USAID
FROM THE AMERICAN PEOPLE

U.S. PRESIDENT'S MALARIA INITIATIVE

U.S. PRESIDENT'S MALARIA INITIATIVE
vectorlink
INTELLIGENT › INNOVATIVE › INTEGRATED

THE U.S. PRESIDENT'S MALARIA INITIATIVE BEST MANAGEMENT PRACTICES (BMP) MANUAL

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

Recommended Citation: Chandonait, Peter; Guyah, Kerri-Ann; Acquaye, Albert; Diop Dieng, Sana. February 2020. *The U.S. President's Malaria Initiative (PMI) Best Management Practices (BMP) Manual for Indoor Residual Spraying (IRS) in Vector Control Interventions.* Rockville, Maryland. The PMI VectorLink Project, Abt Associates Inc.

Contract Number: AID-OAA-17-00008

Task Order: AID-OAA-TO-17-00027

Submitted to: United States Agency for International Development (USAID)/PMI

Abt Associates Inc.
6130 Executive Boulevard Rockville, Maryland 20852
T. 301.347.5000 | F. 301.913.9061 | www.abtassociates.com

THE U.S. PRESIDENT'S MALARIA INITIATIVE
BEST MANAGEMENT PRACTICES (BMP) MANUAL

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

Spray Team ready for spray operations in Ghana.

PREFACE

PMI's Strategy for 2015–2020 takes into account the progress over the past decade and the new challenges that have arisen. Under this strategy, the U.S. Government's goal is to work with PMI-supported countries and partners to further reduce malaria deaths and substantially decrease malaria morbidity, towards the long-term goal of elimination. In FY 2017, thanks to increased funding for PMI from the U.S. Congress, PMI announced plans for a five-country expansion adding programs in Burkina Faso, Cameroon, Côte d'Ivoire, Niger and Sierra Leone, which grew PMI's reach to 24 malaria-endemic countries in sub-Saharan Africa, including those with the highest burden, and three programs in the Greater Mekong Sub-region of Southeast Asia

IRS activities involve the use of insecticides and hence are subject to USAID's 22 Code of Federal Regulations (CFR) 216 regulations, particularly the implementation of the monitoring and mitigation requirements of the 2012 and 2017 updates 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 insecticide use in IRS:

1. Environmental Assessment
2. Worker and Resident Health and Safety
3. Insecticide Storage, Stock Control and Inventory
4. Insecticide Transport
5. Spraying Techniques
6. Effluent Waste Disposal
7. Solid Waste Disposal
8. Spill Response
9. Incident Reporting
10. DDT Special Considerations
11. IRS-related Construction

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. These checklists will be used to generate field reports that can be shared with project staff and local environmental authorities to ensure corrective action and guide forthcoming IRS activities in environmental compliance. 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
- Spray Operator Transportation Vehicle Inspection

- Home Owner Preparation and Spray Operator Performance
- End of Day Cleanup
- Storekeeper Performance
- Post-IRS Environmental Compliance Inspection

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

ACT	Artemisinin-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
DECS	Director of Environmental Compliance and Safety
ECO	Environmental Compliance Officer
ECM	Environmental Compliance Manager
FAO	U.N. Food and Agricultural Organization
EIA	Environmental Impact Assessment
IP	Implementing Partner
ITN	Insecticide Treated Bed Net
IRS	Indoor Residual Spraying
IVM	Integrated Vector Management
MEO	Mission Environmental Officer
MOH	Ministry of Health
MSP	Mobile soak pit
NMCP	National Malaria Control Program
OHS	Occupational Health and Safety
PEA	Programmatic Environmental Assessment
PMI	U.S. President's Malaria Initiative
PPE	Personal Protective Equipment
SEA	Supplemental Environmental Assessment
TOT	Training of Trainers
USAID	U.S. Agency for International Development
WHO PQ	World Health Organization Prequalification
WHOPES	World Health Organization Pesticide Evaluation Scheme

ACKNOWLEDGEMENTS

This is the second update to the PMI Best Management Practices for Indoor Residual Spraying. It was prepared under the IDIQ AID-OAA-17-00008, Task Order 1, AID-OAA-TO-17-00027, the PMI VectorLink project.

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

We appreciate the guidance of the USAID/Global Health Bureau, including Allison Belemvire, Kristen George, and Dennis Durbin. 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) Manual establishes a uniform approach for the environmental assessment of Indoor Residual Spraying (IRS) 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 January 2017, details the pathways of risk associated with IRS through various media (e.g., inhalation, oral, etc.) and activities (e.g., mixing insecticides, spraying, etc.); evaluates human health risks associated with WHOPES-approved and WHO Pre-qualification listed IRS insecticides.

This BMP establishes requirements for the following activities:

- Responsibilities for Environmental Assessments
- Contents of SEAs
- Determining scope of the project
- Procedures for processing SEAs

SUPPLEMENTAL ENVIRONMENTAL ASSESSMENTS

The general purpose of an SEA is to provide Agency and host country decision makers with a 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 SEA has more detailed information on country and/or district level of the proposed vector management activities than the overall programmatic Integrated Vector Management environmental assessement. The SEA process allows a more in-depth environmental analysis at the country and district level.

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.

SUMMARY

Summarize in the appropriate sections below major conclusions, areas of controversy, if any, and the issues still to be resolved through the EA. The project description should include all phases of project activities, as an example, for infrastructure projects this includes pre-construction, construction, operations, closure, decommissioning and monitoring, as well as connected and ancillary activities as the basis for the identification and evaluation of impacts.

- Project Description
- Project Context
- Summary of 22cfr216 Requirements (E.G., IEE and Threshold Determination)

- Major Conclusions of Scoping Process
- Areas of Controversy (if any)
- Issues to be Resolved

PURPOSE

Specify the underlying purpose and need to which the Agency is responding in proposing the alternatives including the proposed action. Provide relevant contextual information, including the outcome of the scoping process, relevant host country context, and stakeholder consultations.[1]

- Project Description
- Purpose and Need for the Proposed Action
- Host Country Context
- Summary of Environmental Scoping Process
- Stakeholder Engagement and Host Government Consultations

AFFECTED ENVIRONMENT (SOCIAL, PHYSICAL, ENVIRONMENTAL)

Succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration. Unless the project is country-wide, descriptions provided for each category below should address the status in the projects area of influence. The descriptions shall be no longer than is necessary to understand the effects of the alternatives. Data and analyses in the EA shall be commensurate with the significance of the impact with less important material summarized, consolidated, or simply referenced. The data and analysis provided here may involve collection of additional baseline data, particularly for data gaps identified in the Scoping Statement, through field surveys, stakeholder engagement, and site visits. Useful areas of information are provided below to organize project data and analyses for the EA.

- Population Characteristics
    - Size
    - Ethnicity
    - Gender
    - Age Distribution
    - Socioeconomic Status and Characteristics
    - Description of Project Beneficiaries
- Public Health Status
- Geographic Characteristics
- Land Use Characteristics

[1] See Public Participation Best Practices published by IAIA (2006) http://www.iaia.org/publicdocuments/specialpublications/SP4%20web.pdf

- Cultural Or Historic Resources
- Environmental Baseline Information
    - Climate and Climatic Patterns (historic, current, and predicted)
    - Air
    - Water Resources
    - Ground Water
    - Surface Water
    - Land Resources
    - Wildlife
    - Endangered, Threatened, and Protected Species and Their Critical Habitats
    - Protected Areas and National Parks
    - Environmental Data
    - Environmental Studies of Affected Area

Policy, Legal, Regulatory, and Permitting Requirements

1. Relevant and Applicable Host Government Policy, Legal, and Regulatory Requirements

   Describe in detail the regulatory requirements that the project should follow.

2. Relevant and Applicable International Standards and Best Practices

   Describe in detail the international standards and best practices that the project should follow, especially in the absence of adequate host country requirements.

3. Relevant and Applicable Permitting Requirements

   Describe any license or permit requirement necessary for the project. Such permits may include, but are not limited to, building permits, storm water permits, and land use permits.

Alternatives, Including the Proposed Action and Connected Actions

Provide the environmental impacts of the proposal and its alternatives in comparative form in order to provide a clear basis for choosing the proposed action among the identified alternatives. This section should:

1. Explore and evaluate reasonable alternatives and briefly discuss the reasons for eliminating those alternatives not included in the detailed study;
2. Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits;
3. Include the alternative of no action;
4. Identify the Agency's preferred alternative or alternatives, if one or more exists;
5. Include appropriate mitigation measures not already included in the proposed action or alternatives.]

DISCUSSION OF ALTERNATIVES

Alternative 1 (Proposed)

Alternative 2

Alternative 3 (No Action)

COMPARISON OF ENVIRONMENTAL IMPACTS

As required by 22CFR216.6(c)(3), the following provides in comparative form, impacts of the proposed intervention, reasonable alternatives, and the no action scenario.

Notes: (+2) highly positive effect/beneficial; (+1) positive effect/beneficial; (-2) significant negative effect/highly detrimental; (-1) negative effect/detrimental; (0) remains the same (i.e., no effect or same rate of change versus becoming progressively worse or better).

EVALUATION OF THE ALTERNATIVES

RATIONALE FOR ELIMINATING ALTERNATIVES NOT INCLUDED FOR FURTHER EVALUATION

RANKING OF ALTERNATIVES WITH RESPECT TO SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

ENVIRONMENTAL CONSEQUENCES

Per 22CFR216.6(c), this section forms the analytic basis for the comparisons of the identified alternatives. Discuss the environmental impacts of the alternatives, including the proposed action; any adverse effects that cannot be avoided should the proposed action be implemented; the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity; and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented.

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

- Direct Effects and Their Significance
- Indirect Effects and Their Significance
- Cumulative Effects and Their Significance
- Area of Land Disturbance
- Impacts to Endangered, Threatened or Protected Species and Their Critical Habitats
- Impacts to Forestry and Biodiversity
- Wetland Impacts
- Possible Conflicts Between Proposed Action and Land Use Plans
- Possible Conflicts Between Proposed Action and Policies and Controls for Areas Concerned
- Energy Requirements and Conservation Potential of Various Alternatives and Mitigation Measures

- Natural or Depletable Resource Requirements
- Conservation Potential of Various Requirements and Mitigation Measures
- Urban Quality
- Historic and Cultural Resources
- Design of The Built Environment, Including Reuse and Conservation Potential of Various Alternatives and Mitigation Measures
- Means to Mitigate Adverse Environmental Impacts

COMPARISON OF ENVIRONMENTAL EFFECTS OF THE ALTERNATIVES

- Summary
- Comparison of Remedies Available for the Environmental Consequences of Alternatives
- Overall Comparison of Alternatives with Respect to Feasibility, Ability to Meet Project Goals, Environmental Impact Ranking, Costs, and Schedule for Completion

ADVERSE IMPACTS THAT CANNOT BE AVOIDED

RELATIONSHIP BETWEEN SHORT TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Environmental Mitigation and Monitoring Plans

Provide information on plans for mitigating environmental impacts of planned interventions. Include mitigation, monitoring, responsibilities, costs, and capacity building requirements. Refer to the Environmental Mitigation and Monitoring Plan (EMMP) template here.

