management of pesticide stocks from the point that they have been received in country through the various storage options and eventually to the spray operators and their subsequent return as empty sachets. Close scrutiny is paid to storage and commodity chain-of-custody in order to avoid the inadvertent loss or leakage of pesticide stocks. It is critical to ensure that these pesticides will be used safely, thereby avoiding adverse impacts on human health or environmental contamination. In addition, careful management of storage facilities, stock control and inventory will minimize the risk of leakage into other sectors (e.g., agricultural sector) or the market. Extra care must be taken since the pesticides are in their concentrated form.

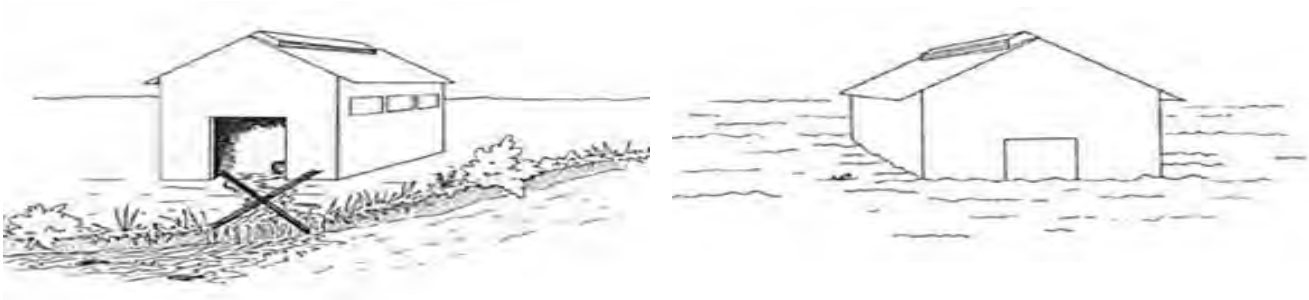
This BMP, although drawn heavily from the FAO Storage and Stock Control Manual, is meant to serve on its own as the primary BMP resource for PMI IRS. It is intended to provide acceptable safety standards and practices for the following:

- Storage Facilities
- Stock Management

Storage Facilities

Suggested conditions for storage facilities differ by duration and quantity of stored pesticides. It is common for a given country to have multiple levels of storage facilities, including: annual, large-volume national/central facilities where pesticide are first delivered and then re-stored at end-of-campaign; regional facilities where pesticide are stored for up to four months; and district or operational base facilities where pesticides are received and distributed on a weekly or daily basis.

FIGURE 9: PROPER SITING OF STORAGE FACILITY IS CRITICAL



SITING

Consult with local authorities to determine factors such as flood zones, wells, soil types, etc. Using this knowledge, locate storage facilities:

- Away from schools, animal feed depots, water courses and residential homes (generally 100 meters away)
- Minimum of 30 meters away from health clinics, and generally away from pedestrian routes to the clinic Note: Due to access limitations and distances of some spray sites, small-scale storage facilities are often necessary. It is not always feasible to locate facilities away from hospital/clinic/markets. It is therefore important to be extra vigilant that access to unauthorized personnel is denied.
- Out of potential flood zones, wells and other supplies of water for domestic or stock animal use
- Away from areas where ground water is close to the surface
- Easily accessible by transport and easy exit in case of an emergency

DESIGN AND STRUCTURE OF BUILDING

- Ventilated so that pesticide vapors do not collect, and so that temperatures don't reach dangerously high daytime temperatures (windows usually provide proper ventilation)
- Floors should be impermeable (e.g. concrete surface) to minimize absorption in case of spills and facilitate clean up
- Large enough to allow for proper accommodation of pesticides as well as storing empty containers and pesticide waste

PESTICIDE SHELVING

- Pesticides should always be shelved on wooden pallets and not directly on the floor to prevent them from getting wet.
- Pesticide stacking should not be unreasonably high, which poses two risks: 1) risks of tipping, and 2) risk of perforation of boxes. A general rule is to not stack beyond two meters, although pesticides may be stored on sturdy shelves that are higher than two meters.
- Do not store liquid materials above dry materials. This prevents any liquid leaks from comingling with dry product.

The following guidelines apply to any pesticide storage facilities, regardless of size

1. Storage facilities are expected to have double locks, and be guarded at all times.
2. Roofs should be well maintained (e.g. no leakage).

3. Post storage signage and warning notices. A notice should be prominently displayed on the outside of the store in the local language(s) with a skull and crossbones sign saying "Danger, Keep Out, Pesticide Storage" to convey that entry is prohibited to unauthorized persons. In addition, and "No Smoking" sign must be posted.

FIGURE 10: HAZARD WARNING SIGNS IN LOCAL LANGUAGE AND GRAPHICAL REPRESENTATION

4. Pesticides and contaminated wastes must be stored in a separate room from other commodities and from the storekeeper's office.
5. Pesticides and contaminated wastes must be correctly recorded on separate stock cards and in a ledger book. The stock balances on the stock cards and in the ledger book should be up-to-date at all times.
6. The pesticide stock rotation rule of First Expiry First Out (FEFO) should be adhered to.
7. Pesticide should be stored away from direct sunlight.
8. The store should be kept free of rodents, pets and pests.

9. Pesticide Stacking

    a. Containers should be arranged (aisle spacing) to minimize handling and thus avoid mechanical damage giving rise to leaks.

    b. Floor spaces should be uncluttered to permit easy inspection and allow free airflow. This also enables immediate clean up in the event of any leakage or spills.

FIGURE 11: LEFT: WET FLOOR IN PESTICIDE STORAGE, AND BOXES SUBJECT TO DAMAGE. RIGHT: BOXES STACKED ON PALLETS FOR SAFETY

FIGURE 12: ITEMS STACKED TOO CLOSE TOGETHER, DIFFICULT TO ACCESS.

FIGURE 13: ESSENTIAL EQUIPMENT WITHIN A PESTICIDE STORE

- Thick polyethylene sheeting on floor (if surface is not concrete or otherwise impermeable)
- Wooden pallets
- Ramps at entrance, or berms within the storage area to contain leakage
- Entrance door with double locks to prevent unauthorized entry
- Secured windows and ventilators to prevent unauthorized entry and rodents

Spill response kit:
- Container of absorbent sand, sawdust or dry soil
- Shovel
- Long-handled brush with stiff bristles
- Short-handled brush and pan
- Water supply, or container of water, with soap
- Detergent solution

- Fire-fighting equipment: fire extinguisher and fireproof blanket. It is best, but not always feasible, to have one fire extinguisher inside the store and one outside. If there is only one fire extinguisher, it should be stored outside during the day and locked up at night.
- Extra PPE (see Worker and Resident Health and Safety BMP #2)
- Labeled contaminated waste containers (preferably 200-liter drum)
- Self-adhesive warning labels for marking containers
- First aid kit
- Stock records, including ledger books and stock cards.

STOCK MANAGEMENT

Storage facilities should have a proper system of stock planning and should maintain a daily accounting of stocks received, held and issued. No more pesticide should be ordered than is required or than can be stored in an appropriate way.

The most effective safeguard is a direct and clear understanding on the part of all staff involved, including the spray operators, of their responsibilities for accounting for the pesticides entrusted to their care and the consequences for not doing so. In addition, the following best practices facilitate the control and accountability for pesticide stocks, including:

- Careful planning of pesticides requirements is essential to avoid the accumulation and/or expiration of stocks.
- Stock control begins with ensuring that the correct pesticide has been procured and delivered and therefore all products should be appropriately and correctly labeled.
- Material Safety Data Sheets (MSDS) should be reproduced and accompany all pesticide shipments leaving the central storage facilities. Pesticide inventory should be verified at each point of delivery. At all storage facilities, the manager/storekeeper should be present when pesticide deliveries are being made and log receipt of boxes. Boxes are then randomly sampled for both quality and quantity controls. If, during the visual inspection, they are damaged, the supplier should be notified and the pesticide should be repackaged and returned to central stores.
- Incoming and outgoing stock should be carefully recorded on inventory stock cards.
  The following are examples of stock card transactions:

Received 25,000 sachets on dd/mm/yyyy in central store

X sachets (from box #-box #) to district A on dd/mm/yyyy

X sachets (from box #-box #) to district B dd/mm/yyyy

- Boxes should be numbered to track the distribution. In the event of inventory loss, misplacement, or quality concerns, the boxes can be tracked back.
- Pesticide stocks should be distributed on a "first-expired/first-out" (FEFO) basis to avoid the risk of stocks becoming obsolete (past their useable life dates).
- Stock delivery records require dual signatures, of those dispatching or delivering the pesticide stocks and of those receiving them, so that there is no confusion about the amounts utilized within the program.
- At the secondary level, a storekeeper must record and sign quantity of pesticide received and distributed. In order to minimize theft, a double lock system should be utilized such that both the storekeeper and guard are needed to open the warehouse, and each will keep one key only.
- For daily transactions, the team leader requests and signs for sachets/bottles from the store keeper. Normally, enough sachets/bottles are distributed to each spray operator to cover the daily target of houses. The team leader therefore requests enough sachets/bottles of pesticide each day for his/her team of 4 to 6 spray operators. The store manager should track the name of the team leader and number of sachets with a pen. The team leader does the same, writes down the number of sachets given to each spray operators. Marking each of the sachets makes it easy to identify which team and eventually what spray operator had custody of any given sachet. Both the spray operators and the

team leaders have their separate sachet inventory cards.

- It is highly recommended that a dedicated logistician periodically visit and verify the inventory stock and storage at the storage facilities. He/She may also spot check the spray operators' record sheets to ensure that their daily stock forms are in order and being properly used, thus reiterating the principles of supervision and accountability.
- Routine stock verification (physical counting of existing stock in the store) is required at each operational site at least once every week. This is done by the storekeeper.

FIGURE 14: EXAMPLE OF STANDARDIZED STOCK CARD USED BY THE PMI PROGRAM

Store/Operating Site _____

Item Description _____

Unit _____

Maximum Level _____

Maximum Level _____

Date	Ref. No.	Issued to or Received From	Quantity Received (+)	Quantity Issued (–)	Losses and Adjustments	Balance	Name/ Signature	Remarks

At the end of the spray season, all temporary stores are decommissioned by shipping all pesticide and commodities back to central stores, and cleaning the facility with soap and water. A Post-IRS EC Inspection must be performed by the implementing partner's Environmental Compliance Officer to ensure that all close-out measures have been taken. A final inventory must be submitted to the central storekeeper so that leftover pesticide is figured into needs calculations for the following year.

Resources and References

- Crop Life International Guidelines for the safe and effective use of crop protection products.
- Crop Life International, Brussels, May 2006, pp.- 62
- USAID Environmental Guidelines for Small-Scale Activities in Africa: Chapter 13- Pest Management II: Safer Pesticide Use. USAID/Africa Bureau, Washington, March 2009, pp.- 13-1 to 13-61.
- FAO Pesticide and Stock Control Manual: www.fao.org/docrep/V8966E/V8966e00.HTM
- US EPA www.epa.gov/pesticides/regulating/storage.htm

BMP 4: PESTICIDE TRANSPORT

PURPOSE AND SCOPE

This Best Management Practice (BMP) is intended to cover transport activities involving large quantities of pesticides (associated with spray activities) carried in motorized vehicles, typically trucks or pickup trucks. Frequently, because of the nature of the program, these pesticides are being transported to remote rural areas, over poor roads, and where supervision and assistance becomes more difficult in the event of an accident. These characteristics add to the hazards and the potential for adverse impacts and therefore underscore the need for extra care with the transport of the pesticides associated with IRS programs.

The BMP is targeted at the prevention of accidents and also deals with the necessary responses should an accident occur and covers the following areas:

- Pesticide Loading and Containment
- Pesticide Transportation Route Planning*
- Selection of Vehicles to be Used for Transporting Pesticides
- Pesticide Driving Training
- Responding to an Accident
- Vehicle Decontamination

***Transport of pesticides over water is covered separately in BMP #10.**

TRANSPORT

In this case, transport refers to motorized vehicles such as 10 ton trucks and pickup trucks. This BMP refers to the transport of pesticides or pesticides shipped in bulk within the host country, from the port of entry, to the central storage facility, to the secondary district and operational site facilities. It does not address the transport of program personnel or spray operators (please see Worker and Resident Health and Safety BMP).

All drivers transporting pesticide must be trained by the AIRS environmental compliance officer and carry a certificate issued by that officer. All vehicles transporting pesticide must be inspected and certified by the ECO as meeting all PMI standards for safety. The pesticide transport vehicle must be equipped with a bucket of sand or sawdust and a tight container in case of pesticide spillage. All personnel loading or unloading pesticide of any quantity must wear a dust mask, overalls, gloves, and gumboots. The driver of the vehicle transporting pesticide must have this PPE with him/her when transporting pesticide, in case there is any need to move it during transport, or to clean up a spill. When cleaning the vehicle with soap and water after all the pesticide has been delivered, this PPE must be used in addition to helmet and face shield to protect against splashes.

In addition, it must be confirmed before departure from central stores that there is sufficient PPE at each storehouse to which the pesticide is being delivered for all workers who will be moving pesticide upon arrival at the storehouse. The storekeeper must have had environmental health and safety training, including a PPE dress rehearsal prior to the arrival of the pesticide.

Given the road conditions likely to be found in rural areas, drivers must be extremely cautious, especially if crossing a water body. An accident during transportation could lead to pesticide over-exposure of the driver, transport helper, bystanders, or leakage into the environment. However, the principal risk during the transport of pesticides is that the packaging might be damaged, as the result of being improperly stowed within the vehicle and/or as the result of a road accident.

Avoid Accidental Release

The following are measures to abide by to avoid accidental release during transport.

Pesticide Loading and Containment

- Ideally, only IRS materials should be in the truck during transportation. If co-transport is necessary, IRS materials should be compartmentalized. Open or leaking containers should never be transported.
- Pesticide containers should be loaded in such a way that they will not be damaged during transport, that their labels will not be rubbed off and that they will not shift and fall off the truck on rough road surfaces (the load must be securely fixed).
- The pesticide load should be checked at intervals during transportation and any leakage, spills or other contamination should be cleaned up immediately. If a leakage is noticed in transit, the vehicle should be brought to a halt immediately, the leak stopped and contained, and the spill cleaned up.
- The truck, including tarpaulins and other goods, should be checked for evidence of spills or leaks after the pesticides have been unloaded, and then decontaminated.

FIGURE 15: PESTICIDE CONTAINERS SHOULD BE LOADED AND UNLOADED CAREFULLY

- Newly arrived consignments should be checked for leaks and loose lids, and repacked immediately if necessary. Replace torn or unreadable labels.

Pesticide Transportation Route Planning

Any potential risk during the course of the route of transport should be considered when planning the transport route to its final destination. These risks could include but are not limited to: poor quality of the road, driving at night, and pilferage/security threats. In certain countries where security risks are high, it would be advisable to hire a security escort. Planning is key to avoiding accidents and includes the following:

- planning for safe routes, with secure stopovers if necessary (Overnight

TIP :

The project or organization responsible for the transport should have a registration system and a series of checklists for dispatchers, warehouse managers loading or receiving cargos, and drivers who have been prepared for the specific cargo and conditions.

stays require a lockable box truck. Tarp covers are not acceptable.)

- verifying that the driver has been trained and fully briefed
- providing the driver with a detailed inventory of stock or bill of lading and material safety data sheet (MSDS).

Selection of Vehicles To Be Used for Transporting Pesticides

- Vehicles should be in good condition (have a certificate of approval issued by the Environmental Compliance Officer) and capable of the trip being planned. They should also be fully lockable.
- Vehicles should be equipped with a fire extinguisher, spill kit, charged and functional cellular telephone, emergency procedures with phone numbers, and a fully stocked first aid kit (see BMP 2).

Drivers' Training

Prior to long-distance transport of pesticides from the customs warehouse/central storage facility to the secondary storage facility, drivers should be informed about pesticides and how to handle emergency situations (e.g. road accidents). Training for long-distance transport should ensure drivers are literate and include:

- Understanding the toxicity of the pesticide and security issues and implications of the pesticide getting into the public's hands (such as contamination of environment and health hazards)
- Handling an accident or emergency
- The combustibility and combustion byproducts of pesticide
- Handling vehicle contamination.

Vehicles and drivers should be carefully selected and suitably qualified and licensed for this kind of transport task.

FIGURE 16: PESTICIDE TRANSPORT VEHICLE IN AN ACCIDENT, WITH SPILLED PESTICIDE

Appropriate Response to an Accident

The driver and helper should be adequately trained in the proper response should an accident occur. For example:

- It is imperative to avoid fire as a result of the accident and a fire extinguisher should be deployed just in case. The engine should be shut off and smoking in the area strictly prohibited.
- For major spills, send for help immediately; drivers should have cell phones and an emergency number for use in such cases.
- Protective clothing should be donned prior to attempting to clean the spills.
- Onlookers and bystanders must be kept away from the accident site.
- The spill should be covered with earth, sand, etc. before shoveling into buckets; no attempt should be made to wash away the spill with water or other substances.
- Containers for the spilled waste must be sealed and labeled.
- If the crew has come in contact with the pesticides, they should remove contaminated clothing immediately and wash the pesticide off their skin.

FIGURE 17: BYSTANDERS MUST BE KEPT A SAFE DISTANCE FROM THE SPILL SITE

In case of accident refer to BMP #8 Spill Response.

Vehicle Decontamination

It is important to ensure that pesticide contamination in the vehicle does not have negative impacts when the vehicle is subsequently used for another purpose (e.g. food transport). Drivers are responsible for cleaning and decontaminating the interior of the vehicle and exterior bed. The vehicle should be cleaned at the end of the spray day if the vehicle will then be used for other purposes. If it is used solely for transporting pesticide for the duration of the spray season, cleaning once activities have concluded is sufficient. Drivers should be provided with gloves, goggles, overalls, and boots to wear for cleaning the vehicle. All cloths used in wiping down the interior and bed of the vehicle should be washed with spray operator overalls.

Resources and References

- **FAO** FAO Storage and Stock Control Manual, 1996
  http://www.fao.org/docrep/v8966e/V8966e04.htm#1
- **Illustrations** FAO Storage and Stock Control Manual, 1996
  http://www.fao.org/docrep/v8966e/V8966e04.htm#1

BMP 5: SPRAYING TECHNIQUES

PURPOSE AND SCOPE

This Best Management Practice (BMP) covers the spraying techniques used for IRS. The effectiveness of residual spraying depends on the timing of the spraying relative to the peak of transmission, taking into consideration the residual effect of the pesticide that is applied. Some pesticides stay effective longer than others and decision makers should account for these differences when determining how many times a year to spray.

Pesticides are applied to a household's inner surfaces (walls and ceilings) of rooms that are used for sleeping. In some countries, the outer door frame is sprayed, although this may not be done if there is any breeze strong enough to cause pesticide drift. Doors and windows must be closed during spraying to prevent pesticide drift to the outside and into the environment. Once sprayed on the wall the water evaporates leaving a crystalline "particle". Upon contact with the sprayed surfaces (walls, eaves and roofs), the mosquitoes absorb a lethal dose of the pesticide.

The effectiveness of indoor residual spraying depends on a host of factors, including:

- The toxicity and period of effectiveness of the pesticide against the mosquito
- The effect of the pesticide on the resting behavior of the mosquito
- The type of structure and type of building material (mud, thatch, cement, tin, bamboo, etc.)