ENVIRONMENTAL MITIGATION PLAN

Describe the plan for reducing or eliminating the potential environmental impacts of the planned interventions.

ENVIRONMENTAL MONITORING PLAN

Describe the plan for monitoring the implementation and effectiveness of the planned mitigation measures, including responsible parties and frequency of monitoring.

List of Preparers

List the names and qualifications (expertise, experience, professional discipline) of the persons primarily responsible for preparing the Environmental Assessment or significant background papers.

APPENDICES

TERMS OF REFERENCE

Terms of Reference (TOR) of the EA include: a) Requirements related to data on ecological resources within the defined geographic zone; b) Timeframes for all phases of the project; c) Information gaps/survey needs that should be addressed in order to assess potential impacts and their significance.

RELEVANT MAPS

TECHNICAL DESIGNS AND DRAWINGS

DOCUMENTATION OF STAKEHOLDER CONSULTATION

- Key Stakeholders identified
- Means of identification and consultations
- Stakeholder meeting notes and comments

PROCESSING THE SEA

Preparations of SEA reports should occur 6 months before the beginning of spray operations, coordinating with both the in country PMI Mission and the project COR team, and on-site evaluation of proposed operations 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 the PMI COR team, USAID environmental officers (Mission Environmental Officer (MEO), Regional Environmental Advisor (REA), Bureau Environmental Officers (BEOs), and the in-country PMI Mission. Once the reviewers' comments are incorporated into the document, the final SEA is cleared by the Mission Director and then submitted to the USAID Global Health and Africa Bureau Environmental Officers for signature.

HOST COUNTRY EIAS

Many of the countries receiving support under the U.S. 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. Preparation of the EIA for the host country procedures and that of USAID should be undertaken concurrently to the extent possible. Much of the information gathered during the EIA process should be the similar for both the host country procedures and USAID. If applicable, a certificate of approval from the competent national environmental authority must be received before IRS may begin.

RESOURCES AND REFERENCES

- USAID Integrated Vector Management Programs for Malaria Vector Control: (2012 and 2017 Update) Programmatic Environmental Assessment USAID

2012 Version: https://www.pmi.gov/docs/default-source/default-document-library/implementing-partner-reports/integrated-vector-management-programs-for-malaria-vector-control-programmatic-environmental-assessment---volume-1-of-2-main-document.pdf

2017 Version: https://www.pmi.gov/docs/default-source/default-document-library/tools-curricula/integrated-vector-management-programs-for-malaria-vector-control-programmatic-environmental-assessment-2017.pdf

- USAID Environmental Assessment Guidance and Template
- https://www.usaid.gov/documents/1865/environmental-assessment-ea
- US Code of Federal Regulations (CFR) 22 CFR 216 USAID Environmental Procedures https://www.usaid.gov/our_work/environment/compliance/22cfr216

BMP 2: Worker and Resident Health and Safety

Purpose and Scope

This BMP is intended to provide acceptable safety standards and practices for the handling, storage, transportation and use of insecticides used in PMI-supported IRS programs, to minimize the risk for human exposure. It is drawn largely from PMI experience over many years, and guidelines from the World Health Organization (WHO) and Food and Agricultural Organization (FAO).

This BMP was developed for use by all spray personnel, (supervisors, storekeepers, drivers, washers, and spray operators) and the beneficiaries of the IRS program and includes standards for the handling, storage, and transportation of insecticides and use of insecticides during spray operations, 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
- Insecticide Exposure and Treatment

Definitions

- Exposure: The condition of being unprotected from the effects of insecticides
- Contamination: The presence of impurity(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 insecticides. All persons with potential direct contact or exposure to insecticides during handling, transportation, storage, use and cleaning of insecticides or insecticide contaminated materials must wear appropriate personal protective clothing in accordance with the safety instructions on the product label or material safety data sheet (MSDS).

For spray operators, the following guidelines should be followed:

- Helmet to protect head from spray droplets or falling objects;
- Full face shield to protect face and eyes against spray fall-out and splashes;
- Filter mask to protect nose and mouth from airborne particles of the spray fall-out and to avoid inhalation. Paper filter masks must be replaced each day for spray operators;
- Neck protection to protect the neck from spray fall-out and splashes;
- Long sleeved overalls of a weight and thickness appropriate for the climate. Local preferences, such as two-piece overalls or long skirts wrapped around pants for women, may be followed, as long as they afford the same degree of protection. Spray personnel must have two uniforms minimum to allow for daily changes. Pants should be worn over boots, not tucked into them. They must be changed daily for spray operators using IRS chemicals other than DDT; every two days for spray operators using DDT (to minimize effluent waste).
- Unlined nitrile rubber, neoprene, PVC, butyl rubber or disposable polyethylene gloves long enough to cover forearm and very flexible in washings. The gloves must be worn over overalls, with the last inch of sleeve turned down to catch drippings when arms are raised during spraying.
- Unlined Rubber or heavy canvas boots to protect the feet from splashes, punctures or slips.

FIGURE 1: PERSONAL PROTECTIVE EQUIPMENT FOR SPRAY OPERATORS

There must be adequate distribution of sizes for coveralls, gloves and boots that are appropriate for the specified work force (women's sizes and men's sizes). Adequate backup PPE must be stored in the event of defect, breakage, loss or contamination.

All PPE must be thoroughly examined before use. Any defects or damage must be reported immediately and work halted until appropriate PPE is replaced.

PPE must be stored appropriately and according to manufacturer's instructions. All workers must also be provided with suitable information, instruction and training (including training in the use, care and maintenance of PPE) to enable them to make proper and effective use of any PPE provided for their protection.

TABLE 1: REQUIRED PPE FOR SPRAY TEAM MEMBERS

Role	Minimum PPE Required[2]
Store Manager & all Workers handling insecticide and equipment	• Worn at all times: boots and overalls • When updating stock management records in insecticide storage area: latex gloves and filter mask • When handling insecticide and equipment: nitrile rubber/neoprene/PVC or butyl rubber gloves and filter mask • When cleaning up wet or dry insecticide spills: googles and nitrile rubber/neoprene/PVC or butyl rubber gloves
Washers	• Worn at all times: Filter mask, safety glasses or goggles[3], long sleeved overalls, waterproof apron, boots, nitrile rubber/neoprene/PVC or butyl rubber gloves long enough to cover forearm
Site Manager/ Supervisor	• When entering houses to supervise spray operations: helmet, face shield, filter mask, overalls, rubber boots, nitrile rubber/neoprene/PVC or butyl rubber gloves
Spray Operators	• Worn during spray operations: Helmet, full face shield, filter mask (as recommended per MSDS), neck protection, 2 long sleeve overalls, nitrile rubber/neoprene/PVC or butyl rubber gloves, rubber boots
Drivers	• When washing vehicle: Safety glasses, filter mask, gloves, boots
Team leaders	• When entering houses to supervise spray operations: helmet, face shield, filter mask, overalls, rubber boots, nitrile rubber/neoprene/PVC or butyl rubber gloves
Security guards	• Filter mask and gloves (only necessary if required to enter insecticide storage area), rubber boots

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 WHO-recommended IRS chemicals other than DDT; 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). A particulate filter mask, safety glasses or goggles, long sleeved overall, apron, gloves and boots should be worn when washing protective clothing.

[2] Anyone assisting in spill clean-up must wear full Spray Operator PPE
[3] Moving towards the use of safety glasses instead of face shield for washers

- Washed clothes should be hung to dry in or around 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 2: WASHERS IN PPE

Note: The helmet and face shield may be replaced by safety glasses when washing clothes. However, if spray operators are in the wash area with sprayers, helmet and face shield must be worn.

Workers' Safety During and After Spraying

The following guidelines should be followed:

- Smoking is forbidden while on duty.
- Eating and drinking during a day of applying insecticides 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 fully during morning breakfast, and will be provided with one hydration break per day. During the hydration break, a wet wipe may be used to wipe gloves, and face shield to avoid drinking contaminated water or contaminating the face. After cleaning gloves and stowing used wipes in zip locked bag or other sealable container, remove gloves to drink water or eat. When finished, don PPE again.
- Spray operators must wash off immediately with soap and water if their skin or clothing is contaminated with insecticide; if insecticide gets into their eyes they should immediately flush with plenty of water. In case of ingestion, see the INSECTICIDE EXPOSURE AND TREATMENT section of this BMP.
- In general, spray operators work a maximum of 8 hours per day.
- Apply insecticide in the early, cooler hours of the day when it is more comfortable to wear protective equipment.

TIP

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

- Additional breaks may be required and permissible when proper hygiene can be maintained, e.g., when wet wipes are available to clean hands and face. Washing of gloves is required prior to drinking.
- 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 SPRAY PERSONNEL

All personnel handling insecticides should go through a preliminary health assessment to determine if they are fit to perform the functions of the job.

The preliminary health assessment should consist of a:

- Standard physical examination including blood pressure test,
- Medical history of allergies, tuberculosis, hypertension, asthma, emphysema, anemia, epilepsy

GENDER MAINSTREAMING

It is inadvisable for pregnant women and nursing mothers to handle or be in the proximity to insecticides. Therefore, pregnant women and nursing mothers are prohibited from handling insecticides in the course of PMI IRS work. Once the applicant is qualified and chosen for a position, a pregnancy test is conducted during a normal medical examination. If the test reveals a positive pregnancy, the person is assigned another role at the same salary as the original role. For spray campaigns lasting longer than 30 days, pregnancy tests should be repeated once every 30 days after the first medical exam. In the event that a pregnancy is discovered on a follow-

FIGURE 3: SPRAY OPERATORS DURING TRAINING

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? Including how to report harassment and repercussions.
3. Construction of appropriate facilities for sanitary and privacy needs of all workers. PMI's standard is separate bathing rooms and toilets for men and women at each site. Each toilet or bathing room has a door that goes all the way to the ground. Toilet paper is provided in all toilets, along with a lidded wastebasket in women's toilets. All female SOPs are provided with a package of sanitary napkins as part of their PPE, to reduce absenteeism resulting from menstruation.
4. Observation of protocols regarding shared and gender-specific sanitary facilities.
5. Respect for privacy at operations sites when cleaning up.