This BMP is intended to provide appropriate safety standards and practices for spraying activities and covers best practices for the following:

- Appropriate equipment
- Preparing pesticide mixture
- Spraying techniques
- Cleaning spray pump and nozzles

Appropriate Equipment

Spray Pumps (also referred to as sprayers)

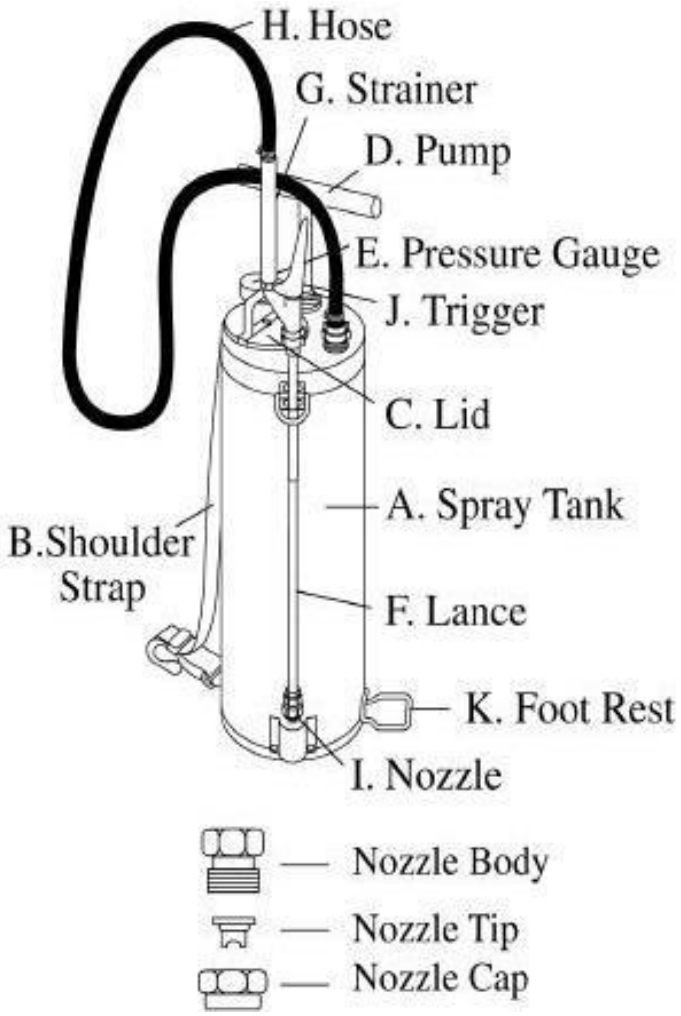
High quality, reliable spray pumps are essential for an effective spraying program. Indoor residual spraying of pesticides is normally done using hand-operated compression sprayers.

TIP :

High quality, reliable spray pumps are essential for an effective spraying program.

Before starting a spray operation, the equipment should be checked as faulty spray pumps may result in under or over application and/or leaks. Supervisors, team leaders, or dedicated maintenance technician should examine spray pumps visually to ensure that all parts are present, assembled correctly and in good condition.

The Hudson X-Pert compression sprayers are one type of sprayer commonly used in disease vector control programs.



NOZZLES

Standardized nozzles should be used throughout the IRS program, although different types are necessary for different pesticides and surfaces (absorbent and non-absorbent). Because the majority of surfaces sprayed in countries where USAID/PMI is supporting IRS have been found to be absorbent, the 8002E nozzle is the most widely recommended. Nozzle tips should be made from hardened stainless steel or from ceramic (which has been demonstrated to have lower erosion properties). Specifications are as follows:

8002/8001 or 8002E / 8001E nozzle tips

80 = 800 (angle of spraing fan)

02 = 0,2 US. gallons (757 ml) per minute, or

01 = 0,1 US. gallons (378 ml) per minute

E = Even (consistent uniform coverage requiring no overlapping of spray).

The 8002 nozzle should typically be used for:

Application of DDT

Application of synthetic pyrethroids/carbamates or organophosphates on absorbent surfaces (e.g., mud and unpainted cement)

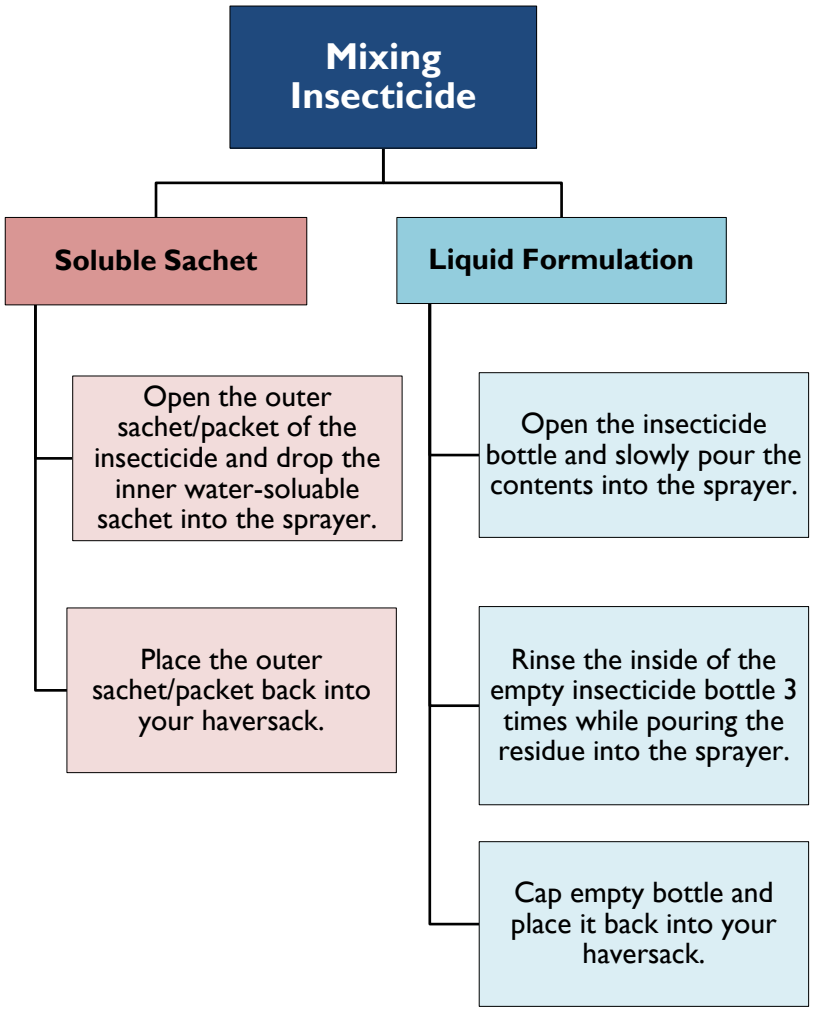
The 8001 nozzle should typically be used for:

Application of synthetic pyrethroids/carbamates or organophosphates on nonabsorbent surfaces (e.g., tiled surfaces)

PREPARING PESTICIDE MIXTURE

- Pesticide spray (e.g. ratio of water to pesticide) varies according to the manufacturer's instruction.
- Place the sprayer on firm ground outside the house, away from any household items.
- Cover the opening of the sprayer with the filter cloth or sieve.
- Fill the sprayer to half the working volume with clean water.
- Follow the steps below, depending on whether you are using insecticide in a sachet or in a bottle.

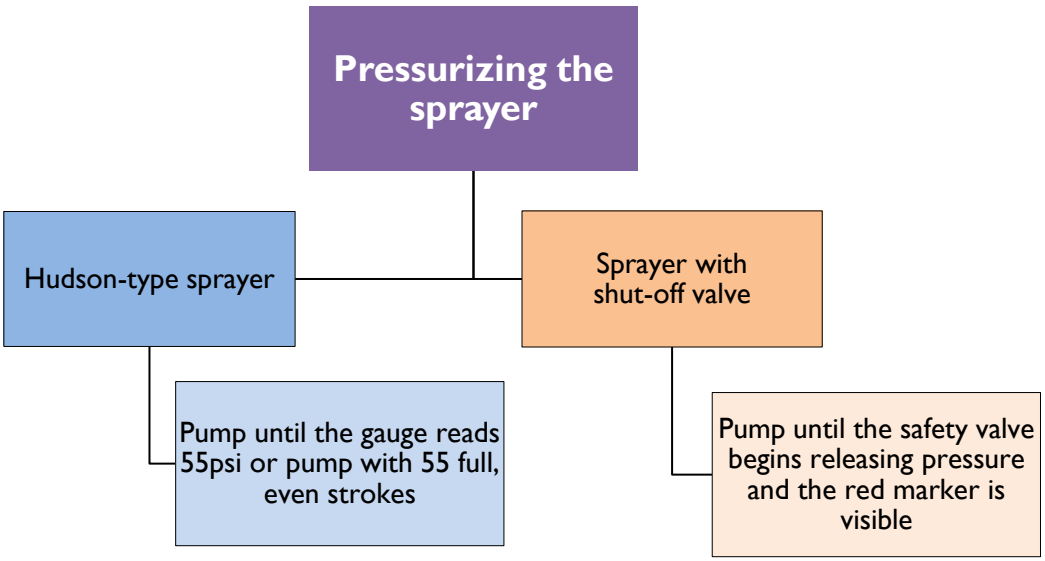
FIGURE 18: MIXING PROCEDURE DEPENDS ON PESTICIDE CONTAINER TYPE



- Cover the opening of the sprayer with the filter cloth or sieve.
- Fill up the sprayer with the rest of the water.
- Close the lid of the sprayer.
- Pump the sprayer with 5 full strokes.
- Pick up the sprayer with both hands. Hold it by the tank body and vigorously shake it side to side, 10 times, so that the contents of the tank should be thoroughly mixed.
- Place the sprayer back on the ground.
- Place your foot firmly on the sprayer's foot rest and the sprayer to the side of your body.
- As you pump, listen for leaks (escaping air) from the sprayer. Inform your Team Leader if you suspect the sprayer has a leak.

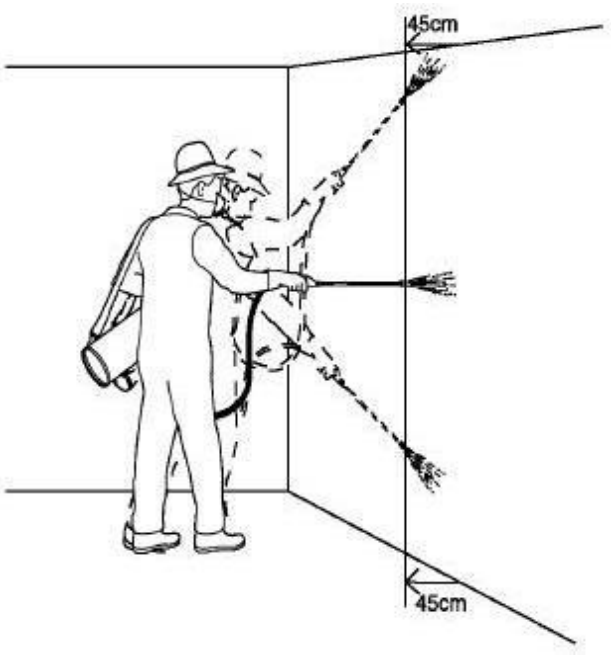
FIGURE 20: PROPER PRESSURIZATION TECHNIQUE

FIGURE 19: PRESSURIZATION PROCEDURE DEPENDS ON PUMP TYPE



SPRAYING TECHNIQUES

Pesticides should be applied in vertical swaths 75 cm wide (2.46 feet). Swaths should overlap by 5 cm. The walls of the room should be sprayed in downward and upward motions.

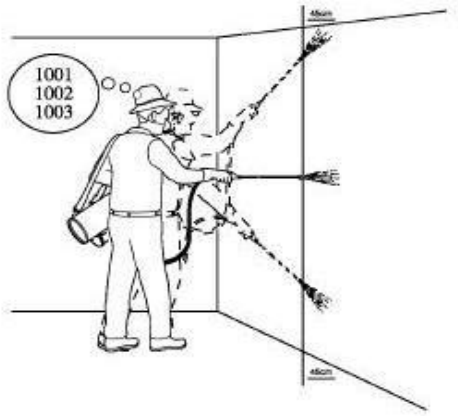


To ensure the correct swath width, the spray tip should be about 45 cm (1.48 feet) from the wall. The spray operator should lean forwards as he/she sprays from top of the wall and move back as he/she brings the nozzle downwards. The process should be continued, moving in a clockwise direction until the room is completed.

FIGURE 21: SPRAY OPERATORS WILL SPRAY HOUSEHOLDS WITH WALLS MADE OUT OF VERY DIFFERENT MATERIALS

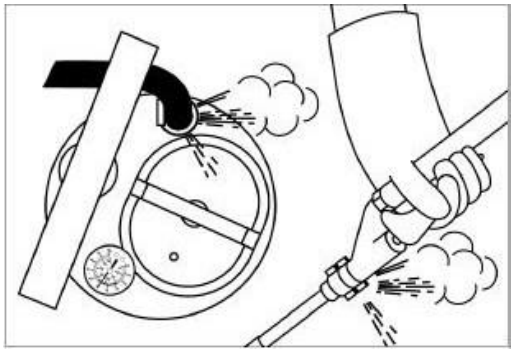
The spray speed should cover one meter every 2.2 seconds, i.e., 4.5 seconds for a 2 m high wall. Timing may be aided by mentally counting "one thousand and one – one thousand and two – one thousand and three -…"

The tank should be re-pressurized when the pressure gauge falls below 25 psi, or when the flow of pesticide is shut off automatically when using a sprayer with a safety (shut-off) valve.

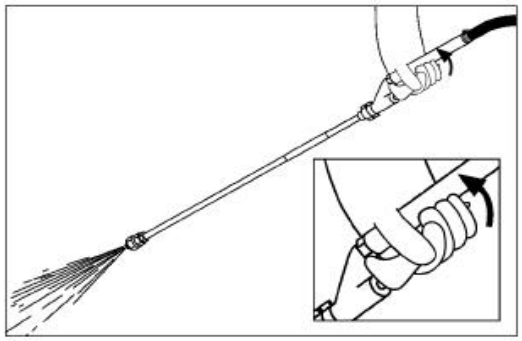


Spray Pump in Proper Working Order

There should be no leaks along the lance and hose, especially where hose joins tank and trigger on/off valve.

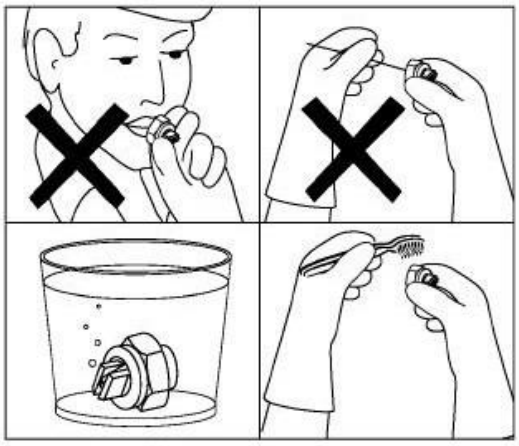


The spray pattern should be even and without streaks.



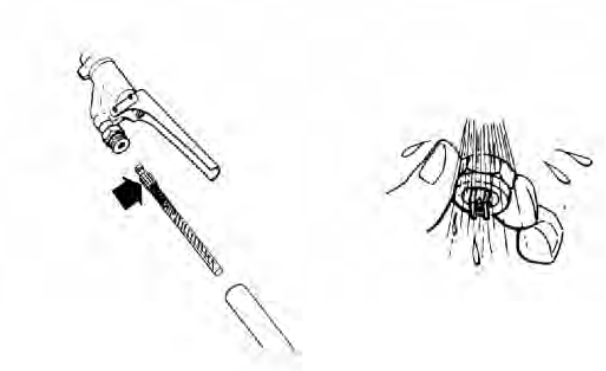
The nozzle should not drip when the trigger on/off valve is released. If there is dripping and/or puddling at bottom of the wall, spray operators should be instructed to wipe these areas with a rag.

Clogged nozzles should be put in a container with water for several hours before the blockage is removed by a very soft toothbrush. NEVER clean nozzle with a hard pin or piece of wire and NEVER put a nozzle to your mouth to blow through it.



Cleaning of Spray Pumps and Nozzles

Equipment should be maintained through daily cleaning. To clean spray equipment, first rinse cans thoroughly with water from the progressive rinse (see the Effluent Waste BMP). Remove the nozzle and add about 2 L of fresh water to the tank. Pressurize the sprayer to 15 psi and flush water through system into the reuse barrel. Release tank pressure. Drain the discharge assembly by holding it pointed downwards with spray control valve open. Drain tank and wipe interior wall.

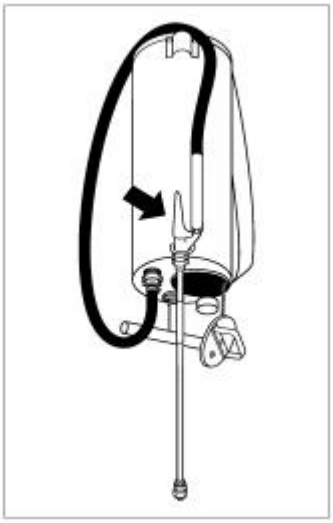


NOTE:

All rinse-water from purging the inside of the pump, the hose, and wand should be emptied into the reuse barrel(s).

Before storing after spray operations (for a period of weeks or months), each sprayer should be completely disassembled and all parts cleaned and dried. The plunger cup leather must be well oiled, while the threaded fittings should be lightly oiled. Oil and aromatic solutions must never be used on the rubber or plastic components of the sprayer.

The stored spray pumps should be hung upside down with lid open to allow air circulation. Allow lance to hang from D-ring on the tank with the trigger valve kept open.



NOTE:

At the end of each day, clean PPEs as described in the Work and Resident Health and Safety BMP.

FIGURE 22: PUMPS HUNG UPSIDE DOWN TO DRAIN AND DRY

RESOURCES AND REFERENCES

- USAID Indoor Residual Spraying (IRS) for Malaria Control Indefinite Quantity Contract (IQC) Task Order 1: IRS Training Guide for Spray Operations.
- HD Hudson Progressive Rinse: a New Approach at Reducing Waste from Indoor Residual Spraying Campaigns http://www.hdhudson.com/global-public-health/newsletters/technical-information/22-progressive-rinse-a-new-approach-at-reducing-waste-from-indoor-residual-spray-campaigns
- WHO Application for Residual Sprays for Vector Control, Third Edition
- IRS W. E. Farrell, Malaria Vector Control, The Application of Insecticides, correct use and care of equipment used and staff training. Wefco Marketing International, Pietermaritzburg, PA.
- Illustrations WHO (2000.3), Manual for Indoor Residual Spraying: Application of Residual Sprays for Vector Control.

BMP 6: Effluent Waste Disposal

Purpose and Scope

In the implementation of IRS activities, waste water (effluent) is generated on a daily basis, at the end of a spray day, during the cleaning process. Because this wastewater is contaminated with the pesticide, unsound or improper disposal of the IRS effluent can have an adverse effect on the environment.

This BMP addresses site considerations, standard design and construction, proper use, and decommissioning protocols for the following IRS effluent cleaning and disposal facilities:

- Progressive Rinse
- Soak Pits
  - Fixed
  - Mobile
- Storage Tanks
- Wash Areas for PPE

NOTES:

This section does not include disposal of IRS solid waste which is addressed in *BMP #7: Solid Waste Management and Disposal*.

Water generated from spray personnel cleaning themselves (mainly hands and face) after cleaning and removing PPE is not considered contaminated. Use of PPE is strictly enforced during IRS, thereby reducing pesticide deposition on skin to trace amounts, if any. Therefore, water used to clean spray personnel does not need to be treated in a carbon bed.

SITE CONSIDERATIONS

Appropriate site considerations for locating all IRS cleaning and waste facilities (Progressive rinse, oak pits, tanks, and wash areas) depend on soil, topography, ground water, and proximity to lakes or streams and sensitive areas. In general, most facilities should be located adjacent to the storage facilities, where they can be more easily protected and monitored. Due to access limitations and distance of some spray sites, it may be more feasible to locate a small facility in an appropriate area near the site.

- Soil characteristics affect how pesticides move through the soil. Clay soils have a high capacity to absorb many pesticides, while sandy soils have a much lower capacity to absorb. Where possible, locate facilities on fine textured soils with good absorptive properties. Hard packed clay or rocky soils are not appropriate.
- Pesticides may move in water runoff as compounds dissolve in water or attach to soil particles. Facilities should be located on high, level ground to minimize exposure to runoff. Avoid steep slopes or natural runoff flow lines. Where feasible, construct berms to divert runoff away from the facility.
- Groundwater may be contaminated if pesticides leach from the facilities. The following table summarizes groundwater contamination potential:

SUMMARY OF GROUNDWATER CONTAMINATION POTENTIAL AS INFLUENCED BY WATER, PESTICIDE AND SOIL CHARACTERISTICS

	Risk of Groundwater Contamination LOW	Risk of Groundwater Contamination HIGH
Pesticide Characteristics		
Water solubility	Low	High
Soil adsorption	High	Low
Persistence	Low	High
Soil Characteristics		
Texture	Fine Clay	Coarse Sand
Organic Matter	High	Low
Macropores	Few, Small	Many, Large
Depth to groundwater	Deep (100 ft.)	Shallow (20 ft or less)
Water Volume		
Rain	Infrequent, Short, Light rain fall	Frequent, Heavy Rainfall

McBride, D.K. 1989, Managing pesticides to prevent ground water contamination, North Dakota State University

- Avoid areas with high groundwater table or that are prone to flooding.
- Do not locate soak pits within 30 meters of crops, animal enclosures, beehives, or public buildings such as schools and surface waters.
- Leaves and mud can clog the soak pit and need to be excluded or removed periodically.
- Constructing soak pit covers will limit access by birds, bees, and other wildlife, as well as prevent the growth or deposition of vegetation that would need to be removed, thus reducing operating costs. These benefits are substantial, so covers should be used wherever possible. These can be constructed out of cement or metal, depending on availability of materials, and should contain a way to secure them closed.

PROGRESSIVE RINSE (ALSO REFERRED TO AS TRIPLE RINSE)

Progressive rinsing is a method used for cleaning spray equipment used during IRS. The equipment is washed daily through a series of rinses that re-uses water, thereby reducing the amount of water used and effluent produced. This in turn minimizes the quantity of water reaching soak pits and storage tanks and reduces the potential for pollution from contaminated rinse water.

STANDARD DESIGN AND CONSTRUCTION

Seven 200L barrels are placed in a line, as shown in following illustration. The first, third, fifth and seventh barrels are left empty, and the second, fourth, and sixth barrels are filled with clean water. The following are the steps taken when cleaning the spray pumps at the end of the day:

1. Spray teams return to their staging areas at the end of spraying operations each day, where the spray pumps are depressurized and any leftover pesticide is poured in the first barrel (No. 1; empty).
2. Approximately two liters of water is added to the spray pump from the second barrel (No. 2; containing clean water). The spray pump is then closed and shaken so all inside surfaces are rinsed. The pump is then pressurized and discharged into the third barrel (No. 3; empty).
   After the tank is depressurized, any remaining contents are poured into barrel No. 3.
3. The spray operator then rinses the tanks two more times using the remaining barrels - No. 4 (full) & 5 (empty) No. 6 (full) and No. 7 (empty). After the third rinse is added, the tank should again be pressurized, and discharged into barrel No. 7. Upon rinsing the spray pump three times, the water emptied into the No. 7 barrel should appear clean.
4. The outside of the spray tank is washed using water from barrel No. 6. The strainer and nozzles should be disassembled and rinsed also using water from barrel No. 6. The wash-water from this cleaning should drain to the soak pit. At this point, the spray pumps are considered cleaned.

FIGURE 23: SPRAY OPERATORS CONDUCTING THE PROGRESSIVE RINSE.

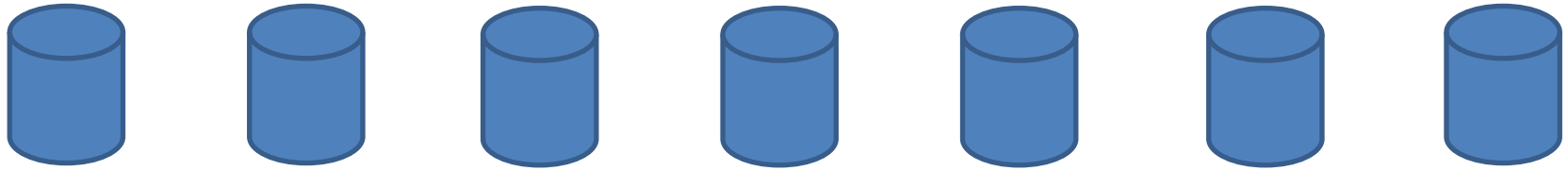
Barrel #1 is for dumping,

Barrel #2 is for fetching clean water to shake spray can with,

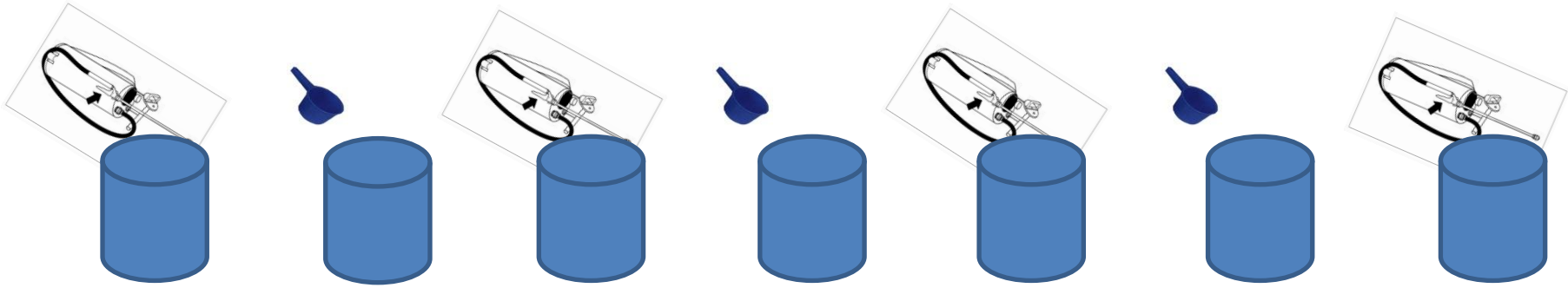
Barrel #3 is for dumping for a second time… and so forth

FIGURE 24: PROGRESSIVE RINSE SCHEMATIC

At the beginning of wash operations						
Barrel #1 Empty	Barrel #2 Rinse Water	Barrel #3 Empty	Barrel #4 Rinse Water	Barrel #5 Empty	Barrel #6 Rinse Water	Barrel #7 Empty



Wash operation sequence						
Empty leftover pesticide from spray pump	Scoop 2 liters and add to pump. Cap, pressurize and shake pump.	Depressurize* and empty 1st rinse into Barrel #3	Scoop 2 liters and add to pump. Cap, pressurize and shake pump.	Depressurize and empty 2nd rinse into Barrel #5	Scoop 2 liters and add to pump. Cap, pressurize and shake pump.	Depressurize* and empty 3rd rinse into Barrel #7



*Spray hose, wand, and nozzles must be purged with rinse water from the 1st and 3rd rinses. After pressurizing and agitating, discharge rinse water into the collection barrel.

NOTES: After this operation is complete, the outside of the pump is washed, along with the spray operators' helmet, face shield, gloves, boots, and neck protection, in the central wash area, with the washwater directed to the soak pit.

When using a mobile soak pit (MSP) a four-barrel rinse system may be employed in order to minimize the number of barrels that the spray team must carry, and the necessary size of the wash area constructed. See the section on mobile soak pits for a full description.

Supervisory personnel must develop a plan to ensure that all leftover pesticide and rinse-water in barrels 1, 3, 5, and 7 is used to fill spray tanks for the next day of operations. Because of the degradation that takes place overnight, the leftover pesticide from the first barrel cannot be used as full-strength pesticide, and is therefore used as makeup water, along with the rinse-water from barrels three (3), five (5) and seven (7). This re-use of water continues on a daily basis until the spray season ends. The final rinse water can be disposed in the soak pit or storage tank, depending on which pesticide is in use.

In some cases smaller barrels (e.g. 20 L or 60 L) can be used, depending on the number of operators using a site. Each operator will require about 8-10 liters of water for cleaning pumps and PPE. Smaller barrels also enable the use of smaller wash areas, but care must be taken to avoid overcrowding.

Soak Pits (Also Referred to as Biobeds)

A soak pit is a specially-designed hole in the ground for disposing of biodegradable waste (e.g., waste from pyrethroids, carbamates, and organophosphates). Soak pits work by the adsorption of pesticide in water by charcoal and subsequent biodegradation which are well-known and common treatment techniques. A properly constructed and sited soak pit protects the environment from contamination while allowing pesticides to degrade and become harmless.

FIGURE 25: ONE SOAK PIT DESIGN

Standard Design and Construction

A soak pit measuring 2m by 1m by 1m is sufficient to absorb the effluent produced from 20-30 spray operators during the duration of the spraying operations, providing proper protocols and procedures are followed. If puddling or ponding occur, the amount of water being introduced to the soak pit must be reduced.

NOTE: Due to access limitations, number of operators, and distances from spray sites, a scaled down version (e.g., 1m x 1m) of the soak pit located near operations may be more appropriate.

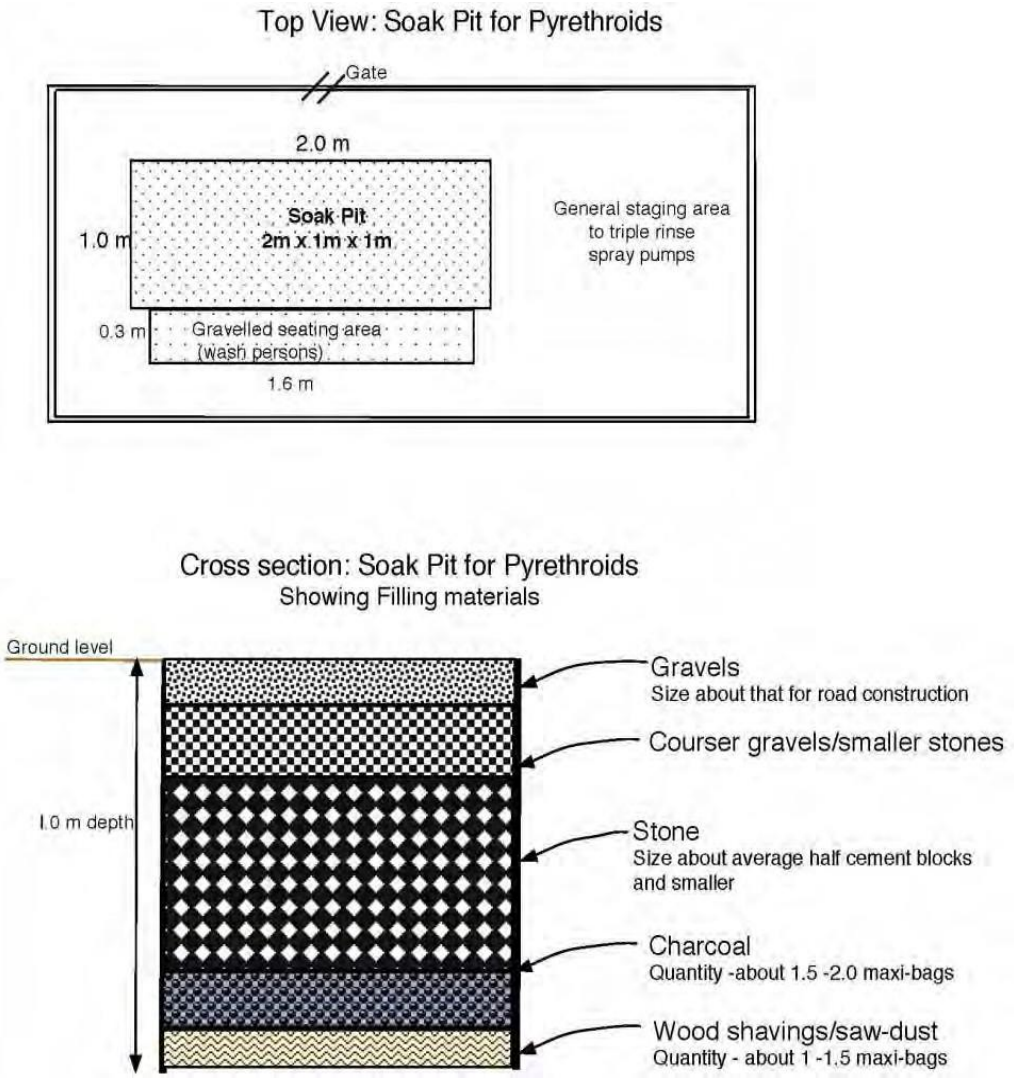
The bottom of the pit is lined with 1.0 to 1.5 bags of sawdust (where feasible), followed by 1 to 2 bags of charcoal. A layer of stone aggregate is then placed on top, followed by a layer of course gravel, and then a layer of small gravel to create a filter one meter in depth (see illustration). As the effluent percolates through these materials, the pesticides filter out and degrade before reaching the surrounding

soils. A concrete curb should be built around the soak pit to contain effluent and divert runoff from the surrounding area.

SITING

Soak pits should be adjacent to or co-located with the wash area so that washwater drains to the soak pit.

FIGURE 26: ANOTHER SOAK PIT DESIGN – CO-LOCATED WITH WASH AREA



Health & Safety: All persons handling spray equipment or maintaining the soak pit should wear complete PPE.
Access: The entire pit should be fenced off to block access to animals and unauthorized personnel. The fence can be simple (single gated) made from tree branches and/or barbed wire or other cross-structures. The fence also serves as temporary hanging places for washed clothes to sun dry. Note: Because the MSP is in use for only 1-2 hours, and is pulled from the ground overnight, fencing may not be necessary.
Warning signs: Hazardous warning signs must be posted in the area to further caution the public.

DECOMMISSIONING

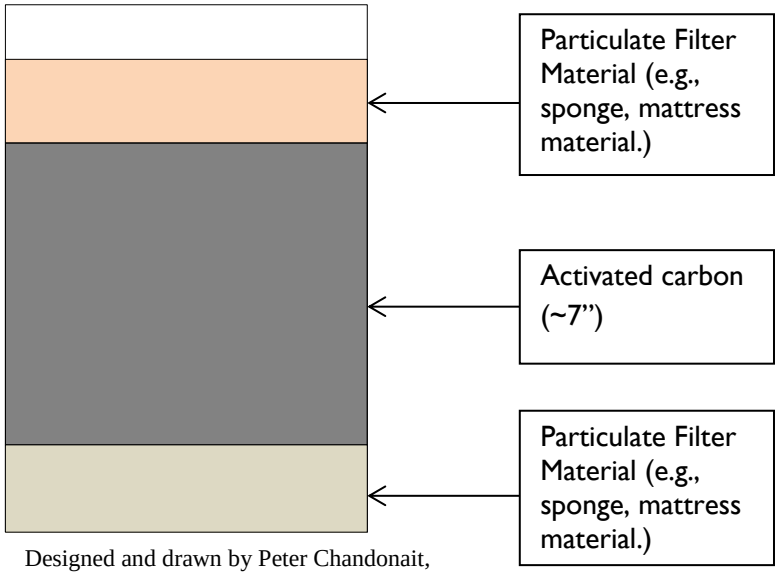
Soak pits should be decommissioned at the end of spray season by applying a cover to prevent access to contaminated materials by animals, humans, birds and bees. Several options are available, depending on local resources, and can include year-round, lockable covers, a thin layer of cement that can be broken up with a sledgehammer the next season, heavy but removable cement slabs, or simply a tarpaulin covered with soil.

Permanent decommissioning should not take place until at least three months after the spray season, when the pesticide has broken down through environmental action. Some soak pits will not require full extraction of the gravel, stones, charcoal or saw dust; instead the pit area will require restoration to previous conditions with at least six inches of soil, by filling in, leveling and planting with appropriate local vegetation.

MOBILE SOAK PITS (MSP)

To reach certain targeted spray areas, operators must travel a great distance, and they may not be able to return at the end of the day to a centralized wash area for clean-up. Sometimes the operators will spend several days in the field, finding lodging and food in the villages where they finish their work for the day. The next day, they either continue to work at the same village, or travel on to the next targeted spray area. Working this way can reduce transportation requirements, shorten the working day, and result in greater productivity. However, operators need a different system for clean-up at the end of the day.

FIGURE 27: MOBILE SOAK PIT LAYERS



Designed and drawn by Peter Chandonait, Abt Associates, Inc.

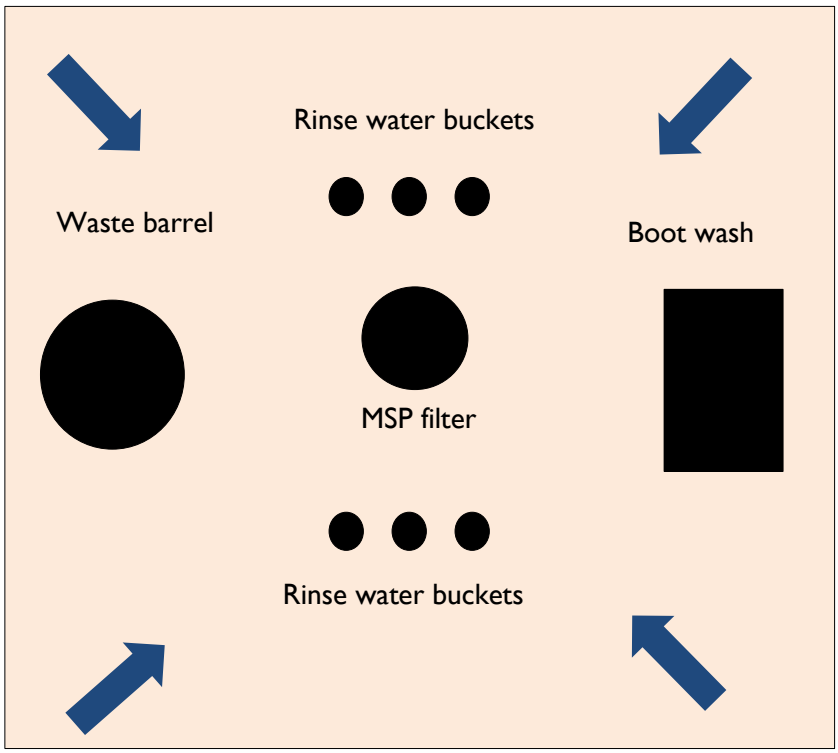
In this situation, the operators carry a MSP filter, wash barrels, and a tarpaulin with them, and construct a temporary wash facility at a suitable site within the village where they will stay. The mobile soak pit filter is a 20-25 L bucket with highly adsorbent activated carbon that removes pesticide contamination from the wash water, so that the water that exits to the ground is purified.

The MSP uses a four-barrel rinse system to minimize the number of barrels that the spray team must carry, and reduce the necessary size of the wash area constructed. The four-barrel rinse system uses three barrels for rinse water, but only one barrel to receive both the leftover pesticide, and the water from all three rinses. This system simplifies the reuse of all leftover pesticide and rinse-water the following day, as the operators draw from only one barrel, instead of four.

MSP Layout

The schematic below shows a 4m x 4m (not to scale) wash area, sloped to the MSP filter at the center, and covered with a tarp. A hole is dug in the center of the area to receive the MSP filter. An X is cut in the center of the tarp to allow rinse-water to drain into the MSP. There is a rectangular boot wash at the entrance to the wash area, so that mud does not drain to and clog the MSP. There are two rows of rinse barrels so that two operators can wash up at one time. The large barrel on the left receives both leftover pesticide and all rinse-waters.