TIP

Local-language Freedom from Harassment posters must be posted at each operations site, and Freedom from Harassment policy should be printed on the reverse of seasonal worker contracts. Seasonal workers sign the policy when they sign their contract, confirming that they agree to comply with the policy.

Taking the necessary actions to ensure the availability of the correct sizes of PPE for women and men is also required.

6. Specification of investigative/corrective/punitive measures that will be taken if sexual harassment is discovered or reported.
7. Teams may not consist of male workers and a single female. They must have a minimum of two females, or none at all.

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.

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 (ECO) 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, supervisors 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 sprayers must be de-pressurized and 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. Seat belts may be required, depending on vehicle type and outfitting, as well as known extreme road conditions. Vehicle accident insurance is required for all vehicles hired to transport VectorLink personnel or insecticide. ECOs are responsible for determining national and local requirements for accident insurance, and the project must comply. 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 4: VEHICLES OUTFITTED FOR SPRAY OPERATOR TRANSPORT

FIGURE 5: SPRAY OPERATORS MOBILIZING TO THE FIELD

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 motorcycle, scooter, tricycle, 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 insecticide spills. This type of transportation should be authorized by the host country.

In some countries, SOPs use bicycles to reach their spray areas. Given that they are required to carry an insecticide sprayer with them, and also that the road conditions can be very challenging, it is required that these SOPs are experienced bike riders, and that the bicycle be outfitted to securely affix the sprayer to the back of the bicycle. The exact manner of doing so is up to the country team, but the country ECO is responsible for approving whatever system is used.

Residents' And Spray Operators' Safety

Information campaigns and mobilization are critical to ensure the safety of residents and spray operators. The following household preparation actions must be completed *before* spraying begins so that spray operators can use the spray technique they have been trained on that results in high-quality IRS. These actions also minimize the risk of injury to the spray operator inside the house and ensure that household items will not be contaminated with insecticide.

The post-spray actions described are necessary to ensure resident's safety after IRS and that the insecticide has the longest-lasting effect possible.

- All moveable items must be removed from the house prior to spraying. This includes clothing, bedding (sheets, blankets, and pillows), toiletries and other personal effects, mattress, suitcases and other storage containers, mats, rugs, mosquito nets, poles and cords used to hang clothes, moveable furniture (chairs/stools, light bedframes), cooking (pots/pans) and eating implements (cups/plates/cutlery), water and food storage containers, all foodstuff, agricultural and household tools. Any furniture items that cannot be moved out of the home should be pulled away from the walls to the center of the room and covered with a tarpaulin or polythene sheet. In some cases, large furniture items like upholstered chairs and sofas, that are too big to remove through doorways, can be stacked on top of each other to minimize their footprint and allow the SOP to stand the correct distance from the walls they are spraying.
- Items are moved so that wall surfaces are not covered or blocked. This facilitates proper spray technique that requires the spray operator to stand the correct distance from the wall, and ensures the operator can move safely around the room without running into or tripping over obstacles blocking their path or left on the floor. This may require moving furniture more than once (For example: some bed frames are too big to be removed from the room, but can be stood on their sides, allowing the spray operator to spray one side of the room first, move the bed frame, and spray the other side).
- Framed pictures, wall hangings, calendars, should be removed from the wall before spraying. In some houses, newspaper or magazine pages are used as 'wall-paper'. Homeowners should be asked if it is okay to remove them from the wall. If the homeowner wants to keep the 'wall-paper' as is, then the spray operator can spray over them treating it as part of the wall surface if it is made of a suitable surface type. The homeowner should be made aware not to touch the wall hangings to avoid unnecessary exposure.
- If a sick person, baby, or any other person cannot leave the house during the two hours required, that house cannot be sprayed.
- In some houses, a room is dedicated to grain storage, or other products like traditional beer stored in vessels. These food and beverage items are often too large, heavy or the bags too fragile to move them out of the house. In this case, that room should not be sprayed, and the entrance way covered with plastic to keep insecticide mist out during spraying the other rooms of the house.

- All household items should be moved a reasonable distance from the house and especially not placed on the veranda. In most countries it is the practice to spray the eaves of traditional houses from the outside so items must not block the path around the house and be placed at a safe distance to avoid contamination (see picture below).
- 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.
- Warn residents to keep children away from the house during spraying and for two hours afterwards.
- Warn residents not to prepare food and not to leave their goods removed from structures in close proximity to the house during spraying.
- Warn occupants to stay outside the home during spraying and for at least two hours after spraying then open windows and door to air out for 30 minutes before re-entry.

  Residents must sweep floors free of residual insecticide and insects killed from the spraying and drop them in latrine pits, or in lieu of a latrine pit, dig a hole at least 30 cm. deep, 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 the nearest health facility, who should contact the program.

  If 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 6: SPRAY OPERATOR COVERING FURNITURE BEFORE SPRAY

FIGURE 7: ROOM EMPTIED OF ALL BELONGINGS BEFORE SPRAYING

FIGURE 8: ROOM EMPTIED, FURNITURE PULLED AWAY, BUT NOT COVERED

FIGURE 9: UPON COMPLETION OF SPRAYING, RESIDUAL MOSQUITOES AND OTHER INSECTS SHOULD BE SWEPT AND DISPOSED OF IN A LATRINE PIT

INSECTICIDE 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 should work to ensure the NMCP provides 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 the nearest health clinic.

TABLE 2: TREATMENT MEDICINES FOR WHO-RECOMMENDED INSECTICIDES

Insecticide 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	Activated Charcoal Lorazepam (for seizure) Vitamin E (for skin irritation) Paracetamol Promethazine (for allergic reaction) Salbutamol sulphate
Neonicotinoid	IV fluids for hypotension Add vasopressors if hypotension persists.
Pyrrole (Chlorfenapyr[4])	Activated charcoal diluted in milk or water Saline solution for eye exposure
Neonicotinoid/Pyrethroid (Clothianidin/Deltamethrin combination)	Activated charcoal and sodium sulfate Benzodiazepine (e.g. diazepam) in the case of convulsions If not effective, phenobarbital may be used.

First Aid Kits

The following are minimum requirements of a first aid kit:

- Band-Aids
- Gauze
- Eye wash (or bottled water where eyewash is unavailable)
- Vitamin E cream/oil

Other first aid supplies such as Hydrocortisone cream and aspirin are accessible at the nearest health center.

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 insecticide 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).

[4] Chlorfenapyr is awaiting WHO-PQ approval

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 https://www.paho.org/hq/dmdocuments/2012/WHO-Manual-Indoor-Spraying-2002-Eng.pdf
- USAID Integrated Vector Management Programs for Malaria Vector Control: Programmatic Environmental Assessment. USAID: September 2012: https://www.pmi.gov/docs/default-source/default-document-library/implementing-partner-reports/integrated-vector-management-programs-for-malaria-vector-control-programmatic-environmental-assessment---volume-1-of-2-main-document.pdf
- USAID Integrated Vector Management Programs for Malaria Vector Control: Programmatic Environmental Assessment. USAID: January 2017: https://www.pmi.gov/docs/default-source/default-document-library/tools-curricula/integrated-vector-management-programs-for-malaria-vector-control-programmatic-environmental-assessment-2017.pdf
- FAO Guidelines for Personal Protection When Working with Pesticides in Tropical Climates: March 1990: http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/Old_guidelines/PROTECT.pdf
- WHO Operational Manual for IRS for Malaria Transmission Control and Elimination, second Edition, 2015: https://apps.who.int/iris/bitstream/handle/10665/177242/9789241508940_eng.pdf?sequence=1

BMP 3: Insecticide Storage, Stock Control and Inventory

Purpose and Scope

This BMP chapter provides guidance on the management of insecticide 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 or bottles. Close scrutiny is paid to storage and commodity chain-of-custody in order to avoid the inadvertent loss or leakage of insecticide stocks. It is critical to ensure that these insecticides will be used safely, thereby avoiding adverse impacts on human health or the environment. 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 insecticides 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 insecticides. It is common for a given country to have multiple levels of storage facilities, including: year round, large-volume national/central facilities where insecticide are first delivered and then re-stored at end-of-campaign; regional facilities where insecticide are stored for up to four months; and district or operations site facilities where insecticides are received and distributed on a weekly or daily basis.

FIGURE 10: PROPERLY SITED STORAGE FACILITY

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

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 by unauthorized personnel is denied, and that insecticides or contaminated materials are not stored near or carried into sensitive locations such as maternity wards.
- 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 insecticide vapors do not collect, and so that temperatures don't reach dangerously high daytime temperatures (windows usually provide proper ventilation). High ceilings and buildings with eaves are advantageous.
- Adequate natural or artificial lighting to permit safe handling of insecticides
- Roofs should be well constructed and maintained (e.g. no leakage)
- Floors and walls are free from cracks, impermeable to insecticide (e.g. concrete surface) to prevent leakage of insecticide or contaminated water.
- Large enough to allow for proper accommodation of insecticides as well as storing empty containers and insecticide waste.

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

1. Storage facilities are required to have double locks, and be guarded at all times.
2. 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, Insecticide Storage" to convey that entry is prohibited to unauthorized persons. In addition, and "No Smoking" and adequate PPE sign must be posted.

FIGURE 11: HAZARD WARNING SIGNS IN LOCAL LANGUAGE AND GRAPHICAL REPRESENTATION

3. Insecticides and contaminated wastes must be stored in a separate room from other commodities and from the storekeeper's office.
4. Insecticides 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.
5. The insecticide stock rotation rule of First Expiry First Out (FEFO) should be adhered to.
6. Insecticide should be stored away from direct sunlight.
7. The storage facility should be kept free of rodents, pets and pests.
8. Insecticide containers should be stacked according to their dimensions, design, the materials of which they are made and contents.

    - Insecticides should always be stacked on wooden or plastic pallets and not directly on the floor to prevent them from getting wet.
    - Insecticide stacking should not be stacked beyond two meters, although insecticides may be stored on sturdy shelves that are higher than two meters if A-frame ladders are available for safe access.
    - Do not store liquid materials above dry materials. This prevents any liquid leaks from comingling with dry product.
    - Containers should be arranged in aisles with adequate spacing between each aisle to move containers freely, enable inspection and facilitate spill cleanup.
    - Insecticides should not be stored against walls. Provide at least 15 cm. between insecticide containers and walls in order to avoid sun-heated walls, and provide ventilation.
    - 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 12: LEFT: WET FLOOR IN INSECTICIDE STORAGE, AND BOXES SUBJECT TO DAMAGE RIGHT: BOXES STACKED ON PALLETS FOR SAFETY

FIGURE 13: ITEMS STACKED TOO CLOSE TOGETHER, DIFFICULT TO ACCESS

FIGURE 14: ESSENTIAL EQUIPMENT WITHIN AN INSECTICIDE 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 ventilation to prevent unauthorized entry and rodents

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

- Fire-fighting equipment: bucket with sand and shovel, or fire extinguisher. 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. Care should be taken not to block the exits or access to fire extinguisher.
- Extra PPE (see Worker and Resident Health and Safety BMP #2)
- Labeled contaminated waste containers (preferably 200-liter drum) with insecticide identity.
- 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 insecticide should be ordered than is required or than can be stored in an appropriate way.