FIGURE 28: MOBILE SOAK PIT CONFIGURATION



Designed and drawn by Peter Chandonait, Abt Associates, Inc.

FIGURE 29: PREPARING THE SITE FOR THE MSP INSTALLATION

FIGURE 30: THE MSP IS INSTALLED WITH THE TOP JUST BELOW GROUND LEVEL

FIGURE 31: WASH AREA AFTER REMOVAL OF MSP AND BACKFILLING

Washwater Holding Tanks

A holding tank is an impermeable tank for the storage of water contaminated with non-biodegradable liquid pesticide waste such as DDT. It can be designed to evaporate the water collected, leaving the solid pesticide behind, or to facilitate other means of treatment. If evaporation is used, there is substantial potential for exposure to the dried residue when cleaning it up. PPE must be used during the final cleaning, including gloves, masks with organic cartridges, rubber boots, and overalls.

Standard Design and Construction

An IRS holding tank should hold approximately 15,750 liters or 4,100 gallons, which should be sufficient to allow disposal of effluent from 20-30 DDT spray operators during the spray season. If a larger number of operators will be using the facility, it should be designed accordingly. The tank can be designed and engineered to maximize evaporation if that is the separation mechanism, or to accommodate various forms of treatment.

The tank must be constructed with an impermeable surface (e.g., concrete) and covered with a lockable wire mesh on top of a window screen to exclude birds, bees and other insects. It should be simple to connect a pump for treatment or evacuation. If evaporation is used, the dried residue is carefully collected wearing full PPE, and then disposed of together with other DDT waste. If overflow is a risk during operations, an overflow tank should be provided, and a berm should be constructed around the perimeter of the tank for further protection.

Siting

Holding tanks should be constructed away from flood prone areas, steep gradients and slopes, traffic areas, and water sources (wells and springs). A berm may be required to prevent run-on of stormwater into the tank. The tanks should also be located slightly downhill from the progressive rinse area so that so that run-off from this facility can be directed into the tank. The wash area must be covered when not in use to prevent overflow of the tank due to collected rainflow.

Proper Use

- All operations that involve handling dried DDT must be performed by technicians using full PPE, including an organic filter respirator. After a spray round, all of the sand, sludge, and pesticide residue remaining in a storage tank should be scooped out, placed into a sealed, labeled container, together with empty sachets, and disposed according to BMPs for DDT-contaminated waste.
- Cover the tank with a raised tarpaulin to allow cross airflow for evaporation while excluding rainwater from refilling the tank.
- If water level in the tank comes within 6 inches of the drainage hole, liquid should be siphoned into plastic polytanks (around 4k L) for temporary storage, until they can be added back to the tank.

FIGURE 32: PRECAUTIONS FOR USING STORAGE TANKS FOR PESTICIDE-CONTAMINATED WATER

Health and Safety: All persons handling spray equipment or maintaining the storage tank should wear a complete PPE.

Access: Women and children may not be permitted exposure to pesticides. The entire structure should be fenced off to block access to animals and unauthorized personnel. The fence also serves as temporary hanging places for washed clothes to sun dry. Cover tank with fine screen to exclude bees from foraging for water.

Warning: Hazardous warning signs must be posted in the area to further caution the public

FIGURE 31: STORAGE/EVAPORATION TANK DESIGN

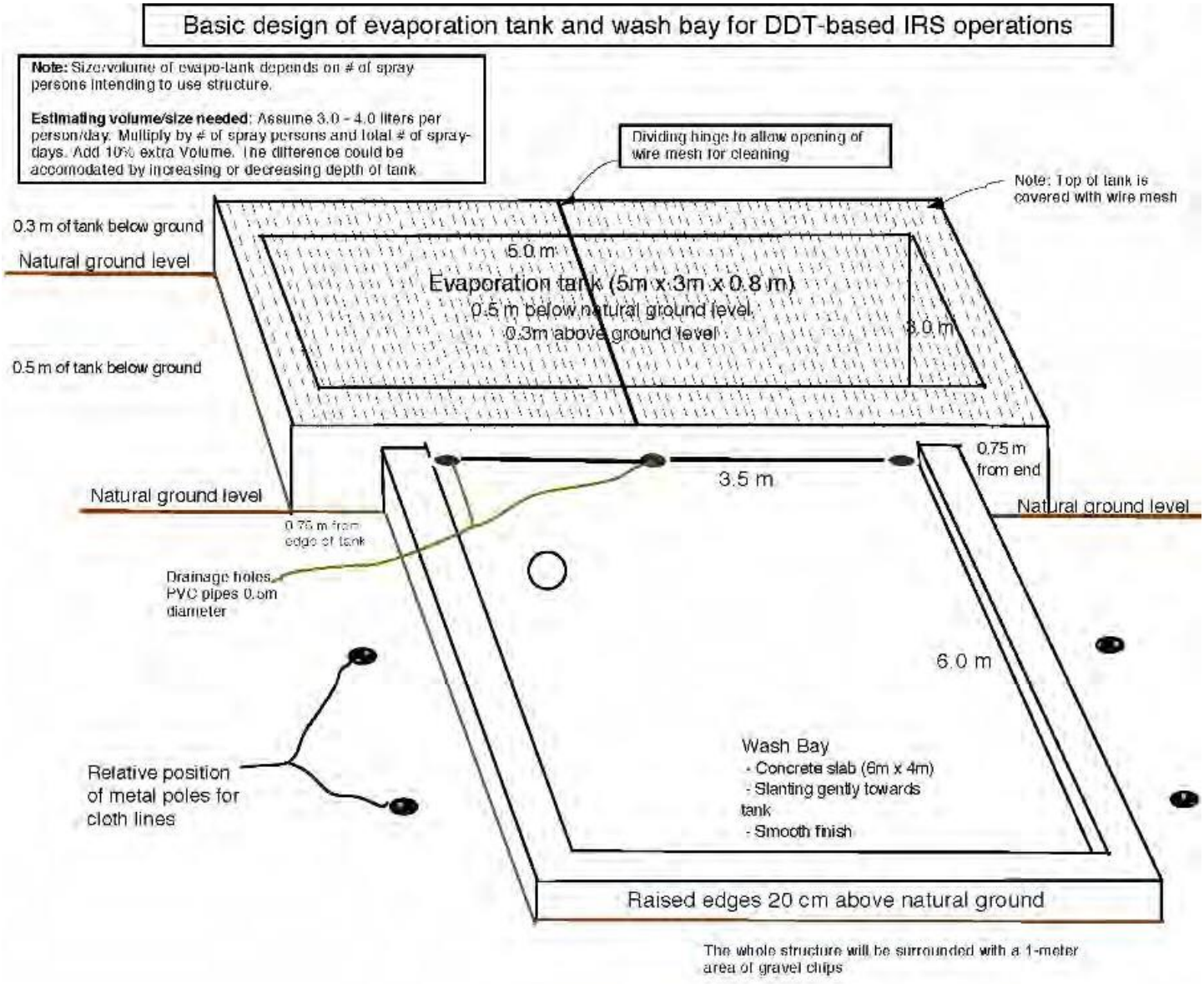


FIGURE 33: STORAGE TANK WITH ADJACENT WASH AREA.

NOTE:

The storage tank must be covered to exclude rainwater, and screened to exclude bees and other insects

DECOMMISSIONING

If transferring operation of evaporation tanks to another entity, remove DDT residue from tank prior to transfer. If evaporation tanks are to be decommissioned, they should be dismantled after thorough cleaning, and the area should be restored back to its natural state as much as possible once IRS activities discontinue permanently. Pesticide sampling of the site should be done to determine that DDT levels in the soils are not above ambient concentrations.

Wash Areas for PPE

Standard Design and Construction

A wash area is an impermeable surface sloped so as to capture wash-water drippings and direct them to a treatment system. It is where:

1. PPE (helmets, face shields, gloves, boots, and overalls) and drop cloths used to cover household items are washed with detergent and water.
2. Spray pumps are triple-rinsed, disassembled for cleaning and/or maintenance, and rebuilt.

A separate wash basin for daily washing of face and hands should be provided.

When washing non-DDT PPE, a tarpaulin should be used to capture all effluent and directed to soak pits. PPE used for DDT IRS activities should be washed in a cemented bay that drains into a holding tank for further treatment. Hanging lines for drying the overalls may be erected directly over the washing areas, or in another secure location.

FIGURE 34: WASHED OVERALLS HUNG TO DRY INSIDE LOCKABLE WASH AREA

PROPER USE

FIGURE 35: PRECAUTIONS FOR WASHING PPE

Health & Safety: Spray operators should wear recommended PPE when completing end-of-day washing of helmets, face shields, gloves, boots, and spray pumps, and washpersons should wear boots, gloves, and aprons when washing overalls
Access: The entire structure should be fenced off to block access to animals and unauthorized personnel. The fence can be simple (single gated) made from tree branches and/or barbed wire or other cross-structures. The fence also serves as temporary hanging places for washed clothes to sun dry. If possible, cover soak pit with fine screen to exclude bees from foraging for water..
Warning signs: Hazardous warning signs must be posted in the area to further caution the public

FIGURE 36: STORAGE TANK WITH PPE HANGING TO DRY

DECOMMISSIONING

Wash sites that handled DDT should be decommissioned the same as the evaporation/storage tanks, including sampling surrounding soil for DDT levels. Sites not used for DDT should be cleaned with soap and water, and restored to their previous condition.

RESOURCES AND REFERENCES

- USAID/PMI: Indoor Residual Spraying (IRS) for Malaria Control Indefinite Quantity Contract (IQC) Task Order 1: IRS Training Guide for Spray Operations
- HD Hudson: Progressive Rinse: a New Approach at Reducing Waste from Indoor Residual Spraying Campaigns www.hdhudson.com/vc-news-fb-07-malaria-fish-net.html
- Illustrations**:** USAID/PMI Training Manual (2009). Schematic from IRS Training Manual

BMP 7: Solid Waste Management

Purpose and Scope

This Best Management Practice (BMP) is intended to provide acceptable safety standards and practices for the storage and disposal of solid wastes generated during IRS operations.

Contaminated solid waste is generated during the implementation of IRS activities in the form of empty pesticide sachets, damaged PPE equipment, used cleaning equipment, materials such as sawdust used to clean up spills, and contaminated soil from accidental spills. These substances create pesticide residue and pose health and environmental hazards if not disposed in an environmentally sound manner.

This document details the standard requirements for the following:

- Solid Waste Storage and Management
- Disposal of Pesticide Containers
- Disposal of Unwanted Pesticides
- DDT Waste Disposal
- Incinerators

This document does not include disposal of IRS effluent waste, which is addressed in BMP #6 Effluent Waste.

Definitions

Contaminated Materials - Waste that has come into contact with pesticides whether purposefully (e.g. immediate packaging of pesticide sachets), or accidentally via spill, leak, etc.

Uncontaminated Materials - Packaging and materials (e.g. pallets, boxes previously containing intact pesticide sachets) which have not come into direct contact with pesticides and can be assumed to be uncontaminated

Solid Waste Storage and Management

All the IRS solid waste must be collected, counted, labeled, and stored throughout the spray campaign in district storehouses prior to shipping to a central warehouse for consolidation or to final disposal. Certain IRS wastes like empty sachets and respirators are collected on a daily basis while other waste types (e.g., gloves, and covering sheets) are collected periodically. Contaminated waste should be stored in a separate room from non-contaminated waste, but may be stored with pesticide.

Safe and Secure Storage

The storage facility must be lockable, with a roof in good condition, adequate but secure ventilation (to exclude rodents, etc.), accessible and away from flood prone areas.

FIGURE 37: SECURITY AT STORAGE FACILITIES

Security guard at central storage facility

Security guard at central storage facility

IRS Waste Stock Management Records

The storekeeper is responsible for maintaining an accurate inventory of all IRS wastes using the forms provided for stock management. Sachets and masks should be tracked daily using spray operator sachet sign-out and return records maintained by storekeepers and audited regularly by senior project personnel. Containers for contaminated waste must be clearly labeled with the contents (i.e., contaminated sachets) and the contaminant (i.e, Fendona).

IRS Obsolete Materials Management

PMI's preferred disposal of solid waste streams generated from IRS operations is detailed in the following guide:

Cardboard Boxes

Unless the insecticide packaging outer sachet was damaged within the cardboard box, PMI does not consider the cardboard boxes to be contaminated. If uncontaminated boxes are incinerated, they can add considerably to the cost and workload of incineration and their incineration will generate large amounts of carbon dioxide and other air contaminants. Therefore, these uncontaminated boxes are to be:

- Reused or Recycled (check with shippers, newsprint suppliers, card manufacturers, or other paper manufacturers or users in major cities), or
- Landfilled.

If cardboard boxes are contaminated, (i.e., contained insecticides with damaged packaging) they should be incinerated with masks and sachets.

Gloves and Boots

When gloves and boots can no longer be used, they must be thoroughly cleaned with soap and water. When cleaned properly, they are to be considered uncontaminated. They then should be:

- Offered to spray staff for their personal use,
- Recycled if an outlet can be found for them (e.g., plastic manufacturers), or,
- Landfilled.

Most of the gloves and boots available on the market contain greater than 1% chlorine. When incinerated, they can create dangerous Persistent Organic Pollutants (POPS) in contravention of international agreements. In addition, the majority of incinerators available in Africa are not configured for optimum combustion and may produce noxious or nuisance fumes and odors. Therefore, gloves and boots MAY NOT BE INCINERATED. Please consult with the PMI IRS implementing partner's environmental manager for further information.

Dust Masks

Waste dust masks are always considered contaminated and hazardous. The potential for inappropriate misuse is high. They should be inventoried, consolidated, labeled, and correctly stored at the secondary storage facility before shipping to central storage and/or to the prior approved waste disposal facility to be incinerated with other contaminated materials approved for incineration.

Overalls

Overalls that may no longer be used for IRS may be given to spray operators for their personal use, after they have been washed.

Heavily contaminated (more than 1 square foot wetted) PPE should be washed, triple rinsed, shredded or punctured and sent to central disposal centers.

Insecticide Containers (Sachets and Bottles) Sachets

Insecticide sachets should not be reused for any purpose. They should be inventoried, labeled, and correctly stored in the storage facility in the same room as any unused pesticides, (not stored with other uncontaminated commodities) until they can be incinerated at the prior approved waste disposal facility.

Water-soluble inner sachets are strongly preferred for PMI IRS operations. Otherwise, empty sachets should always be emptied out, as far as is practicable, before disposal to minimize both the hazard and the waste of residual pesticide. Sachets that have contained emusifiable concentrate, or wettable powder (wp) formulations should be rinsed with water several times, and the rinsings should be added to the spray pump before the tank is filled to the required volume.

FIGURE 38: CARDBOARD BOXES WITH EMPTY SACHETS STORED AND LABELED PROPERLY

GLASS CONTAINERS

Glass containers should be smashed and steel drums and metal and plastic containers punctured and crushed (do not puncture aerosol containers) to ensure that they cannot be reused, before being sent to a central location for recycle or disposal.

PLASTIC BOTTLES

Some organophosphates and other insecticides may be packaged in PETE (also known as PET) or HDPE bottles. There may be a code embossed in the bottom of the bottle that will indicate of what material they are made (See Figure 39 below). By recycling bottles rather than incinerating them, greenhouse gas and other toxic emissions can be avoided, and a usable product may be produced. For these reasons, responsible, monitored recycling is the PMI BMP for managing plastic wastes.

Bottles must be triple-rinsed in the field during pesticide makeup to ensure that they are free of contamination. Spray operators must not carry contaminated empty bottles back to the operations site. While in storage awaiting disposal, the empty bottles should be punctured such that they may not be used for other purposes.

FIGURE 39: PLASTIC MATERIAL RECYCLE CODES

Disposal of Unwanted Pesticides

To avoid excess waste, use the correct amount for each day's operations, and prepare the correct amount to fill each spray pump as needed. Whenever possible, only one year's supply of pesticides should ordered (pesticides may only have a two year shelf life). Occasions will arise when it will be necessary to dispose of pesticide concentrates. This is usually because the stock is outdated and has been found to be unusable, because the product is no longer registered for the original purpose, or because resistance has emerged. Where large quantities are to be disposed of, professional advice must be sought from the suppliers and national authority. If only a few kilograms or liters of pesticide are involved, it should be collected and sent to a central location for disposal by the implementing partner. Pesticides are best disposed of by burning in a special incinerator that burns at 1100°C-1300°C. Storekeepers should not make decisions about pesticide disposal and should rely on the Environmental Compliance Officer, headquarters Environmental Compliance and Safety Manager (ECSM), or relevant national authority.

DDT Waste Disposal

DDT solid waste can only be disposed of in an approved incinerator that meets Basel Convention DDT disposal technical requirements. If no in-country incinerator exists, the waste must be transported out of the country to a certified facility. This can be complicated due to inter-country transport/export /import laws. Once incinerated, the remaining ash residue from the incinerator must be disposed of according to US, international, and national regulations. Any disposal of DDT pesticide must be approved by the implementing partner's headquarters staff, as well as the Contracting Officer's Representative and the Global Health Bureau Environmental Officer.

Incinerators

Incineration (also known as thermal destruction) is the standard method that is used in the disposal of pesticide-contaminated IRS solid wastes in all participating countries. The wastes will only be disposed in incinerators that meet the following requirements (drawn from WHO and FAO guidelines):

- Commercially licensed facilities that are accredited and licensed by the host governments to dispose toxic waste. Obtain a list of all the approved and licensed facilities from the environmental agencies/authorities.
- Facilities that are assessed by the implementing partner and found to satisfy PMI and international requirements for toxic waste disposal
- Incinerators constructed or procured by the implementing partner that meet international standards (WHO/FAO
- Incinerators that consistently burn between 1100 deg. C and 1300 deg. C, with a minimum 2 second residence time in the afterburner chamber (hot zone) with excess oxygen (>11%) and with high levels of induced turbulence in the gas stream to promote complete combustion. The gas stream is then rapidly cooled to eliminate the risk of dioxin and furan formation. (Note: Some non-chlorinated pesticides may be incinerated at 850 deg. C or above. Consult with ECSM)
- Incinerators with air scrubbers to ensure minimal impact to air quality
- In some cases incineration can be negotiated with the pesticide manufacturers, who are responsible for recapturing solid wastes and then disposing of those wastes in an environmentally sound manner.
- Alternatively, cement kilns or furnaces can also be considered for disposal in countries where cement factories or copper furnaces and meet the above criteria are available.

Worker Health and Safety

Full PPE is required for all incineration activities. The following PPE will be provided for the incinerator operators where needed:

1. Helmet
2. Face shield or goggles
3. Dust mask
4. Overalls
5. Heat and pesticide resistant gloves
6. Rubber Boots

Timeline

Solid wastes from IRS activities should not be allowed to accumulate and should be disposed at the end of each seasonal spray schedule, wherever possible.