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

- Careful planning of insecticide requirements is essential to avoid the accumulation and/or expiration of stocks.
- Stock control begins with ensuring that the correct insecticide 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 insecticide shipments leaving the central storage facilities. Insecticide inventory should be verified at each point of delivery. At all storage facilities, the manager/storekeeper should be present when insecticide deliveries are being made and log receipt of boxes. Boxes are then randomly inspected to ensure correct quantity and undamaged contents. If, during the visual inspection, they are damaged, the supplier should be notified and the insecticide should be repackaged and returned to central stores.
- Incoming and outgoing stock should be carefully recorded on inventory stock cards and insecticide units serialized for proper tracking. This includes:
    - Serialize individual insecticide bottles/sachets
        - Serialization completed by storekeepers before insecticide issued to spray teams

- Serial numbers must be unique, so we would recommend a standard protocol across operations sites
- Serial numbers can be written in permanent marker or adhered with a pre-printed sticker label

o Storekeepers to record serial numbers issued to Team Leaders

- Recommended to track on reverse of Daily Insecticide Tracking Sheet (See Annex B)
- Storekeepers to issue insecticide serial numbers to Team Leaders in series (e.g., 100020 – 100050) rather than randomly
- Daily Insecticide Tracking Sheet must be completed mornings and afternoons and reconciled daily

o Team Leaders to record serialized insecticide units issued to/from SOPs at the point of issuance/re-collection

- Recommended to use the Team Leader Serialized Insecticide Tracker (See Annex B)
- Each Team Leader completes this tool twice daily, similar to storekeepers' Daily Insecticide Tracking Sheet
- Team Leader completes after receiving insecticide from storekeeper (and before issuing insecticide to SOPs)

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.
- Insecticide 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 insecticide 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 for the quantity of insecticide received and distributed. In order to minimize theft, a double lock system should be utilized such that, at least, two locks have to be opened before anyone can have access to the insecticide: at least one lock should be on the main door to the store, and another lock should be on the door to the insecticide room. In addition to the storekeeper, who is ultimately responsible to all IRS materials in the store (and so has keys to the both locks), one other district supervisor (for example, District Coordinator, Logistics Coordinator) should have a copy of the keys to the lock for the main door (not the insecticide room).
- 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 insecticide each day for their team of 3 to 5 spray operators. The store manager should track the name of the team leader and number of sachets/bottles with a pen. The team leader does the same, writes down the number of sachets/bottles given to each spray operators. Marking each of the sachets/bottles makes it easy to identify which team and eventually what spray operator had custody of any given sachet/bottle. Both the spray operators and the team leaders have their separate sachet/bottle inventory cards.

- It is highly recommended that a dedicated logistician periodically visit and verify the inventory stock and storage at the storage facilities. They 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. ECOs, supervision teams and Implementing Partner senior staff should also do a physical inventory when visiting a store.
- Routine stock verification (physical counting of existing stock in the store) is required at each operations site at least once every week. This is done by the storekeeper.
- Each store should have the following tools for warehouse management:
    - Store ledger (register)
    - Stock card
    - Requisition form
    - Issue note
    - Delivery note
    - Receipt note (goods received note)
    - Daily insecticide tracking form
- Daily team leader distribution forms At the end of the spray season, all temporary stores are decommissioned by shipping all insecticide 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 ECO to ensure that all close-out measures have been taken. A final inventory must be submitted to the central storekeeper so that leftover insecticide is figured into needs calculations for the following year.

FIGURE 15: STOREKEEPER RECORDING EMPTY AND FULL SACHETS RETURNED AT THE END OF THE DAY

FIGURE 16: EXAMPLE OF STANDARDIZED STOCK CARD USED BY THE PMI PROGRAM

County……Sub-County……Operation Site……..

Item……

Code…….Standard Unit of Distribution……

Remarks……

Date	Origin/ Destination	Quantity Received (+)	Quantity Issued (–)	Input	Stock Balance	Remarks/ D. Note #/ Sign

- At the end of the spray season, all temporary stores are decommissioned by shipping all insecticide 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 ECO to ensure that all close-out measures have been taken. A final inventory must be submitted to the central storekeeper so that leftover insecticide is figured into needs calculations for the following year.

RESOURCES AND REFERENCES

- 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: INSECTICIDE TRANSPORT

PURPOSE AND SCOPE

This BMP is intended to cover transport activities involving large quantities of insecticides (associated with spray activities) carried in motorized vehicles, typically trucks or pickup trucks. Frequently, because of the nature of the program, these insecticides 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 insecticides 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:

- Insecticide Loading and Containment
- Insecticide Transportation Route Planning*
- Selection of Vehicles to be Used for Transporting Insecticides
- Insecticide Driver Training
- Responding to an Accident
- Vehicle Decontamination
- Water Crossings

TRANSPORT

In this case, transport refers to motorized vehicles such as 10 ton trucks and pickup trucks. This BMP refers to the transport of insecticides or insecticides shipped in bulk within the host country, from the port of entry, to the central storage facility, to the secondary district and operations 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 insecticide must be trained by the Implementing Partner ECO or responsible delegate, and carry a certificate issued by that officer. All vehicles transporting insecticide must be inspected and certified by the ECO as meeting all PMI standards for safety. The insecticide transport vehicle must be equipped with a bucket of sand or sawdust and a tight container in case of insecticide spillage. All personnel loading or unloading insecticide of any quantity must wear a dust mask, overalls, gloves, and gumboots. The driver of the vehicle transporting insecticide must have this PPE with him/her when transporting insecticide, 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 insecticide has been delivered, this PPE must be used in addition to helmet and face shield to protect against splashes.

Each site to which insecticide is to be delivered must pass the pre-season environmental compliance inspection, and be green-lighted by the home office Environmental Compliance Manager (ECM) and country ECO. It must be confirmed before departure from central stores that there is sufficient PPE at each storehouse to which the insecticide is being delivered for all workers who will be moving insecticide 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 insecticide.

When transporting insecticide at any step along the insecticide supply chain (i.e., from the port of entry, to the central warehouse, to a district distribution center and finally to operations sites), the transport vehicle is required to carry necessary stock management documentation. Specifically, the person managing the insecticide movement must carry an original delivery note and a copy of the goods issued note from the point of origin. Upon delivery, this person also must collect a copy of the goods received note from the final destination. These necessary stock management forms must confirm insecticide quantities at all steps of the insecticide supply chain and be signed by persons responsible.

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 insecticide over-exposure of the driver, transport helper, bystanders, or leakage into the environment. However, the principal risk during the transport of insecticides 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.

Insecticide 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.
- Insecticide 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 insecticide 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 insecticides have been unloaded, and then decontaminated

FIGURE 17: INSECTICIDE 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.

Insecticide 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: weather conditions, 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 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).

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.

Selection of Vehicles To Be Used for Transporting Insecticides

- Vehicles should be in good condition (have a certificate of approval issued by the ECO 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 insecticides from the customs warehouse/central storage facility to the secondary storage facility, drivers should be informed about insecticides 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 insecticide and security issues and implications of the insecticide 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 insecticide
- Handling vehicle contamination.
- Vehicles and drivers should be carefully selected and suitably qualified and licensed for this kind of transport task.

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 with insecticide identity.
- If the driver or teams have come in contact with the insecticides, they should remove contaminated clothing immediately and wash the insecticide off their skin.

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

Vehicle Decontamination

It is important to ensure that insecticide 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 insecticide 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.

Water Crossings

Transporting insecticides across water, including lakes, rivers, or streams, 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 insecticides.

All WHO-recommended insecticides 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 insecticides, 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 insecticides 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 insecticide, 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 insecticide, so that they can be reconstituted and repacked with the insecticide upon arrival at the storeroom. This is very important for inventory and tracking purposes.

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

Road Transport prior to water crossing

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. Crossing must be made during daylight only, and at a very safe speed. Take no chances!

The following questions must be researched and answered before water transport of insecticides:

1. How long does the crossing take at a safe speed? ____ min./hr. (circle one)
2. Can the crossing be completed before dark?
3. Is the water currently calm?
4. Is it windy?
5. Is the weather expected to be clear and calm during the entire time of crossing? (If not: mention the weather condition)
6. How far is the water crossing from the central store ____ km?
7. At the crossing of the river will the goods be transported in the vehicle? If no, go to the next section.
8. 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)
9. ___meter length
10. ___ meters wide

11. Is the length and width of the barge at least twice as large as the truck length and width?
12. What is the maximum load that the barge can carry? _____ kg
13. Is the barge is powered/ propelled?
14. Is it covered against rain and sun?
15. Is there a net or other means to recover objects that accidentally fall into the water? (If yes, list the tools)
16. Is there a first aid kit on board?
17. Carefully drive the vehicle into the center of the barge. (Only one vehicle may be transported at a time.)
18. Block all four tires of the vehicle on both sides.
19. Turn the engine off as soon as the truck is positioned on the raft and tires are blocked.
20. Only Implementing Partner personnel, a guard, and the pilot are allowed on the barge with insecticide. Personnel may not ride inside the vehicle during the crossing.

For insecticide 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 insecticide 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?

RESOURCES AND REFERENCES

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

BMP 5: Spraying Techniques

Purpose and Scope

This 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 insecticide that is applied. Some insecticides stay effective longer than others and decision makers should account for these differences when determining which insecticide to spray.

Insecticides are applied to a house's inner surfaces (walls and ceilings) of rooms that are used for sleeping. In some countries, the outer door frame and eaves are sprayed, although this may not be done if there is any breeze strong enough to cause insecticide drift. Ensure that there is adequate lighting before you begin applying insecticide. Use a headlamp, or use your free hand to hold the flashlight to light the work area. If you require more light, keep one door or window slightly open to let in natural light. (Ensure that you do not spray directly into the opening to prevent insecticide drift to the outside and into the environment.

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

- The toxicity and period of effectiveness of the insecticide against the mosquito
- The effect of the insecticide 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 insecticide mixture
- Spraying techniques
- Cleaning sprayer and nozzles

Appropriate Equipment

Sprayers

High quality, reliable spray pumps are essential for an effective spraying program. Indoor residual spraying of insecticides is normally done using hand-operated compression sprayers. WHO maintains specifications for IRS sprayers, and any sprayer that meets those specifications may be used.