Resources and References

- **WHO** *Health and Safety Guide-Cyhalothrin and Lambda-cyhalothrin.* International Programme on Chemical safety. Health and Safety Guide No. 38. World Health Organization, Geneva, Switzerland (1990). http://www.inchem.org/documents/hsg/hsg/hsg038.htm. *Accessed 06 June 2008*
- **FAO** *International Code of Conduct on the Distribution and Use of Pesticides: Guidelines on Management Options for Empty Pesticide Containers*. Food and Agriculture Organization of the United Nations. Rome, Italy (2008). *Accessed 2 June 2008*
- **ASTDRUS** ASTDRUS Agency for Toxic Substances and Disease Registry, Production, *Import/Export, Use and Disposal of DDT* http://www.atsdr.cdc.gov/toxprofiles/tp35- c5.pdf
- **Africa Stockpiles Program (ASP)** Review of Disposal Technology Standards, November 2007

BMP 8: Spill and Emergency Response

Purpose and Scope

This Best Management Practice (BMP) is intended to provide acceptable safety standards and practices for responding to pesticide spills in the event of an accident. Pesticides are biologically active materials and potentially hazardous to human health and the environment. There will occasionally be spills even in the best-run programs, especially where pesticides are repacked and transferred into other containers. Complete decontamination and effective disposal are often very difficult to achieve. Pesticide spills can be the result of:

- Natural disasters (flash flooding, fire, earthquake, cyclones etc.)
- Vehicular accidents of any type that result in damage to the vehicle or its contents
- Accidents involving equipment for moving pesticides within a store.
- Other unforeseen occurrences (i.e., falling from a transport vehicle due to rugged conditions)

This BMP addresses the following measures to be taken in the event of natural disasters or accidents:

- Spills in storage facilities
- Spills during spray operations
- Spill during transport
- Human health precautions post-spill
- Major emergencies
- Reporting of accidents

The Three "C's"

The basics of a good spill response program are the three "C's":

CONTROL: Control the spill (minimize the volume released)

CONTAIN: Contain the spill (to as small an areas as possible)

CLEAN: Clean up the spill immediately (consider possible use of spilled material or disposal)

Implementing the Three "C's"

Spills in Storage Facilities

Regardless of the type of pesticide (liquid or solid) the following principles are considered best practices in managing spills:

- Spills must be cleaned up immediately.
- More than one worker should respond to severe spills.

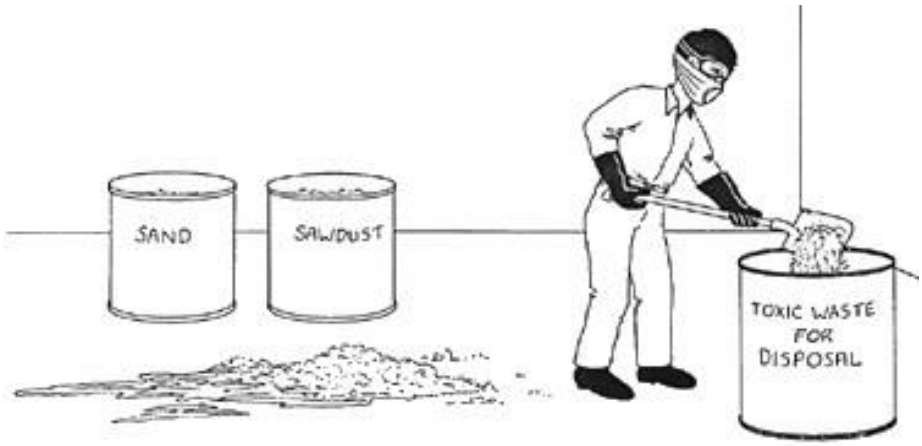
- During cleanup they must wear protective nitrile rubber gloves, goggles, and facemasks.
- Pesticides should be stored in warehouses with floors constructed of impermeable (sealed) concrete or other non- absorbent material. If this is not feasible, then immediate action is even more critical, as spilled pesticide may be absorbed into the floor.
- The spill should NOT be hosed down with water as this merely disperses the pesticide.
- A supply of absorbent sawdust, sand or soil should be kept in a container in the store.
- Sawdust, sand or soil should be scattered over the area of the liquid spill and mixed with the pesticide. If wettable powders have been spilled, the sawdust, sand or dry soil should be dampened to avoid excess dust.
- The sawdust, sand or soil containing absorbed spilled pesticide should then be swept or shoveled carefully and placed in a labeled, enclosed container for disposal.
- After sweeping (more than once if necessary) use a scrubbing brush at the end of a stick to scrub down the area with minimum amount of water and detergent. Excess soapy water should be soaked up and removed with a rough floor cloth and not hosed down. The brush and cloth should then be cleaned in the soak pit or storage tank wash areas.

FIGURE 40: SPILL KIT WITH SHOVEL, BUCKET OF SAND, AND FIRE EXTINGUISHER

Spills During Spray Operations

- When a spill has occurred, restrict access and cover the spill with earth, sand, etc.; no attempt should be made to wash away the spill with water or other liquids.
- Contaminated material should be placed in container for collection and central disposal.

FIGURE 41: SPILL SOAKED UP BY SAND OR SAWDUST BEING CAREFULLY SWEPT UP BY THE STOREKEEPER AND PLACED IN A LABELED CONTAINER



Spills During Transport

Transport vehicles should be decontaminated thoroughly as soon as spills or leaks are seen. Considering that vehicles will often be used for other uses, such as transporting food or people, it is especially important that the spill be cleaned up immediately to avoid permeating the vehicle with the pesticide. Spills should be cleaned as previously described for warehouses. The contaminated washings from the vehicle should also be absorbed by sawdust, sand or soil and placed in a container for collection and central disposal. Therefore, transport vehicles that are used for transporting large quantities of pesticides should be equipped with a bucket of sand, sawdust or soil, a shovel, and fire extinguisher.

Human Health Precautions - Minor Exposure

Pesticides coming into contact with the skin can enter the body. Successful decontamination of body surfaces requires prompt action: rapid application of plenty of soap and water and thorough washing.

Anyone contaminated with pesticide should strip off their clothing and quickly and thoroughly scrub the affected part of their body with soap and water. Careful rinsing and toweling dry should follow this. (See Spraying Techniques BMP.)

Response for Moderate to Severe Exposure

Health workers within IRS areas should receive training and the necessary equipment and medical supplies to support the spray teams and the population in the treatment and management of pesticide exposure cases.

FIGURE 42: PREPAREDNESS FOR EXPOSURES AND INJURIES

Provision of Poison Treatment Drugs	Provision of First Aid Kits
Treatment medication for dermal exposure or pesticide poisoning should be available in all health facilities as recommended by WHO and this BMP manual. Health personnel from the MOH or certified nurses in the spray area should be trained to deal with pesticide exposure emergencies. In the event of accidents or injuries, the exposed or injured person should be given first aid attention and then taken immediately to the health center.	First-Aid kits should be readily available and kept stocked in case of an emergency in every IRS operational center, warehouse and vehicle transporting spray operators. Records should be kept when items are dispensed, and precautions taken to avoid theft of first aid materials. Persons using the First Aid kits should be well trained on first aid. The contents of the First Aid kits should be reviewed and adapted to spray work environment and should include eyewash kit. Ensure instructions are in host country language.

Residents Safety in Case of Exposure

In the event that residents are exposed:

- For accidental exposure, if skin itches, wash with soap and water; for eye irritation, flush eyes with water; for respiratory irritation, leave the home for fresh air; for ingestion, contact program staff or go to nearest health facility.
- To avoid exposure when a spill has occurred, restrict access and cover the spill with earth, sand, etc.; no attempt should be made to wash away the spill with water or other liquids.

FIGURE 44: FIRST AID KIT

FIGURE 43: EYEWASH STATION

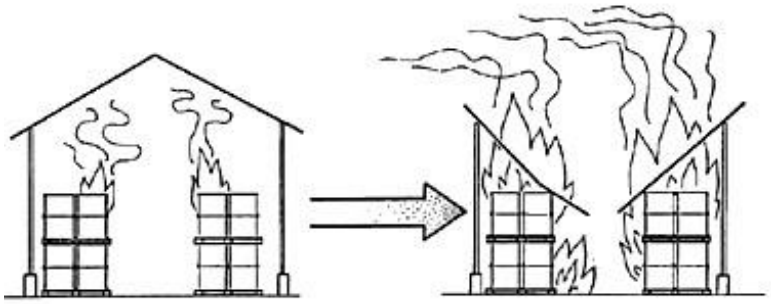
Major Emergencies

Pesticides present major fire hazards because the solvents used in formulations (oils and petroleum distillates) have low flashpoints and may be readily vaporized at normal temperatures. Gases that are formed when pesticides burn are extremely hazardous. To reduce the risk of fire the following steps should be taken:

FIGURE 45: EXTINGUISHING A SMALL FIRE IN A PESTICIDE STORE USING SHOVELFULS OF SAND.

- The outside of pesticide stores should bear prominently displayed warning notices stating "Danger pesticides: authorized persons only" and "No smoking: no naked flame" as well as symbols. These rules should be strictly followed.
- Fire extinguishers (powder or carbon dioxide, not water) should be available in the store and should be regularly checked.
- Static or running water (required, together with soap, for decontamination purposes) should also be available.
- Buckets of sand or earth (also required for absorbing any liquid pesticide spills or leaks) are useful for putting out small fires.
- The local fire brigade should be informed of the store's existence and the hazards involved.
- It is very useful to place a notice on the outside of the store giving names and addresses of those responsible for the store (including key holders) who can be contacted in an emergency.
- Fires in pesticide stores that contain organo-phosphorus compounds and carbamates can be extremely dangerous to fire fighters. Firefighter should always wear breathing apparatus and avoid being downwind of the fire. Protective clothing and equipment used by fire-fighter should be thoroughly decontaminated after the fire.
- Solid water streams from fire-fighting hoses should be avoided since they can disperse the pesticide over a wide area (especially powder formulations).
- Care should be taken to avoid dragging fire hoses through pesticide or contaminated water.

FIGURE 46: PESTICIDE STORE IN FLAMES - THE LIGHT ROOF HAS COLLAPSED THUS PREVENTING AN EXPLOSION



Reporting

Timeline for Report Submission

- All serious adverse events must be reported within 24 hours to the Chief of Party, and relevant Implementing Partner Headquarter Staff
- All adverse events must be reported to the COR within 48 hours.

Report Content

The adverse event report must include the following information:

- Brief description of event
- Date, time and exact known location of the event
- Name(s) of person(s) involved
- Nature of Implementing Partner's relationship with any involved persons (specify 3rd party, Implementing Partner's employee, Implementing Partner's consultant, subcontractor employee or a seconded person and include the direct employer of any seconded personnel)
- Involvement of police or any administrative authority
- Existence of a police report if applicable (which should be scanned and attached)
- Extent of damage to, or loss of, property or personal injury to Implementing Partner's personnel, including whether or not any those personnel are able to report to work
- Extent of property damage or injury to a third party
- Information on
    - Complaints or reports filed with the authorities
    - Payments already made to provide emergency medical care
    - Press or newspaper report
    - Status of Implementing Partner's client's awareness of the incident.
    - Any information on local procedures, common practices, traditional processes and requirements, or demands on those involved for similar incidents or situations.
- Please provide a short initial analysis of fault/liability if any.
- Also, please include sources of the information provided on this point
- Any further information that would be helpful or questions/requests for guidance.

Resources and References

- **FAO** Pesticide Storage and Stock Control Manual 1999
  http://www.fao.org/waicent/faoinfo/agricult/agp/agpp/pesticid/disposal/v8966e/01.htm

BMP 9: DDT Special Considerations

Purpose and Scope

IRS programs can be sustained for many decades and have been shown to have considerable impact on malaria morbidity and mortality. However, any country considering using DDT should ensure that the right regulatory mechanisms are in place and that the program is well controlled with scientific and medical oversight (from: Considerations for the Use for DDT in Malaria Control, American Enterprise Institute for Public Policy Research).

This Best Management Practice (BMP) is intended to provide acceptable safety standards and practices for the handling, storage, transportation and use of DDT used in Indoor Residual Spraying (IRS) of the PMI program, to minimize the risk for human exposure.

Most of these standards and practices are applicable for all pesticide applications, though, due to its bio-persistence, the following are special BMP considerations for DDT.

- Worker Health and Safety
- Pesticide Storage and Stock control
- Effluent Waste Disposal
- Solid Waste Disposal
- Spraying Techniques
- Monitoring Sampling

DDT Description

DDT is an organochlorine pesticide with low volatility and very low solubility in water, but soluble in fats and organic solvents. DDT is highly persistent, and has a long residual effect on most sprayed surfaces. The long persistence in the environment and its high bioaccumulation in fatty tissues have contributed to the dispersal of DDT residues everywhere (including arctic ice) from its agricultural use in the 1950s and 1960s. This bioaccumulation has resulted in highly toxic effects at the top of food chains, particularly in sharks, eagles, and falcons.

The main danger of environmental contamination from using DDT as an indoor residual spray comes from the illicit diversion of the pesticide from malaria control to agricultural use. Other dangers include inadequate disposal of wastes, or pumps indiscriminately washed in surface waters. These risks could be prevented by proper education and strict supervision (from: *Treatment Guidelines for WHO recommended pesticides for Indoor Residual Spaying)*.

Worker Health and Safety

Safety of Women Spray Personnel

As there is some evidence that DDT is bioaccumulative, and may have an impact on fetal development, it is especially important for countries using DDT to ensure that pregnant women and nursing mothers are not exposed to DDT or any other pesticides. When recruiting spray operators, pregnancy tests must be conducted during a normal medical exam to ensure that pregnant women are not hired into positions involving any contact with pesticides. For spray campaigns lasting longer than 30 days, the pregnancy tests must be repeated once every month during the campaign.

Pesticide Exposure and Treatment

Early symptoms may include paresthesia (tingling) of the tongue, lips and parts of the face, which in severe cases extends to the extremities. The patient may have a sense of apprehension and disturbance of equilibrium, dizziness, confusion, and a characteristic tremor.

Remove contaminated clothing and wash the affected skin with clean water and soap, and flush the affected area with large quantities of clean water. Keep the patient calm and in quiet, shaded conditions and seek medical

Pesticide Storage and Stock Control

Strict auditing and mechanisms for retrieving empty sachets of DDT from the districts should be established. Once retrieved, the empty sachets will be kept in a secured designated location until incinerated in a certified incinerator (see solid waste disposal). Strict punitive measures against pilferage and unauthorized use of DDT should be enforced.

Medicines to be Administered by a Professional at the Hospital in Case of DDT Poisoning:

Activated Charcoal (priority): Phenobarbital.

Diazepam or Lorazepam (for seizure): Cholestryamine resin.

Effluent Waste Disposal

In the implementation of IRS activities, waste water (effluent) is generated on a daily basis at the end of a spray day during the cleaning process for the spray pumps and PPE's (overalls, gloves, boots) and tarpaulin covering sheets. Because this waste water is contaminated with the pesticide, unsound or improper disposal of the IRS effluent could pollute and cause adverse risk and damage to environment. Because DDT is a persistent organic pollutant (POP), (meaning that it does not decompose in the environment), PMI does not use soak pits for the disposal of contaminated wash-water. Instead, the wastewater is collected and stored for subsequent treatment and destruction.

Storage Tank

A storage tank is a tank for the storage of non-biodegradable liquid pesticide waste such as DDT (see Effluent Waste Disposal BMP).

Polythene Tanks

In cases where the storage tank is not large enough to handle the amount of DDT effluent safely, or where there are no storage tanks, the DDT effluent should be stored in polythene tanks.
Once the level in the tank has dropped sufficiently, the effluent can then be added to the tank, or transported to the closest storage tank.

FIGURE 47: POLYTHENE TANK USED AS SECONDARY STORAGE OF DDT EFFLUENT WASTE

Decommissioning

After a spray round, all of the sand, sludge, and pesticide residue remaining in a storage tank should be sampled for DDT concentrates, then scooped out, placed into a sealed container, placed with empty sachets, and disposed according to the BMP for solid waste disposal. Storage tanks should be dismantled and restored back to their natural state as much as possible once PMI DDT activities discontinue. Pesticide sampling of the site should be done to determine that DDT concentration does not exceed ambient concentrations in the surrounding soils.

PPEs used for DDT IRS activities should be washed in a cemented bay that is adjacent to and drains into storage tank. Hanging lines for drying the overalls should be erected directly over the storage tank.

Solid Waste Disposal

Contaminated DDT solid waste is generated during the implementation of IRS activities in the form of respirator cartridges, empty pesticide sachets, damaged PPE equipment, used cleaning equipment, and materials such as sawdust used to clean up spills, storage tank residue, contaminated soil from accidental spills, and expired pesticides. These substances are generally toxic and pose health and environmental hazards and should be incinerated in an incinerator that meets Basel Convention technical standards for DDT disposal.

All DDT solid waste will be stored in similar manner as all other IRS wastes. Ideally suppliers are required to dispose of all DDT waste, and provide a certificate of destruction as proof that the wastes have been disposed of in a certified facility.

Should DDT solid waste be disposed of in an approved incinerator, the remaining ash residue from the incineration must be treated as toxic waste and be disposed according to the requirements for disposal of toxic ash residue principally in regulated landfills (see the Solid Waste Disposal BMP).

Spraying Techniques

Appropriate Equipment - Nozzles

The 8002 nozzle should typically be used for application of DDT.

Monitoring Samples

One of the main concerns with the use of DDT is the transport of the chemical to any sensitive receptor. This category may include children or women of childbearing age, birds, aquatic life and invertebrates. Because DDT degrades slowly and is highly adsorbed to organic materials it has a tendency to move with soil and becomes sequestered in sediments such as streambeds. While this is a highly unlikely scenario for IRS (because of the mitigations and conditions placed on the spray techniques), it should be noted that DDT could move along these pathways to important receptors. Therefore, to be sure that procedures are adequate and that they are being followed, the following sampling strategy should be employed:

Procedure Detail

This procedure defines the types of environmental monitoring required as part of any IRS program using DDT for malaria vector control. It also defines the requirements for monitoring in accordance with the USAID environmental regulations 22 CFR 216 and the Programmatic Environmental Assessment for Integrated Vector Management for Malaria. This procedure intends to provide brief guidance on when and what to sample. It does not include detailed protocols for sampling, analysis, or data management, analysis, and interpretation.

The EMP/Quality Assurance Project Plan (QAPP) must be developed in conjunction with the sampling plans. The EMP provides detailed information concerning the objectives, and scope to be used in the monitoring program. This should include any benchmark for humans and ecological receptors such as maximum residual levels, and toxicity reference values. These benchmarks should be selected based on site specific receptors and must be identified prior to any undertaking any sampling.

EU MRLS for food (0.05mg/kg) for DDT can be found at:
http://ec.europa.eu/sanco_pesticides/public/index.cfm?event=substance.resultat&s=1

Other helpful benchmarks can be found in the IRIS database at the US EPA website, and at the ECOTOX website and at https://www.globalmrl.com/db#query maintained by Bryant Christie Inc.. Last, the PEA for IVM for Malaria contains several benchmarks which are important for evaluation. Work with a human and ecological risk assessor to assist in choosing the most appropriate benchmark for receptors.

The QAPP provides detailed information on the management structure, staff roles, training requirements, quality control procedures, and documentation required to assure the overall quality of monitoring data collection, management, and analysis. This would include sampling and analysis techniques (statistical, laboratory, and sampling techniques).

Environmental Monitoring Plan (EMP) and Quality Assurance Project Plan (QAPP)

Baseline Sampling Plan

The data from this sampling round acts as a baseline by which all future rounds are compared and must be executed prior to the launch of USAID-supported IRS programs. Programs with DDT spraying already underway should consider "round 1" of sampling the as the baseline, though it can also be used to compare to previously agreed benchmarks. This sampling and analysis effort establishes pre-USAID supported IRS DDT levels in media of concern (e.g., soil, sediments and homestead and field crops), and is collected from randomly-selected future IRS homesteads. It should be noted if DDT has ever been used in the area and how much time has passed since the last IRS event. DDT daughter products, such as DDE, and DDD should also be analyzed as the ratio of DDT to DDE and DDD can give an indication of weathering/age of product.

If the area targeted for IRS includes locations at which elevated concentrations of DDT might be expected (e.g., fields previously used for growing cotton, plants used to process cotton, prior IRS operations), samples should also be collected from such locations.