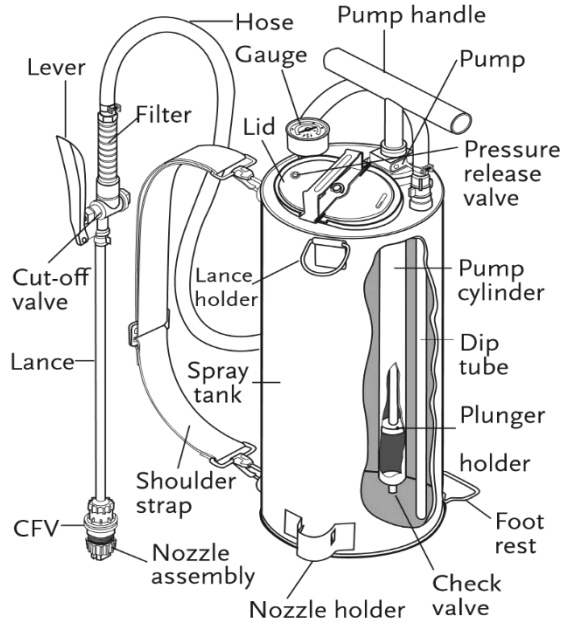
Before starting a spray operation, the equipment should be checked as faulty sprayers may result in under or over application and/or leaks. Supervisors, team leaders, or dedicated maintenance technician should examine spray pumps visually to ensure that all parts are present, assembled correctly and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

TIP

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

Compression sprayers commonly used in disease vector control programs have the following specifications.

FIGURE 18: STANDARD COMPRESSION SPRAYER WITH CONTROL FLOW VALVE (CFV)



Source: WHO

FIGURE 19: PLASTIC SPRAYER USED IN IRS

NOZZLES

Standardized nozzles should be used throughout the IRS program, although different types are necessary for different insecticides and surfaces (absorbent and non-absorbent). Because the majority of surfaces sprayed in countries where 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 = 80 degrees (angle of spraying 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)

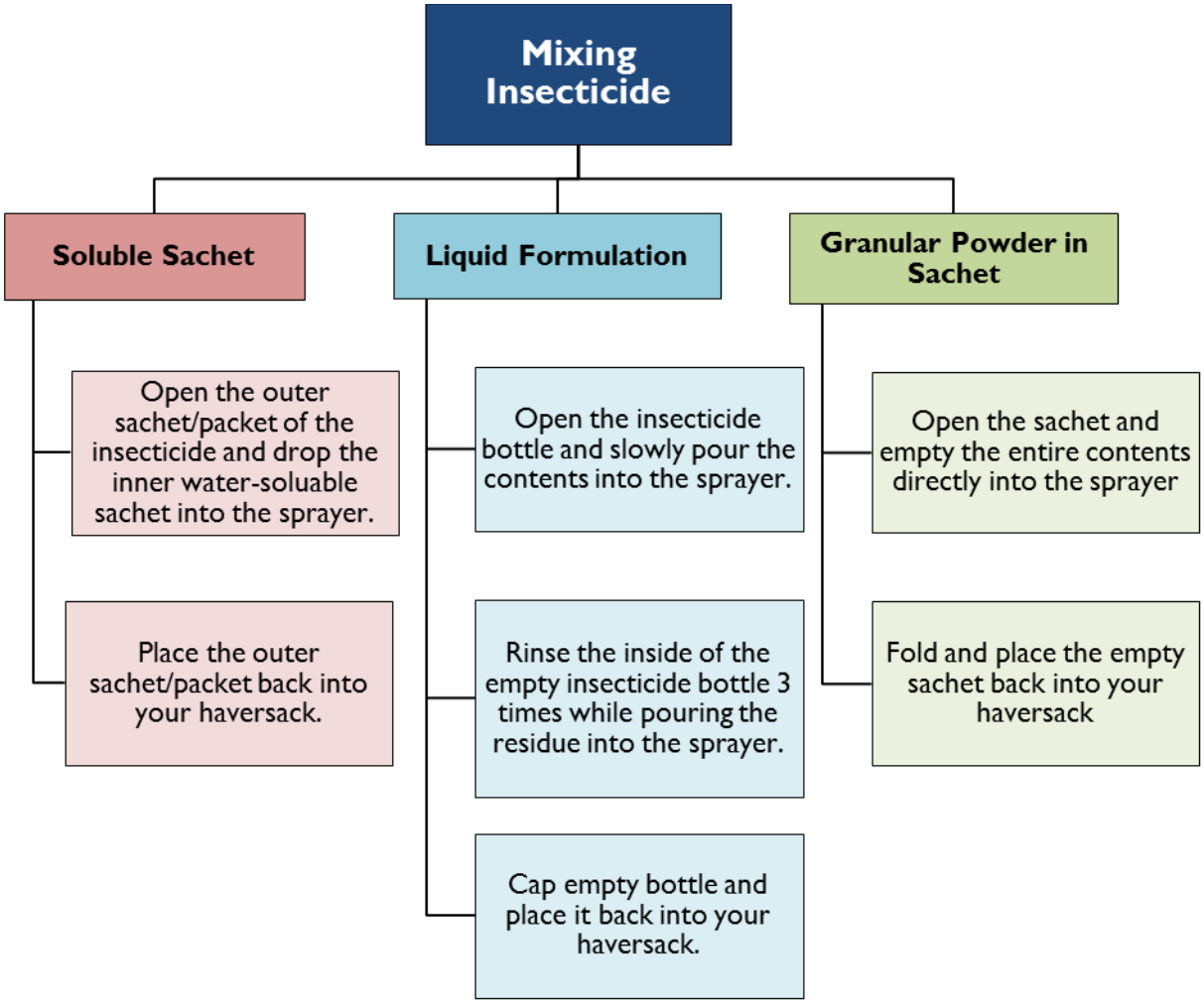
The 8001 nozzle should typically be used for:

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

PREPARING INSECTICIDE MIXTURE

- Insecticide spray (e.g. ratio of water to insecticide) varies according to the manufacturer's instruction.
- Place the sprayer on a plastic sheet (about 1m x 1m) on firm ground outside the house, away from any household items to prevent accidental spillage on to the bare ground.
- 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 20: MIXING PROCEDURE DEPENDS ON INSECTICIDE CONTAINER TYPE

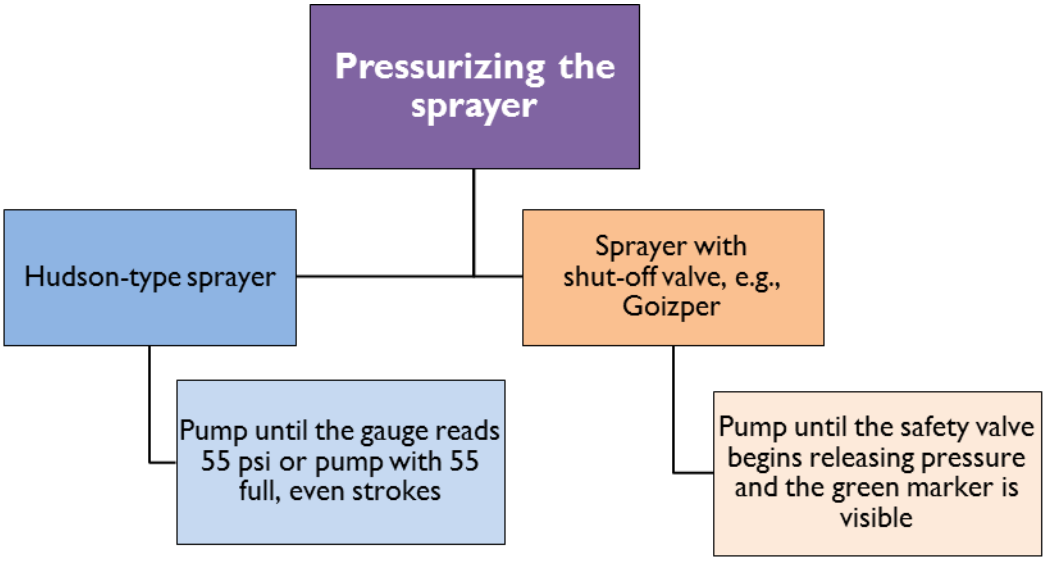


Cover the opening of the sprayer with the filter cloth or sieve.

- 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 plastic sheet on firm 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 21: PROPER PRESSURIZATION TECHNIQUE

FIGURE 22: PRESSURIZATION PROCEDURE DEPENDS ON PUMP TYPE



SPRAYING TECHNIQUES

Insecticides 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.

FIGURE 23: TRAINING FOR PROPER SPRAY TECHNIQUE (VERTICAL AND OVERLAPPING SWATHS)

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 they spray from top of the wall and move back as they bring the nozzle downwards. The process should be continued, moving in a clockwise direction until the room is completed.

FIGURE 24: SPRAY OPERATORS WILL SPRAY HOUSEHOLDS WITH WALLS MADE OUT OF VERY DIFFERENT MATERIALS

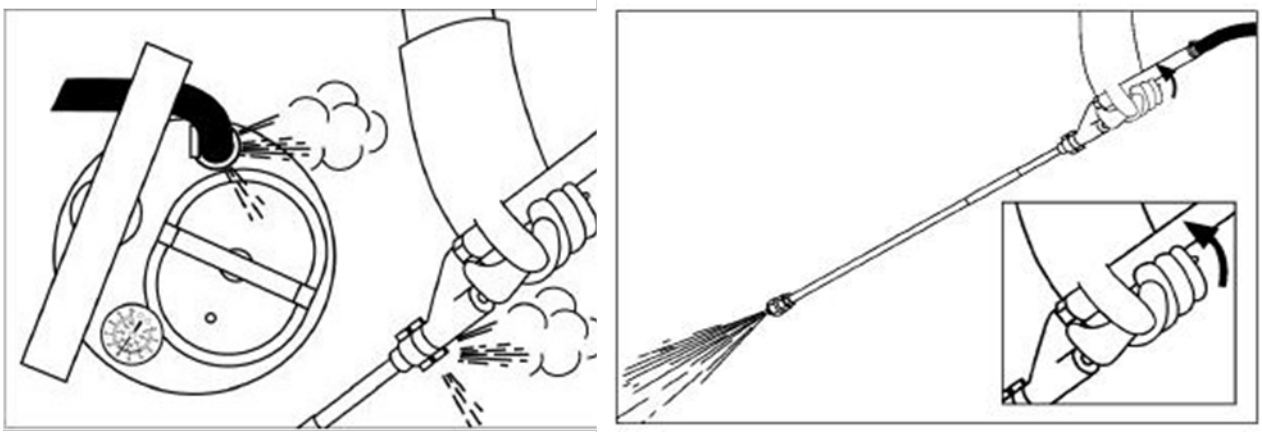
The spray speed should cover one meter every 2.2 seconds, i.e., 4.5 seconds for a 2 m high wall. Timing may be aided by mentally counting "one thousand and one – one thousand and two – one thousand and three - …"

The flow is automatically stopped by the control flow valve (CFV) when the pressure within the spray tank falls below 35 psi, or when the flow of insecticide ceases when using a sprayer with a safety (shut-off) valve.

Sprayer 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.

FIGURE 25: MAINTAIN SPRAYERS TO PREVENT LEAKS



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.

FIGURE 26: CLEANING THE NOZZLE

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.
- Goizper Spraying: https://www.goizper.com/en/spraying/ik/public-health/vector-control/ik-vector-control#descargas

BMP 6: Effluent Waste Disposal

Purpose and Scope

In the implementation of IRS activities, wastewater (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 insecticide, 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 insecticide deposition on skin to trace amounts, if any. Therefore, water used to clean spray personnel's bodies (face and hands, minimum) 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, soak 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 insecticides move through the soil. Clay and organic soils have a high capacity to absorb many insecticides, 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.
- Insecticides 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 rainwater runoff away from the facility.
- Groundwater may be contaminated if insecticides leach from the facilities. The following table summarizes groundwater contamination potential:

TABLE 3: SUMMARY OF GROUNDWATER CONTAMINATION POTENTIAL AS INFLUENCED BY WATER, INSECTICIDE AND SOIL CHARACTERISTICS

	Risk of Groundwater Contamination LOW	Risk of Groundwater Contamination HIGH
Insecticide 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 sprayer at the end of the day:

1. Spray teams return to their staging areas at the end of spraying operations each day, where the sprayers are depressurized and any leftover insecticide is poured in the first barrel
2. Approximately two liters of water is added to the tank from the second barrel. The sprayer is then closed and shaken so all inside surfaces are rinsed. The sprayer is then pressurized and discharged into the third barrel through the lance for approximately one minute.
   After the sprayer is depressurized, any remaining contents are poured into barrel No. 3.
3. The spray operator then rinses the sprayer two more times with one liter of water using the remaining barrels). After water is added, the sprayer should again be pressurized, and discharged for one minute into barrels No. 5 & 7, then depressurized and emptied into the appropriate barrel. Upon rinsing the sprayer three times, the water emptied into the No. 7 barrel should appear clean.

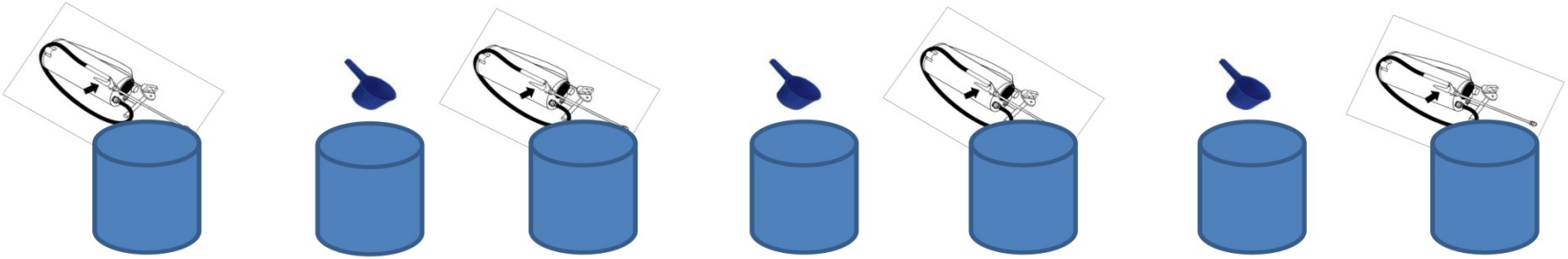
4. The outside of the sprayer is washed using water from barrel No. 6. The strainer and nozzles should be disassembled and rinsed also using water from barrel No. 6. The wash-water from this cleaning should drain to the soak pit. At this point, the sprayer are considered cleaned.

FIGURE 27: SPRAY OPERATORS CONDUCTING THE PROGRESSIVE RINSE

FIGURE 28: 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

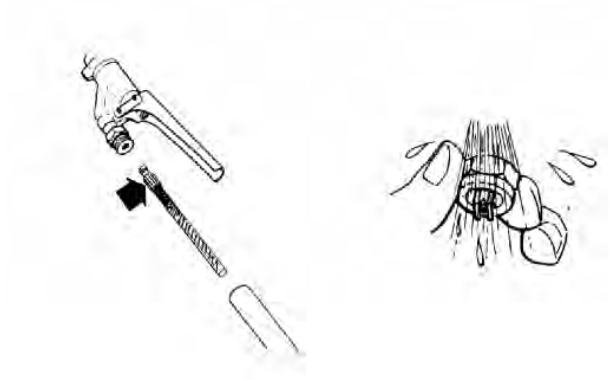
Wash operation sequence						
Empty leftover insecticide from sprayer	Scoop 2 liters and add to sprayer. Cap, pressurize and shake sprayer.	Depressurize* and empty 1st rinse into Barrel #3	Scoop 1 liter and add to sprayer. Cap, pressurize and shake sprayer.	Depressurize* and empty 2nd rinse into Barrel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



*Sprayer hose, lance, and nozzles must be purged for about a minute with rinse water from the all three rinses. After pressurizing and agitating, discharge rinse water into the collection barrel before depressurizing and emptying the remainder of the rinse water into barrel #3, #5, or #7.

CLEANING OF SPRAYERS AND NOZZLES

After completing the triple-rinse, the filter must be rinsed with water and nozzle soaked in a cup of water before being brushed lightly with a toothbrush.



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 sprayers should be hung upside down with lid open to allow air circulation. Allow lance to hang from D-ring on the sprayer with the trigger valve kept open.

NOTE

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

FIGURE 29: SPRAYERS HUNG UPSIDE DOWN TO DRAIN AND DRY

NOTES

After this operation is complete, the outside of the sprayer is washed, along with the spray operators' helmet, face shield, gloves, boots, and neck protection, in the central wash area, with the wash water 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 insecticide and rinse-water in barrels 1, 3, and 5 is used to fill sprayer for the next day of operations. Because of the degradation that takes place overnight, the leftover insecticide from the first barrel cannot be used as full-strength insecticide, and is therefore used as makeup water, along with the rinse-water from barrels three (3) and five (5). Rinse water from barrel seven (7) should be emptied into barrel two (2) for use in rinsing the sprayers the following day. 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 insecticide is in use.

In some cases smaller barrels (e.g. 20 L or 60 L) can be used for the triple rinse, depending on the number of operators using a site. Each operator will require about 6-8 liters of water for cleaning sprayers 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 insecticide products). Soak pits work by the adsorption of the insecticide 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 insecticides to degrade and become harmless.

FIGURE 30: CONCRETE WASH AREA WITH SEPARATE SOAK PIT

Standard Design and Construction

A soak pit measuring 2m by 1m by 1m is sufficient to absorb the effluent produced from up to 50 spray operators during the duration of the spraying operations, providing proper protocols and procedures are followed. If the soak pit is used by more than 30 spray operators, charcoal and sawdust/wood chips must be changed every two years. If puddling or ponding occurs, the amount of water being introduced to the soak pit must be reduced, or the soak pit must be rebuilt if clogged.

The sides of the soak pit are lined with plastic sheet or poured concrete before adding the other materials. The plastic serves to eliminate migration of contaminated water out through the sides before it can be treated. 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 small gravel is then placed on top, followed by a layer of course gravel, and then a layer of larger aggregate to create a filter one meter in depth (see illustration). Distribution piping is used to distribute the influent across the bed for better insecticide removal efficiency. As the effluent percolates through the charcoal, the insecticides filter out and degrade before reaching the surrounding soils. The wash area should be close to the soak pit with a drainage system and a slope that can drain all the water from the washing area to the sump. A concrete curb should be built around the soak pit to contain effluent and divert runoff from the surrounding area.

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.

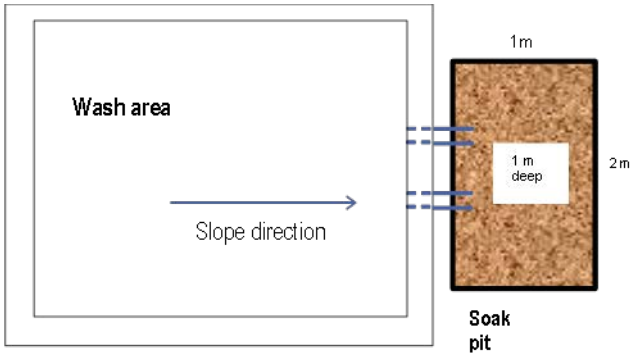
WASH AREA AND SOAK PIT CAPACITY

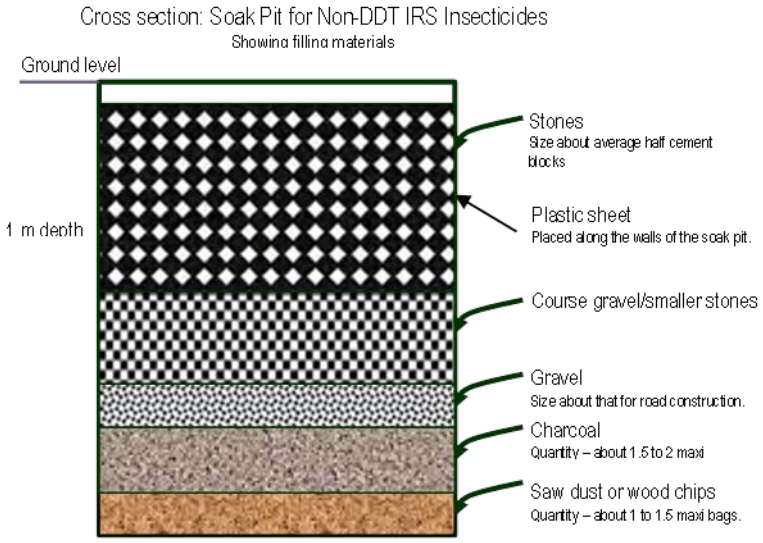
- 5 x 5 meter wash area may be used by 50 SOPs using 2 lines of 7 barrels without overcrowding the wash area.
- 25 SOPs should use a line of 7 barrels. When the number of SOPs exceed 25, a wash area with second line of 7 barrels should be installed in the wash area. In this case, the charcoal in the soak pit must be changed every other year.
- When the number of SOP is more than 50, a second wash area must be built using a fixed or mobile soak pit

SITING

Soak pits should be adjacent to the wash area so that wash water drains to the soak pit.