Environmental Monitoring Plan (EMP) and Quality Assurance Project Plan (QAPP)

IRS Source Monitoring Plan

Crops stored in home

Crops stored in the home should be sampled to monitor DDT transport from the spray area to the stored crop. It is important to note that while crops are moved out of the home during spraying event, residual DDT may volatilize to crops stored in the home. Metadata should include crop type, and storage means (sack, bowl etc.). Crops should not be stored against the walls if possible.

Crops grown near homes

Sampling and analysis of crops grown in areas where houses will be treated with DDT, to detect a potential increase in DDT levels in crops destined for regional or international markets. Crop samples should be collected pre-IRS and post-IRS from a variety of locations in the chain of production and commerce, e.g. fields, storage facilities, local markets, processing facilities, and points of transit.

Soil near homes

To understand if DDT is moving from the home to outside the home, take several samples near the homestead entrance. If DDT is detected at statistically significant levels this may indicate that wash water from the walls or floor dust is being swept out the door. This creates a transport pathway to other receptors such as crops, birds and aquatic life.

Soil near and in evaporation tanks

The sediment at the bottom of the evaporation tank need only be sampled at evaporation tank clean out or tank closing. The results are used for the purposes of tank closeout or for disposing of waste sediment. However, because we cannot be certain there were no incidental spills, sampling and analysis of soils near the evaporation tank must occur at a statistically valid sub set of tanks each year and at all tanks at close out. If a tank is found to have DDT in soils above the selected benchmarks for relevant receptors (selected in the environmental monitoring plan) these soils must be excavated and properly disposed.

INCIDENT MONITORING

Should sampling and analysis of soils, sediments, crops, etc. indicate statistically significant levels of DDT (relative to baseline or benchmarks), the site may require further sampling for the purposes of delineating the extent of the DDT. Such samples may also be required if post-IRS source monitoring detects DDT levels substantially above baseline. This would be done to determine the route or magnitude of environmental contamination associated with the DDT. In either case, further action may be required and the BEO and MEO should be contacted for further assistance prior to any action.

ENVIRONMENTAL MONITORING REPORT

The Environmental Monitoring Report presents results and interpretations from the monitoring program. It summarizes the purpose of the monitoring program, sampling design, sampling and analytical methods, results, and conclusions. The analysis and interpretation are considered during the annual Malaria Operational Planning. Therefore it is imperative that the data be made available in a timely fashion.

RESOURCES AND REFERENCES

- **PMI IVM for Malaria**: IVM for Malaria Programmatic Environmental Assessment
- **EU**: EU MRLs http://ec.europa.eu/sanco_pesticides/public/index.cfm?event=substance.resultat&s=1
- **ECOTOX:** ECOTOX Benchmarks http://www.pesticideinfo.org/DetailPesticide.jsp?Rec_ID=PC33482#Toxicity
- **EPA:** EPA IRIS database

BMP 10: Water Crossings

Purpose and Scope

Transporting pesticides across water, whether lakes, rivers, streams, or any other water body, carries substantial risk to the environment, and potential risk to the health and safety of nearby populations of humans and animals. Water transport is inherently less stable than transportation on land, and conditions on the water can change rapidly due to weather or other influences. Water bodies commonly serve multiple functions, including habitat for a wide array of species, a source of food and water for humans and animals to drink, and a source of irrigation water for agriculture. All of these functions could be severely impacted if an accident occurred during the transport of IRS pesticides.

All WHO-recommended pesticides are especially toxic to aquatic organisms, and if they were to be released into a water body due to a transportation accident, there would likely be a substantial die-off at the site of the accident, and potentially far downstream, as well. In addition, if humans or animals were to drink water contaminated by these pesticides, they could suffer symptoms up to and including death. For these reasons, it is essential that PMI establishes and follows a strong protocol for the methods that are to be used for shipping pesticides across water, and that each proposed shipment be thoroughly analyzed and planned for appropriately.

Guidance

The first step is to make sure that the water crossing is necessary. If there are any alternatives to shipping across water, they should be thoroughly investigated, with a bias towards avoiding water crossings. Secondly, all possible crossing points should be evaluated in terms of the distance and time required, as well as for the type(s) of vessel(s) available, and the speed and turbulence of the water at the crossing, in both good weather and during heavy rainfall or storms. Finally, if the Chief of Party, in consultation with the Technical Coordinator and Environmental Compliance and Safety Manager, determine that a water crossing is truly necessary, the shipment must be thoroughly planned, with consideration of the following factors and safeguards.

For smaller shipments, bottles will be packed in 220 liter open top barrels with a tight-fitting top and a locking ring. These containers are used in industry for containment of very hazardous liquid chemicals, so they will be safe if used properly as outer packaging. Each of these barrels can hold about 100 one liter bottles, and will weigh about 100 kg. when loaded. Therefore, at least two people, and preferably three, will be required to lift a full barrel onto the vehicle and/or vessel(s) to be used. Waterproof labeling must be affixed to the barrel, with all of the information found on the cardboard cartons, including the identity of the pesticide, number of bottles inside, the weight, the type of hazard posed by the contents, and the personal protective equipment to be worn when handling the barrel.

The empty cardboard cartons should be carefully flattened and transported with the pesticide, so that they can be reconstituted and repacked with the pesticide upon arrival at the storeroom. This is very important for inventory and tracking purposes.

For larger shipments, it is preferable to ship pesticides in their original cartons, but specially wrapped in plastic so as to be waterproof and so they will float in water. In order to be able to load and unload the packages at each transition point, no more than six cartons can be packaged together.

Shipping documents stating the type and quantity of insecticide, as well as the packaging type(s) must be completed in triplicate. Three copies are signed by both the issuing storekeeper and driver, and one copy remains with the storekeeper. Two copies are signed by both driver and recipient storekeeper, and each retains one copy.

QUESTIONNAIRE

The following questions must be researched and answered before shipment:

PACKAGING

1. What type of packaging will be used?
   - Wrapped cartons
   - The plastic drum.
2. (handling and transportation of the container depends on its shape and size)
3. Height of container/package _____ meters
4. Length of container/package _____ meters
5. Width of container/package _____ meters
6. Is the container a standard 220 liter open top drum, undamaged, and has a tight fitting cover with locking ring?
7. Have all labels been placed on the outer walls of the container?
8. Have the labels been laminated?
9. Is the container fully charged/ filled with insecticide bottles, with sponges placed on top to limit movement?
10. Is the container clearly labeled on the outside with the number of bottles contained?
11. Is the weight of the loaded container clearly marked on the outside?
12. Can one person easily carry/move the container when loaded? (If not, specify the number of people required to carry/move it)
13. Is the container packed in another external protection? (If yes, please specify the type of packaging)
14. If applicable, what is the name of the company that prepared this package?

ROAD TRANSPORT

PRELIMINARY INVESTIGATION

1. Is it stipulated in the contract that the vehicle will carry sensitive and dangerous products and that the vehicle owner is willing?
2. What is the empty weight of the vehicle? _____kg
3. What is the cargo weight capacity of the vehicle? _____kg (excluding the weight of the vehicle)
4. What is the length of the vehicle?
5. What is the height of the truck bed that the containers will be loaded onto? ____ meter

6. Does the driver have a clean driving record with no accidents? (Check infringement)
7. Can the cargo portion of the vehicle be sealed to the weather and locked?
8. Can the containers be tied down inside the truck? (Chain, adjustable strap, other……...)

BEFORE DEPARTING FROM STORES

1. Do we have all the information about the route and the water body to be crossed (If yes, quote the relevant information Ex: what time the water starts to become difficult to navigate)
2. Are there any known relevant customs or taboos along the route? (If yes include beliefs and taboos that are still deeply rooted and that may affect the workflow or outcome.)
3. Are the needed personnel available at each strategic point on the route? (List where assistance will be needed.)

WATER TRANSPORT

The ECO must personally inspect each proposed water transport vessel, and take pictures to be presented for approval by the Chief of Party and the Operations Manager. For any crossings exceeding ½ hour duration, the ECO must make the crossing (with a representative load on board) before recommending a method or vessel for use. The ECO should take pictures or video of any notable feature during the crossing.

1. Crossing must be made during daylight only, and at a very safe speed. Take no chances!
2. How long does the crossing take at a safe speed? _____ min./hr. (circle one)
3. Can the crossing be completed before dark?
4. Is the water currently calm?
5. Is it windy?
6. Is the weather expected to be clear and calm during the entire time of crossing? (If not: mention the weather condition)
7. How far is the water crossing from the central store _____ km?
8. At the crossing of the river, will the goods be transported in the vehicle? If no, go to the next section.
9. What is the length and width of the barge/raft on which the truck will be transported? (If boat is not stable, vehicle or packaged products may capsize overboard)
    - ___meter length
    - ___ meters wide
10. Is the length and width of the barge at least twice as large as the truck length and width?
11. What is the maximum load that the barge can carry? _____ kg
12. Is the barge is powered/ propelled?
13. Is it covered against rain and sun?
14. Is there a net or other means to recover objects that accidentally fall into the water? (If yes, list the tools)
15. Is there a first aid kit on board?

16. Carefully drive the vehicle into the center of the barge. (Only one vehicle may be transported at a time.)
17. Block all four tires of the vehicle on both sides.
18. Turn the engine off as soon as the truck is positioned on the raft and tires are blocked.
19. Only AIRS personnel, a guard, and the pilot are allowed on the barge with pesticide. Personnel may not ride inside the vehicle during the crossing.

For pesticide containers that will be off-loaded from vehicles onto a barge or boat:

1. Have the porters have been trained? Date __/__/__
2. Are the porters wearing lifejackets?
3. Do the porters have to enter the water to load the barges?
4. Distance between the bank and the barge: _____ meters
5. Is the water deeper than knee level to reach the barge? (If water is above the upper edge of the boot, it may impede the movement of porters)
6. Is the river bottom solid to walk on, or muddy?
7. Is the gateway to board the barge stable?
8. Are the porters wearing clean PPE? (If PPE is contaminated it may introduce contamination into the river)
9. Are there more than 3 people maneuvering the barge (If yes, give the exact number (minimum 3 required: one rear, one in front and one on the sides)
10. Can the pesticide containers be tied down to the deck?
11. Are the containers stacked more than 1.5 meters high?
12. If the containers are drums, is it standing upright or lying down?
13. Are all containers at least one meter from the edge of the barge? Are they placed as close to the center of the barge as possible?
14. Are all people getting on the barge authorized and have received training? (How many people?)
15. Are all people wearing PPE? (overalls, boots, gloves and life vests)
16. Does the barge have suitable space to place these people?
17. Does the barge have handholds for these people to cling to?

ANNEX A: ENVIRONMENTAL COMPLIANCE AND SUPERVISORY ASSESSMENT AND INSPECTION CHECKLISTS

	**Date of Inspection :**	
	Inspector's name and organization:	
	Country:	
	Level 1:	
	Level 2:	
	Level 3:	
	Level 4:	
Spray Operator Morning Mobilization and Transport Vehicle Inspection	**Number of spray operators at site:**	
	Number of days of operation at this site:	
	Vehicle Make:	
	Vehicle Model:	
	License Plate Number:	

	Question	Response		Follow Up Question	Follow up Response	Comments	ECO Action
	Morning Mobilization						
1	Are you conducting this inspection at the beginning of the spray day?	Yes	No	**If no, go to question 8**			
2	Have the spray operators eaten breakfast and had plenty of water to drink prior to donning PPE?	Yes	No				If no, Advise all spray operators to eat breakfast and drink plenty of water before donning PPE.
3	Are SOs in full PPE before boarding truck?	○ Helmet ○ Face shield ○ Overalls ○ Boots ○ Gloves ○ Mask ○ Neck protection ○ Flashlight					If no, Advise all spray operators to be in full PPE before boarding truck.
4	Are any spray operators eating or drinking after donning PPE?	Yes	No				If yes, Advise spray operators not to eat after donning PPE. Make note of spray team and suggest retraining.
5	Do the Team Leaders do a casual physical inspection of SOs, i.e., look out for any obvious breathing problems, fatigue, weakness, alcohol intoxication, etc.?	Yes	No				If no, Ask the Team Leaders do a casual physical inspection of SOs to look for signs of any obvious breathing problems, fatigue, weakness, alcohol intoxication, etc.

	Question	Response		Follow Up Question	Follow up Response		Comments	ECO Action
6	Do operators fill spray pumps using the contents of drums 1, 3, and 5 and 7 from the previous day's progressive rinse?	Yes	No					If no, Ask spray team supervisor to demonstrate correct procedure for filling up spray pumps for spray operations.
7	Are barrels 1, 3, 5 and 7 empty when Spray Operators depart for the field?	Yes	No					If no, Ask spray team supervisor to demonstrate correct procedure for filling up spray pumps for spray operations.
	Transportation Vehicle Inspection (TVI)							
8	Was this vehicle inspected and approved by ECO or authorized AIRS representative before contract signing?	Yes	No	If yes, Is the AIRS-issued certificate in the vehicle?	Yes	No		If no, Perform full Pre-contract vehicle inspection. Contact Logistics and notify of vehicle substitution, and of inspection results.
9	Is a special license or certificate needed for driver or vehicle transporting hazardous goods or numerous people?	Yes	No	If yes, Does the driver and/or vehicle have the needed certification (driver's license, etc.) for transporting hazardous goods or numerous people?	Yes	No		If no, Contact operations coordinator immediately and advise of violation.'
				If yes, Date of expiration:	___/___/_____			
10	Has the driver attended safety training?	Yes	No	If Yes or No, Date of training:	___/___/_____			If No, Provide safety training for driver
11	Other than the pesticide sachets or bottles for the day's use, are any pesticides transported in the same vehicle with the operators?	Yes	No					If yes, Notify driver and site supervisor of violation. Supervise correction of the problem.
12	Are food products, animal feed, or consumer goods transported in the same truck as pesticides?	Yes	No					If yes, immediately remove all food products, animal feed, and consumer goods from all trucks transporting pesticide. Instruct driver and logistics personnel about prohibition.
13	Are there: 1. a spill kit (sand, shovel, bucket), and 2. spill/emergency/ accident response procedures in the vehicle?	○ Sand ○ Shovel ○ Bucket ○ Spill response ○ Emergency response ○ Accident response		If no, Date(s) of delivery: ___/___/_____				If no, Call main stores to determine delivery status of missing item(s

	Question	Response		Follow Up Question	Follow up Response	Comments	ECO Action
14	Is there a fully-stocked first aid kit (eye wash, Band-Aids, gauze, antibiotic cream, hydrocortisone cream/calamine, aspirin) in the vehicle?	○ Eye wash ○ Band aids ○ Gauze ○ Antibiotic cream ○ Hydrocortisone cream/ Calamine ○ Aspirin		If no, Date for delivery of missing first aid kit items: ___/___/_____			If no, Provide missing items for first aid kit for the vehicle.
15	Do drivers have a cell telephone and appropriate PPE (boots, gloves, and filter mask) in case of a spill or accident?	Yes	No				If no, Instruct driver to get PPE from stores.
16	If this vehicle transports pesticide, can the pesticides be adequately secured and tied down in the vehicle?	Yes	No				If no, Provide materials for securing and tying down pesticides in the vehicle
17	Does the vehicle have a fire extinguisher?	Yes	No				If no, Instruct the driver to get a fire extinguisher from stores.
18	If this vehicle transports operators, does the spray operator transport vehicle have seats and railings?	Yes	No	If no, Date vehicle will be fitted with seats and railings. ___/___/____			If no, Arrange for vehicle to be fitted with seats and railings ASAP
19	Are the operators properly seated in the transport vehicle with the pump secured between their legs?	Yes	No				If no, Instruct the spray operators to be seated with the pump secured between their legs.
20	Is the vehicle overcrowded?	Yes	No	If yes, Take a picture of the problem.			If yes, Find alternate transportation for some operators.
21	Is there evidence of pesticide leakage in the trucks?	Yes	No				If yes, Instruct driver to decontaminate the vehicle before next use
22	Have there been any incidents of pesticide exposure?	Yes	No	If yes, Has an incident report form been filed?		Yes No	If no, Get as much information as possible and ensure that an accident form is filed immediately
23	Have there been any vehicular accidents?	Yes	No	If yes, Has an incident report form been filed? If yes, Date of incident: ___/___/_____		Yes No	If no, Get as much information as possible and ensure that an accident form is filed immediately
24	Additional Comments	_____ _____ _____ _____					

	**Date of Inspection :**	
	Inspector's name and organization:	
	Country:	
	Level 1:	
	Level 2:	
	Level 3:	
	Level 4:	
Spray Operator Performance and Homeowner Preparation	**Number of days of operation at this village:**	
	Spray Operator Team ID	
	Household ID Number(s)	
	Number of home owners interviewed:	

	Question	Response		Follow Up Question	Follow up Response		Comments	Follow up Actions
	Homeowner Interview							
1	Ask resident if they were informed in advance about the spray activities.	Yes	No					
2	Have all personal belongings, food items, animals/sick persons been removed from the structure?	Yes	No					If no, Direct spray operator not to start spraying a home until all personal belongings, food items, animals and sick persons have been removed from the structure
3	Have all items that cannot be removed been properly covered with plastic sheet?	Yes	No					If no, Direct spray operator to cover all items that cannot be removed with a plastic sheet before spraying the structure
4	Are there any rooms in the house that are used as food stores at the time of spraying?	Yes	No	If yes, Was the food removed before spraying?	Yes	No		If no, Ensure that stored food is removed before room is sprayed. If food cannot be removed, do not allow SO to spray room.
5	Were the eaves of the house sprayed?	Yes	No	If yes, Were the household items that are normally stored on the porches, roofs and exterior of the walls removed?	Yes	No		If no, Direct spray operator to require the residents to remove all the household items that are stored within 3 meters of spray.

Question		Response		Follow Up Question	Follow up Response	Comments	Follow up Actions
6	Have the residents been instructed not to enter for 2 hours, and then open windows and door to air out for 30 minutes before moving back in?	Yes	No				If no, Direct spray operator to instruct residents on re-entry requirements.
7	Have residents been informed to wash itchy skin, and to go to a health clinic if they don't feel well after their house has been sprayed?	Yes	No				If no, Direct spray operator to instruct residents on what to do if they suspect exposure to the pesticide
8	Are all animals kept outside the structure during spraying and for 2.5 hrs. afterward?	Yes	No				If no, Direct spray operator to instruct residents to keep all animals outside the structure during spraying and for 2.5 hours afterward
9	If there are people (sick, elderly, babies) that cannot be moved, is this household being sprayed?	Yes	No				If yes, Stop spray operator immediately. Direct Spray operator not to spray structures where people (sick, elderly, babies) cannot be moved
10	Have the residents been told to sweep up dead mosquitoes and deposit them in latrine pit and not to allow children or animal inside until this has been completed?	Yes	No				If no, Direct spray operator to ask residents to sweep up dead mosquitoes and deposit them in the latrine pit and not to allow children or animals inside until this has been completed
11	Are the residents told not to plaster, paint or clean the sprayed surfaces?	Yes	No				If no, Inform resident of post-spray protocol.
12	Are there households observed that are refusing IRS?	Yes	No	If yes, Why are the households refusing IRS?			If yes, Interview household as to why they are refusing IRS.
13	Are the households satisfied with the IRS?	Yes	No	If no, Why are the households not satisfied with IRS operations?			If no, Interview household as to why they are not satisfied with the IRS operations.