FIGURE 31: THE STANDARD SOAK PIT DESIGN – ADJACENT 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 insecticide 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 (MSPS)

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.

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 close to where a spray team is expected to complete a day's operations.

MSP CHARACTERISTICS

The MSP is used to provide environmentally-responsible equipment decontamination for IRS spray teams working in remote areas. The MSP filter is a container with highly adsorbent activated carbon that removes insecticide contamination from the wash water. It is perforated at the bottom so that purified water can exit to the ground.

The MSP can be produced in various sizes, and uses as a container industry-standard drums or carboys typically used for shipping chemicals. Thus, it is rugged, and can be expected to last several seasons, and not be damaged in transport. The configuration of the drum provides a long flow-path within the activated charcoal for enhanced removal of chemical contaminants such as IRS insecticides. These drums come in 20, 40, and 60 liter sizes, and can be purchased used in many, if not all, African countries. The 20 liter MSP can service one team of spray operators, the 40 liter MSP can service two, and the 60 liter MSP can be used by 3 teams. It can be used in remote locations, or it can augment existing fixed soak pit sites where more than 25 spray operators are based.

INSTALLING AN MSP

Locations for the installation of an MSP are typically chosen in advance by the ECO, after micro-planning is complete. Some of the requirements for the site are similar to those of a fixed soak pit:

1. 30 meters or more from any sensitive receptors (water resources, habitat, dwellings, etc.) or heavily trafficked areas,
2. A flat, level surface of at least 4 meters x 4 meters for a wash area, preferably clear of vegetation,

Unlike a fixed soak pit, in most circumstances, it is not necessary to fence off the MSP site, because of its temporary nature, and the ability to remove and securely store the MSP materials overnight. The MSP can be installed in areas of high groundwater or subject to seasonal flooding, because the profile is shorter, and the insecticide is not left in the ground.

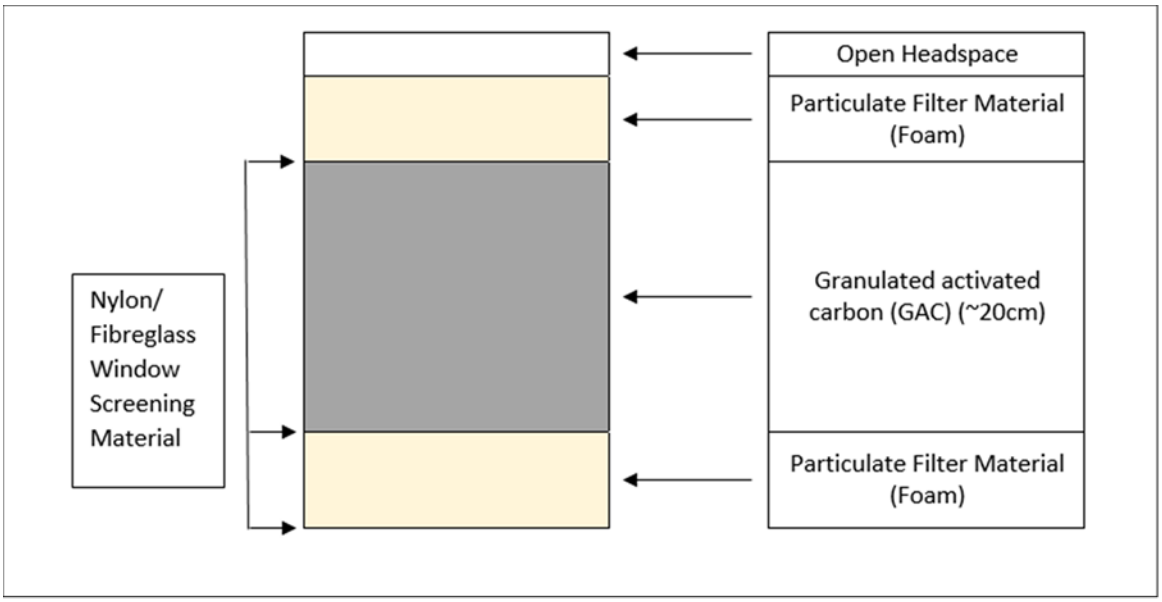
The MSP has a smaller or practically non-existent environmental footprint, because it is a temporary installation. The captured insecticide is removed from the site in the MSP, and the site is restored to its original condition after use.

MSP LAYERS

An MSP consists of a plastic container filled from bottom to top with layers of screen, foam/sponge, screen, granulated activated charcoal (GAC), screen, and foam (see Fig. 27).

The foam layers act as large particulate filters to prevent mud from operators' boots from plugging up the filter, and also acts to hold the granulated activated charcoal (GAC) in place. GAC is a finely divided, specially treated charcoal widely used in industrial water and air purification applications. Activated charcoal adsorbs organic chemicals much more strongly, and has much greater capacity than traditional cooking charcoal. Thus a much smaller amount of it is needed to adsorb the same amount of insecticide.

FIGURE 32: MOBILE SOAK PIT LAYERS



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 insecticide and all rinse-waters. 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 insecticide, and the water from all three rinses. This system simplifies the reuse of all leftover insecticide and rinse-water the following day, as the operators draw from only one barrel, instead of four.

FIGURE 33: MOBILE SOAK PIT CONFIGURATION

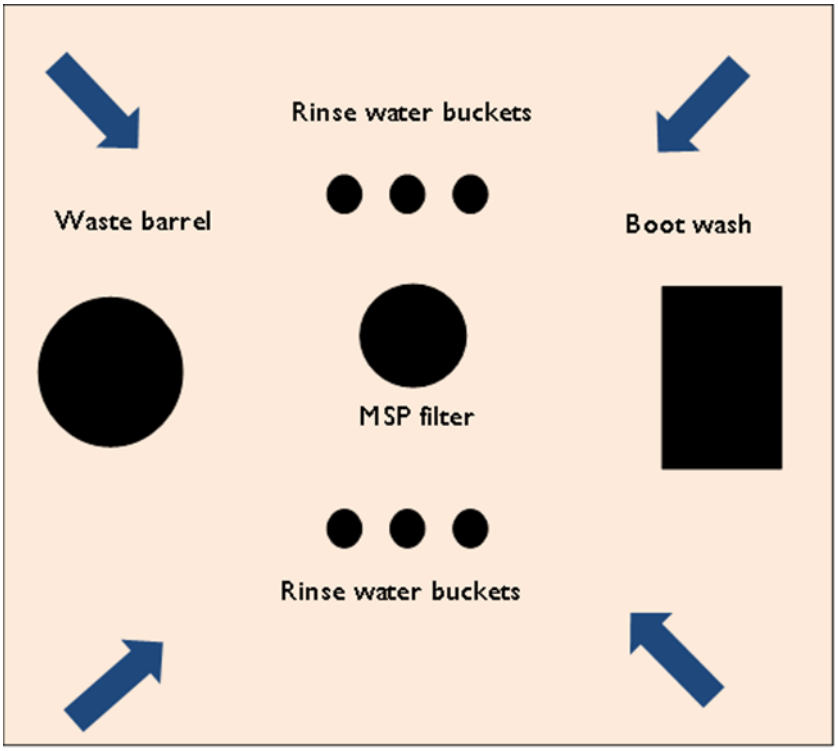


FIGURE 34: MSP MOBILE SOAK PIT FILTERS

FIGURE 35: THE MSP IS INSTALLED WITH THE TOP JUST BELOW GROUND LEVEL

FIGURE 36: PREPARING THE SITE FOR THE MSP INSTALLATION

FIGURE 37: COMPLETED MOBILE SOAK PIT INSTALLATION

WASH AREAS

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

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.

It is strongly suggested to cover wash areas, using tarpaulins for a temporary fix, or corrugated sheets for a more permanent structure (see Fig. 38 below). Covers serve two important purposes. First, they provide a degree of comfort for the spray operators so that they are not exposed to the sun while performing their clean-up procedures. Secondly, they prevent or minimize rainwater from entering the soak pit, which can result in overflows, or flushing contaminated water out of the soak pit.

FIGURE 38: COVERED WASH AREA

DECOMMISSIONING

All wash sites should be decommissioned by washing the surface with soap and water, and restored to their previous condition. DDT sites should have soil samples taken of the immediate surrounding area to assess DDT levels.

RESOURCES AND REFERENCES

- USAID/PMI: Indoor Residual Spraying (IRS) for Malaria Control Indefinite Quantity Contract (IQC)
- PMI VectorLink Training Guides:

  SOP Guide: https://pmivectorlink.org/wp-content/uploads/2019/06/0.-VectorLink-Spray-Operator-Pocket-Guide-Aug-2018-FOR-PRINT.pdf

  Team Leader Guide: https://pmivectorlink.org/wp-content/uploads/2019/06/1.1-VectorLink-Team-Leader-Guide-Sep-2018-PDF.pdf

- Illustrations**:** USAID/PMI Training Manual (2009). Schematic from IRS Training Manual

BMP 7: Solid Waste Management

Purpose and Scope

This 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 insecticide sachets/bottles, damaged PPE equipment, used cleaning equipment, materials such as sawdust used to clean up spills, and contaminated soil from accidental spills. These substances create insecticide 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 Insecticide Containers
- Disposal of Unwanted Insecticides
- 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 insecticides whether purposefully (e.g. primary packaging of insecticide sachets/bottles), or accidentally via spill, leak, etc.

Uncontaminated Materials - Packaging and materials (e.g. pallets, boxes previously containing intact insecticide sachets/bottles) which have not come into direct contact with insecticides 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/bottles 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 insecticide.

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.

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/bottles 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, SumiShield).

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.

Particulate respiratory filters and Used Wet Wipes

Waste particulate respiratory filters and used wet wipes are always considered contaminated and hazardous. Particulate respiratory filters 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. It is not necessary to inventory used wet wipes, but in all other aspects they should be handled like particulate respiratory filters.

PPE: Gloves, Boots, Insecticide Apron, Face Shield, Goggles Helmet, Neck Protectors, Overalls

When gloves, boots, insecticide aprons, face shields, helmet and neck protectors 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 as a last resort.

Since 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.

Insecticide Containers (Sachets and Bottles)

Insecticide sachets/bottles 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 insecticides, (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 insecticide. Sachets that have contained emulsifiable concentrate, or wettable powder (WP) formulations should be rinsed with water several times, and the rinsings should be added to the sprayer before the tank is filled to the required volume.

FIGURE 39: CARDBOARD BOXES WITH EMPTY SACHETS STORED AND LABELED PROPERLY

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 insecticide makeup to ensure that they are free of contamination. Spray operators must 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.

Batteries

Alkaline and lithium batteries should be disposed of according to home country environmental regulations.