Question		Response		Follow Up Question	Follow up Response		Comments	Follow up Actions
Spray Operator Observations and Interview								
14	Are SOs in full PPE?	○ Helmet ○ Face shield ○ Overalls ○ Boots ○ Gloves ○ Mask ○ Neck protection ○ Flashlight						If unchecked boxes, Direct SOs to wear full PPE throughout spray operations.
15	Is mixing of the insecticide witnessed by the household resident?	Yes	No					If no, Direct SOs to request that homeowner observes mixing.
16	Is the pesticide packaged in bottles (Actellic, propoxur)?	Yes	No	If yes, Does the operator triple-rinse the bottle while preparing the pesticide in the tank?	Yes	No		If no, Direct spray team supervisor to demonstrate the correct procedure for rinsing the bottle while preparing the pesticide tank.
17	Is the tank shaken to mix the contents before pressurizing?	Yes	No					If no, Direct spray operator to properly mix pesticide before pressurizing tank.
18	Is the Hudson pump pressurized to 55 psi, or the Goizper pump pressurized until the safety valve begins releasing pressure and the red marker is visible before spraying?	Yes	No					If no, Direct operator of correct procedure for preparing the pesticide tank.
19	Are there any leaks from the pump?	Yes	No	If yes, Does the operator service the pump before proceeding?	Yes	No		If no, Direct operator to immediately service leaking pump.
20	Are the spray operators spraying with the tip of the nozzle 45 cm away from the wall?	Yes	No					If no, Direct operator to ensure that the tip of the nozzle is 45 cm away from the wall.
21	Are the spray operators maintaining the correct speed of application, i.e., covering 2 meters of vertical wall surface in 5 seconds?	Yes	No					If no, Direct operator to adjust the speed of spraying to cover 2 meters of vertical wall surface in 5 seconds. Help them with counting 5 seconds and estimating 2 meters.
22	Is there a 5 cm overlap with each successive swath?	Yes	No					If no, Direct operator to ensure that there is a 5 cm overlap with each successive swath. Assist them in estimating 2 cm of swath.

Question		Response		Follow Up Question	Follow up Response		Comments	Follow up Actions
23	Are SOs spraying all the recommended surfaces? (walls, eaves, inside of doors, ceiling)	Yes	No					If no, Discuss with spray operators the correct surfaces to spray.
24	Are the SOs spraying floors, metal roofs, the outside of doors, glass, inside of cupboards, wallpaper, food granaries, curtains, latrines, animal pens?	Yes	No					If yes, Discuss with spray operators the areas that should not be sprayed.
25	Is the pump re-pressurized if the Hudson tank pressure falls below 35 psi, or the Goizper automatically shuts off?	Yes	No					If no, Discuss with spray operators the correct pressurization procedure for spraying homes.
26	Are any of the SOs observed smoking, drinking or eating during the day?	Yes	No	If yes, Spray operators name?				If yes, Direct spray operators not to smoke, drink, or eat during the spray day. Take note of SOs who do not follow prescribed procedure.
27	Have there been any reported accidents or complaints of pesticide exposure from residents or operators?	Yes	No	If yes, Has an Incident Report Form been filed? If yes, Date of incident:	Yes Yes	No No	__/__/____	If no, File incidence report for pesticide exposure event.
28	Are the Spray Operators accurately recording data?	Yes	No	If no, In what way is the data inaccurate?			○ Spray data is not correct ○ Population protected data is not correct ○ Mosquito net data is not correct ○ Mandatory parts of the form a skipped (ex: IRS #)	If no, Discuss with the spray operator the correct way to collect and record data and the mistakes that he/she might have made.
29	Are the spray operators correctly marking the houses they have competed spraying?	Yes	No					If No instruct spray operators, team leaders, and supervisors that houses must be marked after spraying.
30	Additional Comments	_____ _____ _____ _____ _____						

End of Day Cleanup

Date of Inspection :	
Inspector's name and organization:	
Country:	
Level 1:	
Level 2:	
Level 3:	
Level 4:	
Number of spray teams at site:	
Number of spray operators at this site:	
Spray team ID No(s).	

	Question	Response		Comments	Follow up Actions
0	Is a mobile soak pit being used by the team	Yes	No	**If yes, go to question 28.**	
1	Do the SOs continue to wear PPE on the way back to the operations site?	Yes	No		If no, Flag the SO(s) to the supervisor and insist the all SOs continue to wear PPE on the way back to the operations site.
2	Is anyone eating or drinking prior to removing PPE and washing?	Yes	No		If yes, Instruct site supervisor to ensure that no eating or drinking takes place prior to removing PPE and washing.
3	Are the Team Leaders supervising the cleaning and wash-up?	Yes	No		If no, Instruct the Team leaders to supervise all cleaning and wash-up.
4	Are there wash facilities with soap and water available for operators?	Yes	No		If no, Notify site supervisor to provide soap and water for the wash facilities for operators.
5	Do workers at a minimum wash their face and hands with soap and water?	Yes	No		if no, Instruct spray supervisor to ensure that operators wash their face and hands with soap and water.
6	Is there a sloped concrete catchment area or tarpaulin spread out on the ground to catch all effluent?	Yes	No		If no, Notify site supervisor to ensure that the wash area is sloped to the soak pit, and covered with a tarpaulin to catch all effluent.
7	Are all people (spray operators, washers, maintenance techs) in the wash/soak pit area wearing full PPE?	Yes	No		If no, Instruct site supervisor to ensure that all people (spray operators, washers, maintenance techs) in the wash/soak pit area wear full PPE.
8	Is all pesticide remaining in pumps emptied into the #1 drum?	Yes	No		If no, Notify site supervisor, retrain spray operators and team leaders.
9	Do the #2, 4 and 6 drums have sufficient water for today's cleanup?	Yes	No		If no, Instruct team leaders to be sure that sufficient water is available for triple rinse.
10	Are spray pumps triple rinsed using the progressive rinse method?	Yes	No		If no, Instruct spray supervisor to demonstrate correct triple-rinse procedure
11	Are the outsides of the pumps rinsed off in the soak pit?	Yes	No		If no, Instruct spray supervisor to demonstrate correct washing procedure.
12	Are the helmets, face shields, boots, and gloves rinsed off in the soak pit?	Yes	No		If no, Ask spray supervisor to demonstrate correct rinsing procedure
13	Upon return to the storehouse, are full and empty sachets/bottles returned to stores?	Yes	No		IF no, Flag this compliance issue with the site supervisor and check to see if the storekeeper is keeping records of pesticides handed out and returned.
14	Are the empty sachets/bottles counted	Yes	No		If no, Instruct storekeeper to count and store empty

	Question	Response		Comments	Follow up Actions
	and stored in labeled, sealed containers?				sachets in labeled and sealed containers.
15	Do the SOs complete their daily report forms?	Yes	No		If no, Instruct spray supervisor to ensure that all SOs complete the daily report forms.
16	Are forms checked by spray supervisors?	Yes	No		If no, Instruct supervisor to check all daily forms.
17	Are Team Leaders using the Error Eliminator to check the accuracy of Spray Operators data?	Yes	No		If no, Discuss with the Team Leaders the importance of using the Error Eliminator to check data accuracy and provide retraining as needed.
17a	If yes, Are Team Leaders using the Error Eliminator correctly?	Yes	No		If no, Provide feedback to Team Leaders on how to properly use the Error Eliminator.
18	Have there been any accidents? (Pesticide exposure, vehicle accidents, other injuries or property damage)	Yes	No	Type of accident	○ Pesticide exposure ○ Vehicle accident ○ Property damage ○ Other injury
	If yes, Has an incident report form been filed?	Yes	No	If no, Instruct SO and supervisor to file accident form immediately.	
	If yes, Date of incident:	__/__/____			
19	Have any SOs complained of irritation (throat, skin, etc.)?	Yes	No		If yes, Check on status of SO complaining of irritation and file report with Operations Manager.
20	Are the overalls washed and then hung for drying?	Yes	No		If no, Ensure that washers wash and hang overalls
21	Is the soak pit used to dispose of all contaminated water?	Yes	No		If no, Notify Site Coordinator and instruct to retrain all site staff in contaminated waste disposal.
22	Does all contaminated water drain properly into the soak pit?	Yes	No		If no, Reshape soak pit slope or use tarpaulin to ensure proper drainage.
23	Is the soak pit absorbing all the effluent waste without creating a puddle and/or run off?	Yes	No		If no, Soak pit may need rebuilding to remove mud and dirt, or consider relocating soak pit
24	Is there adequate gravel to act as a filter?	Yes	No		If no, Provide adequate gravel for filter
25	Are spray pumps hung upside down to dry?	Yes	No		If no, Instruct spray supervisor to ensure that spray operators hang the pumps upside down
26	Are washed spray pumps stored in an orderly way for easy preparation the next day?	Yes	No		If no, Instruct spray supervisor to ensure that spray operators store the pumps in an orderly manner
27	Are the covers placed on the 7 triple-rinse drums after all pumps are cleaned?	Yes	No	**Go to question 56.**	If no, Instruct spray supervisor to ensure that covers are placed on all the triple-rinse drums after all pumps are cleaned
Mobile Soak Pits					
28	Do the SOs continue to wear PPE on the way back to the operations site?	Yes	No		If no, Flag the SO(s) to the supervisor and insist the all SOs continue to wear PPE on the way back to the operations site.
29	Are empty sachets/bottles and full sachets/bottles returned to the team leader and recorded?	Yes	No		IF no, Flag this compliance issue with the team leader, district coordinator, and operations manager.
30	Is this the first day of operations at this site?	Yes	No	If no, Is there any water in the collection barrel at the beginning of	**Yes** **No** If yes, Instruct the site supervisor to ensure that waste water from the collection barrel is distributed among the pumps at the end of the day.

	Question	Response		Comments			Follow up Actions
				clean up?			
31	Is anyone eating or drinking prior to removing PPE and washing?	Yes	No				If yes, Instruct site supervisor to ensure that no eating or drinking takes place prior to removing PPE and washing.
32	Are the Team Leaders supervising the cleaning and wash-up?	Yes	No				If no, Instruct the Team leaders to supervise all cleaning and wash-up.
33	Is the mobile soak pit correctly installed with tarpaulin spread out on the ground that is sloped towards the mobile soak pit to catch all effluent?	Yes	No				If no, Notify site supervisor to ensure that the wash area is sloped to the mobile soak pit, and covered with a tarpaulin to catch all effluent.
34	Are all people (spray operators, washers, maintenance techs) in the wash/soak pit area wearing full PPE?	Yes	No				If no, Instruct site supervisor to ensure that all people (spray operators, washers, maintenance techs) in the wash/soak pit area wear full PPE.
35	Is all pesticide remaining in pumps emptied into the collection drum?	Yes	No				If no, Notify site supervisor, retrain spray operators and team leaders.
36	Do the 3 rinse water drums have sufficient water for today's cleanup?	Yes	No				If no, Instruct team leaders to be sure that sufficient water is available for triple rinse.
37	Are spray pumps triple rinsed using the progressive rinse method?	Yes	No				If no, Instruct spray supervisor to demonstrate correct triple-rinse procedure
38	Are the pumps depressurized into the collection drum before opening them to dump rinse water	Yes	No				If no, Instruct team leaders and spray operators on correct pump rinsing technique.
39	Are the outsides of the pumps rinsed off in the wash area so that wash water drains to the soak pit?	Yes	No				If no, Instruct spray supervisor to demonstrate correct washing procedure.
40	Is the waste water from the collection drum distributed among the spray pumps for the next day?	Yes	No				If no, Instruct spray supervisor to distribute the waste water from the collection drum into the spray pumps.
41	Are the helmets, face shields, boots, and gloves rinsed off in the wash area?	Yes	No				If no, Ask spray supervisor to demonstrate correct rinsing procedure
42	Do workers at a minimum wash their face and hands with soap and water?	Yes	No				if no, Instruct spray supervisor to ensure that operators wash their face and hands with soap and water.
43	Is the mobile soak pit used to dispose of all contaminated waste water from cleaning the helmet, face shield, gloves, boots, and outside of the pump?	Yes	No				If no, Notify Site Coordinator and instruct to retrain all site staff in contaminated waste disposal.
44	Does all contaminated waste water drain properly into the mobile soak pit?	Yes	No				If no, Reshape the slope of the wash area to ensure proper drainage.
45	Is the soak pit absorbing all the effluent waste without creating a puddle and/or run off?	Yes	No				If no, Mobile soak pit may need to be relocated, or boot wash may be needed. Remind Team Leader to cover mobile soak pit hole when not in use so that rain does not saturate the ground.
46	Are the covers placed on the 4 triple-rinse drums after all pumps are cleaned?	Yes	No				If no, Instruct spray supervisor to ensure that covers are placed on all the triple-rinse drums after all pumps are cleaned
47	Is this the last day of spray operations at this site?	Yes	No	If yes, Have the barrels been removed, hole for MSP refilled, and the ground returned to its original state?	Yes	No	If no, Instruct the Team Leader and Site Supervisor to arrange for the 4 barrels and tarpaulin to be removed, hole for the MSP filled, and the ground returned to its original state.
				If no, Has the MSP been pulled out of the ground with the hole covered	Yes	No	If no, Instruct the Site Supervisor to arrange for the MSP to be pulled out with the hole covered with the boot wash container or collection barrel and secure

	Question	Response		Comments			Follow up Actions
				and site secured?			the site.
48	Is the MSP kept in a secure room after returning from cleaning up?	Yes	No				If no, Discuss alternative storage of the MSP with the Site Supervisor.
49	Are the overalls transported back to the main fixed soak pit to be washed?	Yes	No				If no, Ensure that porters transport overalls to fixed soak pit for washing
50	Do the operators have clean overalls for the next day?	Yes	No				If no, Ensure that porters bring sufficient clean overalls to the field spray team.
51	Do the SOs complete their daily report forms?	Yes	No				If no, Instruct spray supervisor to ensure that all SOs complete the daily report forms.
52	Are forms checked by spray supervisors?	Yes	No				If no, Instruct supervisor to check all daily forms.
53	Are Team Leaders using the Error Eliminator to check the accuracy of Spray Operators data?	Yes	No				If no, Discuss with the Team Leaders the importance of using the Error Eliminator to check data accuracy and provide retraining as needed.
53a	If yes, Are Team Leaders using the Error Eliminator correctly?	Yes	No				If no, Provide feedback to Team Leaders on how to properly use the Error Eliminator.
54	Have there been any accidents? (Pesticide exposure, vehicle accidents, other injuries or property damage)	Yes	No	If yes, Has an incident report form been filed?	Yes	No	If no, Instruct SO and supervisor to file accident form immediately.
54a	If yes, Date of incident:			__/__/____			
	If yes, What type of accident?			○ Pesticide exposure ○ Property damage ○ Vehicle accident ○ Other injury			
55	Have any SOs complained of irritation (throat, skin, etc.)?	Yes	No				If yes, Check on status of SO complaining of irritation and file report with Operations Manager.
56	Additional Comments:	_____ _____ _____ _____					

USAID FROM THE AMERICAN PEOPLE President's Malaria Initiative	**Date of Inspection :**	
	Inspector's name and organization:	
	Country:	
	Level 1:	
	Level 2:	
	Level 3:	
	Level 4:	
Post IRS EC Inspection		

	Question	Response		Follow-up Question	Follow-up Response		Comments	Follow up Actions
1	Is this a temporary store?	Yes	No	**If yes, skip to question 2**	Yes	No		
				Is there a full-time year-round storekeeper?	Yes	No		
				Will pesticides be stored here in the off-season?	Yes	No		If yes, Inspect the stores Stock card & Ledger book to confirm correct recording.
				How much pesticide will be stored?				
				Are there guards at this facility 24 hours a day?	Yes	No		
				What are the expiration dates of the pesticides?	___/___/_____; ___/___/_____; ___/___/_____			
2	Have all the IRS items, signs, insecticides and wastes been removed from this store?	Yes	No	If no, Date IRS items will be removed:	___/___/_____			If no, Notify operations coordinator to arrange for removal of IRS items, signs, insecticides and wastes from the store and soak pit.
3	Has the pesticide storage area been washed with soap and water?	Yes	No	Date store was or will be washed	___/___/_____			If no, Notify operations coordinator to arrange for store to be washed with soap and water.
4	Is the soak pit covered and the gates locked?	Yes	No	Date soak pit was or will be covered and gates locked?	___/___/_____			If no, Contact operations coordinator to arrange to have soak pit covered and locked.
5	Are the soak pit and its surroundings left clean?	Yes	No	If no, Date soak pit and surroundings will be cleared.	___/___/_____			If no, Arrange to have the surroundings of the soak pit cleared.
6	Was the working relationship between the IRS team and owners of the store good?	Yes	No					If no, Investigate reason(s) for working relationship between the IRS and the store owner not being good.

	Question	Response		Follow-up Question	Follow-up Response	Comments	Follow up Actions
7	Would you recommend re-using this store next year?	Yes	No				If no, Research possibilities for relocating storage facility for next spray season.
8	Additional Comments	_____ _____ _____ _____ _____ _____ _____					

Storekeeper Performance

Date of Inspection :	
Inspector's name and organization:	
Country:	
Level 1:	
Level 2:	
Level 3:	
Level 4:	
Name/ID of Storekeeper	
Number of days of operation at this site:	

	Question	Response		Comments	Follow-up Action
1	Do people entering the pesticide storage area wear masks?	Yes	No		If no, Direct all personnel not to enter the pesticide storage area without proper PPE.
2	Do people wear masks, gloves, boots and overalls when handling pesticides?	Yes	No		If no, Direct all personnel to wear masks, gloves, boots, and overalls when handling pesticides.
3	Do warehouse teams eat inside the warehouse?	Yes	No		If yes, Direct warehouse team not to eat inside warehouse while IRS pesticides are in stock.
4	Are there soap and water basins available for washing hands?	Yes	No		If no, Contact logistics to provide water basins for washing hands.
5	Is the current pesticide Material Safety Data Sheet (MSDS) posted?	Yes	No		If no, Obtain the Material Safety Data sheet for the current pesticide and have it posted.
6	Is there a thermometer for monitoring daily temperature in the storage facility?	Yes	No		If no, Inform logistics/central storage to provide thermometer.
7	Are the following items present in the first aid kit?	Check if present: ☐ Band aids ☐ Gauze ☐ Antibiotic cream ☐ Eye wash ☐ Hydrocortisone cream/calamine ☐ Aspirin			If there are unchecked boxes, Inform logistics/central storage of missing items for this facility.
8	Is there a spill kit and a fire extinguisher in the warehouse?	Yes	No		If unchecked boxes, Inform logistics/central storage to provide missing items.
9	Are storekeepers familiar with the symptoms of pesticide poisoning?	Yes	No		If no, Check storekeeper training date. Direct storekeeper to read MSDS for the current pesticide(s) to memorize the symptoms of poisoning .
10	Do storekeepers know where the nearest health facility is located?	Yes	No		If no, Provide information on nearest health facility to storekeepers.
11	Were the antidotes for the pesticide in use provided to the nearest health facility?	Yes	No		If no, Inform logistics/central storage that antidotes may be needed for the health facility.
12	Are there records of pregnancy testing available?	Yes	No		If no, Check on dates for pregnancy testing and discuss with storekeeper to have these available.

	Question	Response		Comments	Follow-up Action
13	Is there any evidence of pesticide leakage?	Yes	No		If yes, Identify the source of the leak. Arrange for spill to be cleaned. Ensure that a labeled, covered hazardous waste container is available. Arrange to have pesticides repackaged as necessary.
14	Is the pesticide stock stored no more than 2 m high and off of the ground?	Yes	No		If no, Discuss stacking and/or packaging with storekeeper.
15	Are the insecticide and contaminated waste stored away from other materials in the store?	Yes	No		If no, Discuss storage of pesticide and contaminated waste with the storekeeper.
16	Is the number of sachets or bottles counted and recorded before distribution to SO?	Yes	No		If no, Discuss record keeping with storekeeper.
17	Is there a system of recording stock cards?	Yes	No		If no, Discuss record keeping with storekeeper.
18	Are the stock cards up to date?	Yes	No		If no, Discuss record keeping with storekeeper.
19	Are the stock of waste (especially, used packaging and dust masks) recorded?	Yes	No		If no, Direct the storekeeper to complete updated stock cards for these waste items.
20	Is there an adequate filing system?	Yes	No		If no, Discuss record keeping with storekeeper.
21	Using the stock cards, can the storekeeper indicate the quantity and age of remaining stock?	Yes	No		If no, Discuss record keeping with storekeeper.
22	Using the stock cards, can the storekeeper indicate the quantity of stock that has been used to date?	Yes	No		If no, Discuss record keeping with storekeeper.
23	Are stocks stored on shelves and labeled?	Yes	No		If no, Discuss packing with storekeeper. Obtain pesticide labels and re-label pesticide boxes.
24	Are pesticides properly labeled?	Yes	No		If no, Obtain pesticide labels and re-label boxes.
25	Are the insecticides distributed on a first expired, first out (FEFO) system so that the insecticide that expires first is distributed first?	Yes	No		If no, Discuss FEFO pesticide distribution with storekeeper.
26	Are there any insecticides past their expiration date?	Yes	No		If yes, Contact logistics to dispose of expired pesticide.
27	Are barrels or containers for empty sachets and used masks available and clearly labeled?	Yes	No		If no, Contact logistic/central storage for barrels or containers for empty sachets and used masks. Clearly label the barrels or containers as contaminated waste. Include type of pesticide on label.
28	Are the used sachets counted and stored neatly in the labeled containers?	Yes	No		If no, Discuss with storekeeper deficient storage and/or labeling of empty sachets.
29	Does the number of empty sachets equal what the storekeeper indicates as the quantity of stock issued to date?	Yes	No		If no, Discuss used sachet collection and recordkeeping procedure with storekeeper.
30	Is there more than one spray season of accumulated solid waste?	Yes	No		If yes, Contact logistics to reassign surplus pesticide.
31	Is there a strategy in place for disposing of solid waste?	Yes	No		If no, Identify waste disposal facilities and clear with ECM.
32	Have there been any complications with identifying a disposal system?	Yes	No		If yes, Discuss waste disposal options with COP and ECM.
33	When will disposal of contaminated waste take place?	__/__/____			

	Question	Response		Comments	Follow-up Action
Annex: Storekeeper Performance Tracking					
34	Is the Spray Performance Tracking Sheet displayed and correctly filled out?	Yes	No		If 'no, Work with the storekeeper to fill out the Spray Performance Tracking Sheet and ask the storekeeper to display it.
35	Is the store ledger book fully updated?	Yes	No		If no, Direct the storekeeper in updating the store ledger.
36	Are the stock cards for all the stock items fully updated?	Yes	No		If no, Direct the storekeeper in updating the stock cards.
37	Does the balance in the store ledger book match the balance on the stock card for all stock items?	Yes	No		If no, Immediately alert the Logistics Manager and District Coordinator that the balance in the store ledger book does not match the balance in the stock cards.
38	Does the balance on the stock card equal to the result of a physical stock count for each item?	Yes	No		If no, Immediately alert the Logistics Manager and District Coordinator that the balance in the stock cards is inconsistent with a stock count.
	Insecticide Stock				
39	Does the stock balance on the Spray Performance Tracking Sheet equal to the physical stock count?	Yes	No		If no, Immediately alert the Logistics Manager and District Coordinator that the balance on the Spray Performance Tracking Sheet is inconsistent with a stock count.
40	Is the Insecticide Tracking Sheet completed daily?	Yes	No		If no, Immediately alert the Logistics Manager and District Coordinator that the Insecticide Tracking Sheet is not completed daily.
41	Does the stock balance on the Insecticide Tracking Sheet match the balances in the store ledger and on the stock card?	Yes	No		If no, Immediately alert the Logistics Manager and District Coordinator that the balance on the Insecticide Tracking Sheet is inconsistent with the store ledger and stock card.
42	Does the sum of the stock balance on the stock card + the stock issued out for the day + the stock balance of empty sachets/bottles, equal to the opening balance in the ledger?	Yes	No		If no, Immediately alert the Logistics Manager and District Coordinator.
	Dust Masks				
43	Does the sum of the stock balance on the stock card + the stock issued out for the day + the stock balance of used masks, equal to the opening balance in the ledger?	Yes	No		If no, Immediately alert the Logistics Manager and District Coordinator.
44	Additional Comments	_____ _____ _____ _____ _____			

Date of Inspection :	
Inspector's name and organization:	
Country:	
Level 1:	
Level 2:	
Level 3:	
Level 4:	
Number of spray operators at site:	
Number of days of operation at this site:	
Number of vehicles carrying operators and pesticides to/from this site	

Pre-Season Environmental Compliance Assessment and Inspection

	Question	Response		Follow Up Question	Follow up Response	Comments	Follow up Action
1	Is there a storage facility at this location?	Yes	No	**If no, go to question 26**			
2	Is the storage facility located an adequate distance from sensitive receptors (schools, homes, and water bodies/flood plains, etc.)?	Yes	No	Distance to nearest sensitive receptor (meters)			If No, Research possibilities for relocating storage facility.
				Take photo showing store and receptor			
3	Is the storage facility fenced?	Yes	No				
4	Are there double locks on pesticide storage?	Yes	No	If no, Delivery date for locks	___/___/_____		If No, Check storage inventory, pending purchase orders, and delivery date for padlocks and needed hardware.
5	Leak-free floor and roof?	Yes	No	If no, take photo of defect			If No, Send picture of defect to contractor for roof and/or floor repair. Get completion date.
				If no, completion date for repairs	___/___/_____		
6	Windows barred and screened?	Yes	No	If no, take photo(s) of windows			If No, Send picture to contractor for installing bars and screens on windows. Get completion date.
				If no, number of windows			
				If no, work completion date	___/___/_____		
7	Adequate lighting?	Yes	No	If no, completion date for lighting improvement	___/___/_____		If No, Improve lighting in storage facility. Get completion date.

	Question	Response		Follow Up Question	Follow up Response	Comments	Follow up Action
8	Will facility be guarded 24 hrs./day?	Yes	No	Training date for guards	___/___/_____		
9	Are any pesticides to be used this year in inventory?	Yes	No	If yes, date of pesticide arrival at store	___/___/_____		
				If yes, take photo of pesticide inventory			
				If no, when will pesticide arrive?	___/___/_____		
				If no, go to question 15			
10	Adequate PPE in inventory for Storekeeper and Visitors (Dust mask, coveralls, gloves, boots)? Check all that are **present**	○ Dust mask ○ Coveralls ○ Gloves ○ Boots ○ None		If missing items, PPE delivery date	Dust masks: ___/___/_____ Coveralls: ___/___/_____ Gloves: ___/___/_____ Boots: ___/___/_____		If No, Contact logistics/central storekeeper to have missing items delivered immediately. Get delivery date. Advise all personnel not to enter pesticide storage without PPE.
11	Pesticides to be used this year properly labeled?	Yes	No	If yes, take photo of pesticide label			If No, Obtain pesticide labels and re-label boxes.
				If no, take photo of absent/defective label			
				Pesticide expiration date (If Actellic, state 2 years after date of manufacture)	___/___/_____		
12	Are there obsolete or expired insecticides in store?	Yes	No	If yes, take photo of pesticide type and expiration date	___/___/_____		If Yes, Contact logistics to dispose of obsolete pesticide.
				If yes, take photo of amount and condition of expired pesticide			
				If yes, name/type of obsolete or expired pesticide			
				If yes, quantity of sachets or bottles			
				If yes, pesticide expiration date	___/___/_____		
13	Pesticide stacked on pallets with intact packaging?	Yes	No	If no, take photo of defects			If No, Discuss stacking and/or packaging with storekeeper, obtain pallets and/or cartons for repackaging damaged cartons of pesticide.
14	Maximum storage height (2 m) exceeded and/or aisles blocked?	Yes	No	If yes, take photo of defects			If Yes, Notify storekeeper to rearrange items that are stacked too high.
	Skip to question 16						

	Question	Response		Follow Up Question	Follow up Response	Comments	Follow up Action
15	Adequate PPE in inventory for Storekeeper and Visitors (Dust mask, coveralls, gloves, boots)? Check all that are present	○ Dust mask ○ Coveralls ○ Gloves ○ Boots ○ None		If no, PPE delivery date	Dust masks: ___/___/_____ Coveralls: ___/___/_____ Gloves: ___/___/_____ Boots: ___/___/_____		If No, Contact logistics/central storekeeper and get missing items shipping/delivery date.
16	Soap, water and tubs available?	Yes	No	If no, delivery date for soap and tubs	___/___/_____		If No, Check with central storekeeper/logistics to get delivery date for soap, wash tubs, and water.
17	Danger signs with skull and crossbones posted?	Yes	No	If no, delivery date	___/___/_____		If No, Check with central storekeeper/logistics to get delivery date for Danger signs.
				If no, installation date for signs	___/___/_____		
18	Correct pesticide Health and Safety Sheet laminated and posted?	Yes	No	If no, Number of H&S sheets, Spill and Emergency Procedures needed for store and vehicles			If No, Print out enough current pesticide(s) Health and Safety sheets for storehouse and pesticide transport vehicles. Deliver to storehouse and post.
				If no, Delivery date for laminated and posted pesticide health and safety sheets	___/___/_____		
19	Emergency response procedure with phone numbers posted?	Yes	No	If no, date form will be delivered and posted	___/___/_____		If No, Print out Emergency Response Procedure for storehouse and pesticide transport vehicles, deliver to storehouse and post.
20	Spill response procedure posted?	Yes	No	If no, date form will be delivered and posted	___/___/_____		If No, Print out Spill Response Procedure for storehouse and pesticide transport vehicles, deliver to storehouse and post.
21	Recording thermometer on wall?	Yes	No	If no, delivery and installation date	___/___/_____		If No, Check with central storekeeper/logistics to get delivery date for thermometers.
22	Fire extinguisher inside and outside storeroom?	Yes	No	If no, delivery and installation date	___/___/_____		If No, Check with central storekeeper/logistics to get delivery date for fire extinguishers.

	Question	Response		Follow Up Question	Follow up Response	Comments	Follow up Action
23	Fully stocked spill kit (Sand bucket, long handle brush with stiff bristle, shovel, short brush) and first aid kit (band aids, gauze, antibiotic cream, eye wash, hydrocortisone cream/calamine, aspirin)? Check all that are **present**	○ Sand bucket ○ Long handle brush ○ Shovel ○ Short brush ○ Band aids ○ Antibiotic cream ○ Eye wash ○ Hydrocortisone cream/Calamine ○ Aspirin ○ None		If there are missing items, get date of delivery to storeroom from central storekeeper	Sand bucket: ___/___/_____ Long handle brush: ___/___/_____ Shovel: ___/___/_____ Short brush: ___/___/_____ Band aids: ___/___/_____ Gauze: ___/___/_____ Antibiotic cream: ___/___/_____ Eye wash: ___/___/_____ Hydrocortisone cream/calamine: ___/___/_____ Aspirin: ___/___/_____		If there are missing items, prepare detailed list of items needed for Spill and First Aid kits and send to logistics/central storekeeper. Get delivery dates.
24	Containers for contaminated wastes available and clearly marked (empty sachets, masks, etc.)	Yes	No	If no, delivery date for containers	___/___/_____		If No, Contact logistics/central storekeeper and get delivery date for contaminated waste containers. Make labels and attach to containers.
				If no, date to be labeled	___/___/_____		
25	Storekeeper trained on signs of poisoning and location of nearest treatment facility	Yes	No	Date storekeeper was or will be trained	___/___/_____		If No, Get date of storekeeper training.
26	Antidotes to pesticides available nearby?	Yes	No	If yes, Distance to nearest health facility (kilometers)			If No, Check with logistics/storekeeper on status of antidotes.
				If no, antidote delivery date	___/___/_____		
27	Pregnancy tests administered?	Yes	No	Date of pregnancy testing	___/___/_____		If No, Get date of pregnancy testing.
28	Is there a soak pit at this location?	Yes	No	**If no, end of questionnaire**			
29	Is the soak pit located away from water bodies, steep slopes or flood prone areas?	Yes	No	Yes or no, take photo of soak pit area			If No, Research possibilities for relocating soak pit.

	Question	Response		Follow Up Question	Follow up Response	Comments	Follow up Action
30	Are soak pit and surroundings cleared of vegetation and cleaned?	Yes	No	If no, date for cleaning/clearing	___/___/_____		If No, Arrange for clearing/cleaning of soak pit area.
31	Is the soak pit correctly fenced, gated, locked & strongly built to hang pumps?	Yes	No	If no, date of repair	___/___/_____		If No, Arrange for repair/replacement of fencing, gate, locks, and/or pump hangers as needed.
				If no, take photo showing defects			
32	Is there an adequate water supply for personnel and clothes washing and triple rinse of pumps?	Yes	No	If no, delivery date	___/___/_____		If No, Check with Operations Manager to secure water supply.
33	Are the washing areas properly sloped to drain to the soak pit, with no leaks or cracks?	Yes	No	If no, date of repair	___/___/_____		If No, Arrange for re-sloping and/or repairing cracks in wash area.
34	Does the sawdust, charcoal, and gravel appear to be adequate & well placed and prepared to act as a filter?	Yes	No	If no, date of repair	___/___/_____		If No, Itemize soak pit needs and arrange for needed soak pit materials and labor to repair.
35	Are there seven progressive rinse barrels and overall wash tubs?	Yes	No	If no, delivery date	___/___/_____		If No, Check with central stores and obtain delivery date for rinse barrels and wash tubs.
36	Are there lines to dry the clothes and are they strong enough to carry the load?	Yes	No	If no, installation date	___/___/_____		If No, Arrange for construction of drying lines for overalls.
37	Are there skull and crossbones hazard signs on the fence?	Yes	No	If no, delivery date	___/___/_____		If No, Arrange for delivery and installation of Danger signs on soak pit fence.
				If no, installation date	___/___/_____		
38	Are there showers and toilets with adequate privacy and drainage present? (male/female)	Yes	No	If no, completion date	___/___/_____		If No, Arrange for construction of operator wash areas and/or toilets.
39	Additional Comments	_____ _____ _____ _____ _____					

USAID FROM THE AMERICAN PEOPLE President's Malaria Initiative	**Date of Inspection :**	
	Inspector's name and organization:	
	Country:	
	Level 1:	
	Level 2:	
	Level 3:	
	Level 4:	
Pre-Contract Transport Vehicle Inspection	**Vehicle Make:**	
	Vehicle Model:	
	License Plate Number:	

Question		Response		Follow Up Question	Follow up Response		ECO Action	Work List
1	Is a special license or certificate needed for driver or vehicle transporting hazardous goods or numerous people?	Yes	No					
1a				If yes, Does the driver and/or vehicle have the needed certification for transporting hazardous goods or numerous people?	Yes	No	If no, Inform vehicle owner that contract will not be awarded without license of certification.	If no, Problem noted: Vehicle or driver does not possess the required certificate or license. Vehicle or driver cannot be used until certificate is obtained.
1b				If 1a is yes, 'Date of Expiration:'	____/_____/_____			
2	Are the vehicle insurance and technical inspection documents up-to-date?	Yes	No				If No, Inform vehicle owner that contract will not be awarded without complying with requirements.	If No, Problem noted: Vehicle does not comply with insurance and inspection requirements. Cannot be used for IRS until rectified.
2a				If Yes, Provide expiration dates of vehicle documents.	Insurance: ____/____/____ Inspection: ____/____/____			
3	Does the driver have a valid license and a cell telephone? Check if present	Lic.	Cell Phone	If Divers License checked, Provide expiration dates of driver's license.	____/____/____		If any unchecked, Inform vehicle owner that contract will not be awarded without ___(list unchecked)___ for the driver.	If No, Problem noted: Driver does not have ___(list unchecked)___. Cannot be used for IRS until rectified.

Question		Response		Follow Up Question	Follow up Response		ECO Action	Work List
4	Has the driver attended safety training this year?	Yes	No				If No, Provide safety training for driver. Follow up to ensure that training takes place as scheduled. Drivers must be given certificates upon completion of training.	If No, Problem noted: Must provide safety training for driver before spray campaign.
4a				If Yes, When did training take place?	____/_____/_____			
4b				If No, When will training take place?	____/_____/_____			
5	Is this truck ever used to transport food products, animal feed, or consumer goods?	Yes	No				If yes, Truck may not be used to transport food products, animal feed, or consumer goods during the course of the rental. Provide driver with directions on how to decontaminate truck after transporting pesticides and before using truck to transport food products, animal feed, or consumer goods.	If yes, Problem noted: Multi-use vehicle. Ensure that vehicle will only be used by AIRS for the duration of the contract, and that it will only be used for either pesticide transport, or for operator transport.
6	Does the vehicle have a leak-free floor or carpeted floor?	Yes	No					
6a				If no, Can the floor be repaired?	Yes	No	If Yes, Instruct owner to have floor repaired or carpeted before vehicles can be used. Confirm date for completing repair. If no, This vehicle cannot be used for IRS.	If Yes, Confirm date of repair of vehicle floor before using for IRS.
6b				If repairable, 'Date for completing repairs:'	____/_____/_____			
7	Is there a fully-stocked first aid kit in the vehicle?	○ Eye wash ○ Band aids ○ Gauze ○ Antibiotic cream ○ Hydrocortisone cream/ Calamine ○ Aspirin					If unchecked boxes, Inform logistics manager to provide missing items for the vehicle.	If unchecked boxes, Problem noted: Need unchecked items for the vehicle before it can be used.
7a				If unchecked boxes, Delivery date for (list missing items)	____/_____/_____			If unchecked boxes, Confirm delivery date for (list missing first aid kit items).
8	Do drivers have appropriate PPE (boots, gloves, and filter mask) in case of a spill or accident?	○ Overalls ○ Boots ○ Gloves ○ Mask					If unchecked boxes, Inform logistics manager to provide (list missing items) for the vehicle.	If unchecked boxes, Problem noted: Need (list unchecked items) for the vehicle before it can be used.

Question		Response		Follow Up Question	Follow up Response		ECO Action	Work List
8a				If unchecked boxes, Delivery date for missing items	_____/_____/_____			If unchecked boxes, Confirm delivery date for (list missing first aid kit items).
9	Can the pesticides be adequately secured and tied down in the vehicle?	Yes	No				If no, Advise logistics coordinator to provide materials for securing and tying down pesticides in the vehicle, before vehicle can be used for spray campaign.	If no, Problem noted: Need to provide materials for securing and tying down pesticides in the vehicle, before vehicle can be used for spray campaign.
10	Do the spray operator transport vehicle(s) have seats and railings?	Yes	No	N/A			If no, Advise driver and vehicle owner that vehicle will not be used unless seats and railings are installed and in good condition.	If no, Problem noted: Need seats and railings before vehicle can be used for spray campaign.
11	Does the pesticide transportation vehicle have a fire extinguisher?	Yes	No	N/A			If no, Advise driver and vehicle owner that vehicle will not be used unless vehicle is equipped with a fire extinguisher.	If no, Problem noted: Need fire extinguisher before vehicle can be used for spray campaign.
12	Is there evidence of pesticide leakage in the vehicle?	Yes	No				If yes, Advise driver and vehicle owner that vehicle will not be used for IRS unless it is decontaminated.	If yes, Problem noted: Check to ensure pesticide leakage has been cleaned up in the spray operator transport vehicle before contract is signed.
13	Does vehicle pass all criteria?	Yes	No				If yes, Provide a numbered certificate to be kept in vehicle during campaign. Certificate must have an AIRS stamp, and list Make and model of vehicle, as well as the license plate number.	
13a				If no, Can vehicle be modified to meet all criteria?	Yes	No	If no, This vehicle cannot be used for IRS.	If yes, Problem noted: Vehicle modifications must be confirmed before contract is signed. If no, Problem noted: Vehicle will not be used for IRS.
13b				If 13a is yes, 'Date modifications will be complete.'	_____/_____/_____			