Where home country allows, alkaline batteries may be disposed as general waste, encased in cement and landfilled or recycled subject to the availability of recycling facilities in country. Lithium batteries can pose a fire hazard, and must be disposed of according to host country regulations. In case of uncertainty, contact the Implementing Partner's Environmental Manager.

FIGURE 40: PLASTIC MATERIAL RECYCLE CODES

Disposal of Unwanted Insecticides

To avoid waste and disposal problems, the quantities of insecticides purchased must be carefully calculated on an annual basis. Whenever possible, only one year's supply of insecticides should be ordered (insecticides may only have a two year shelf life). Occasions will arise when it will be necessary to dispose of insecticide 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. Country teams should not make decisions about insecticide disposal and should rely on headquarters Director of Environmental Compliance and Safety (DECS). 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 insecticide are involved, it should be collected and sent to a central location for disposal by the implementing partner. Insecticides are best disposed of by burning in a special incinerator that burns at 1100°C-1300°C.

When incinerating small quantities of insecticides they should be mixed with other contaminated items such as activated charcoal from soak pits, saw dust/soil/sand used in spill clean-up, particulate respiratory filters or wet wipes.

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 insecticide 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 insecticide-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 insecticides may be incinerated at 850 deg. C or above. Consult with DECS)
- Incinerators with air scrubbers to ensure minimal impact to air quality
- In some cases incineration can be negotiated with the insecticide 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.

- Ashes from the incineration of contaminated materials should be removed from the incinerator at the end of each batch and can be incorporated into cement or added to soil in a landfill that meets the national standards set by the national environmental agency.

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 insecticide 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 insecticide spills in the event of an accident. Insecticides 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 insecticides are repacked and transferred into other containers. Complete decontamination and effective disposal are often very difficult to achieve. Insecticide 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 insecticides 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)

If spill is liquid, use sand to create a berm around the spill so it cannot spread.

CLEAN: Clean up the spill immediately

Implementing the Three "C's"

Spills in Storage Facilities

Regardless of the type of insecticide (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, facemasks and rubber boots.
- Insecticides 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 insecticide may be absorbed into the floor.
- The spill should NOT be hosed down with water as this merely disperses the insecticide.
- 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 insecticide. If wettable powders have been spilled, the sawdust, sand or dry soil should be lightly dampened to avoid excess dust.
- The sawdust, sand or soil containing absorbed spilled insecticide 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.
- Ventilating the spill area may be necessary before re-entry.

FIGURE 41: 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, labeled with identity of contamination (e.g. SumiShield) and central disposal.

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 purposes, such as transporting food or people, it is especially important that the spill be cleaned up immediately to avoid permeating the vehicle with the insecticide. 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 insecticides should be equipped with a bucket of sand, sawdust or soil, a shovel, and fire extinguisher.

Human Health Precautions - Minor Exposure

Insecticides coming into contact with the skin can enter the body and cause reactions. Contact with some of the pyrethroid insecticides (including pyrethroid/neonicotinoid mixture) can cause parasthesia, an abnormal

sensation of the skin (tingling, pricking, chilling, burning, numbness). Successful decontamination of body surfaces requires prompt action: rapid application of plenty of soap and water and thorough washing.

Anyone contaminated with insecticide 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 insecticide exposure cases.

Major Emergencies

Liquid insecticides 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 insecticides burn are extremely hazardous. To reduce the risk of fire the following steps should be taken:

- The outside of insecticide stores should bear prominently displayed warning notices stating "Danger insecticides: 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 insecticide 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 insecticide 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 insecticide over a wide area (especially powder formulations).
- Care should be taken to avoid dragging fire hoses through insecticide or contaminated water.

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: Incident Reporting

USAID must ensure that all project activities are conducted in accordance with USAID regulatory requirements and standards, host country laws, and applicable international conventions. Federal Regulation in Title 22 Code of Federal Regulations Part 216 (22 CFR 216), as authorized by the Foreign Assistance Act, Section 117, establishes USAID's environmental requirements.

The Bureau for Global Health (GH) documents, analyzes, and responds to incidents that occur during implementation of IRS activities using a variety of means, including a 48-Hour Incident Report, follow-up information collection, and Corrective Action Plans (CAPs). Following an USAID initiated 2017 IRS Incident Study Report Standard Operating Procedure (SOP) with comprehensive guidelines for IRS Incident Reporting were developed.

This BMP provides a brief description of the SOP, but the full SOP is annexed to this manual as Annex C. The SOP includes a standard report template, the use of which is mandatory.

Initial Incident Notifications

Appropriate and timely initial notification from implementing partner (IP) field staff to the IP's headquarters management and environmental staff and PMI staff is essential.

Report Content

The incident report must include the following information:

- Incident ID, date, location
- Incident category and priority level
- Brief description of event including:
    - Background or contextual information required to help understand the incident,
    - Category-specific information,
    - Names and contact information of IP staff and non-IP staff involved in the incident,
    - Description of the extent of property damage or injury to a third party (if any),
    - Reports filed with the authorities, local procedures,
    - Information on common practices, traditional processes and requirements.
    - IP staff's status with the project (e.g. dismissal, retained)
- Extent of property damage and estimated cost for repairs
- Extent of injury to IP and non-IP personnel, including any visit to doctor/hospital or whether the injury resulted in missed time from work.
- Initial root cause analysis
- Corrective action and follow-up actions
- Any further information that would be helpful or questions/requests for guidance.

- Any information that is critical to the understanding of the incident that is lacking at the time of submission.

RESOURCES AND REFERENCES

- USAID/PMI Standard Operating Procedure for Incident Reporting, April 2018

BMP 10: DDT Special Considerations

Purpose and Scope

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.

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 insecticide applications, though, due to its bio-persistence, the following are special BMP considerations for DDT.

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

DDT Description

DDT is an organochlorine insecticide 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 insecticide from malaria control to agricultural use. Other dangers include inadequate disposal of wastes, or sprayers 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 bio-accumulative, 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 insecticides. 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 insecticides. For spray campaigns lasting longer than 30 days, the pregnancy tests must be repeated once every month during the campaign.

Insecticide 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 attention.

Insecticide 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 sprayers, PPE and tarpaulin covering sheets. Because this waste water is contaminated with the insecticide, 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 holding tank is an impermeable tank for the storage of water contaminated with non-biodegradable liquid insecticide waste such as DDT. It can store contaminated water for later processing using a filtration system such as granulated activated charcoal. Please see the section on mobile soak pits for further information.

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. However, if the contaminated water is processed during the spray season (e.g., on a daily or weekly basis), the holding tank can be much smaller.

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 restrict access of birds, bees and other insects. It should be simple to connect a pump for treatment or evacuation. 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 storm water into the tank. The tanks should also be located slightly downhill from the progressive rinse area so that so that run-off from the wash area 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 rain flow.

Proper Use

- 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 42: STORAGE TANK WITH ADJACENT WASH AREA.

NOTE

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

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 43: POLYTHENE TANK USED AS SECONDARY STORAGE OF DDT EFFLUENT WASTE

DECOMMISSIONING

After a spray round, all of the sand, sludge, and insecticide 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. Insecticide 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 insecticide 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 insecticides. 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

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, an Environmental Management/Quality Assurance Project Plan (QAPP) should be developed and employed. The QAPP must be developed in conjunction with the sampling plans. and contain detailed information concerning the objectives, and scope to be used in the monitoring program.

Resources and References

- **PMI IVM for Malaria**: IVM for Malaria Programmatic Environmental Assessment, 2017: https://www.pmi.gov/docs/default-source/default-document-library/tools-curricula/integrated-vector-management-programs-for-malaria-vector-control-programmatic-environmental-assessment-2017.pdf
- **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
- Bate, R et al, Considerations for the Use for DDT in Malaria Control, American Enterprise Institute for Public Policy Research, October 2004: https://www.aei.org/articles/considerations-for-the-use-of-ddt-in-malaria-control/

BMP 11: IRS-Related Small Scale Construction

From time to time, PMI may support small scale construction of vector control-related facilities, such as insectaries or storage buildings. Such construction could have the following negative impacts on the environment:

- Improper siting or construction techniques causing:
    - Deterioration of human and social environments
    - Erosion or sedimentation
    - Creation of disease vector habitat
- Use of construction equipment can cause injuries to workers and bystanders.
- Construction activities during renovation of facilities may generate debris and wastes that contain both non-hazardous and hazardous materials that require proper disposal. This includes chemicals, solvents, and any materials containing toxics, such as asbestos, lead-based paint, and formaldehyde.
- Exposure to hazardous building materials during renovation activities can result in health impacts to workers.
- Waste produced during the construction or refurbishment work can be harmful to the environment and human health.
- Use of environmentally unsustainable construction materials such as wood can lead to environmental degradation
- Lack of personal protective equipment may lead to accidents, injuries, or exposure of workers.
- Construction activities may:
    - Produce noise and air pollution
    - Create standing water and breeding habitats for disease vectors.

In order to avoid these negative impacts, all construction must follow guidelines for small scale construction developed by USAID.[5] Guidance for mitigating negative impacts is also provided in the PMI VectorLink Environmental Mitigation and Monitoring Plan, which is included as an Annex in all country-level Supplemental Environmental Assessments.

[5] www.usaidgems.org/sectorGuidelines.htm

ANNEX A: ENVIRONMENTAL COMPLIANCE SUPERVISORY ASSESSMENT AND INSPECTION CHECKLISTS

- Pre-Season Environmental Compliance Assessment
- Pre-Contract Transport Vehicle Inspection
- Spray Operator Transportation Vehicle Inspection
- Spray Operator Morning Mobilization
- Homeowner Prep and Spray Operator Performance
- End of Day Cleanup Form
- Storekeeper Performance
- Post IRS Environmental Compliance Inspection

Pre-Season Storeroom and Soak Pit Assessment

Three profiles:

1. **Mobile Soak Pit (truncated store questions)**
2. **Fixed Soak Pit (traditional store questions)**
3. **Permanent Mobile Soak Pit**

Date/time of Inspection:		
Country:		
Level 1:		
Level 2:		**To be changed to "Operations Site if last level**
Level 3:		**To be changed to "Operations Site if last level**
Level 4:		**To be changed to "Operations Site if last level**
Select the operational site profile:	☐ **Mobile Soak Pit** ☐ **Fixed Soak Pit** ☐ **Permanent Mobile Soak Pit**	
Number of spray operators using this operations site:		
Number of days of operation at this site:		
Number of vehicles carrying bulk insecticide or sachets:		**Note: Questions asked for FSP with a traditional store only**
Inspectors' names and organization:		

		Response		Follow Up Question	Follow up Response	#
Stores for Mobile Soak Pit Sites						
1	Has the program identified a temporary store to hold insecticides?	Yes	No			
2	Is the insecticide store located an adequate distance from sensitive receptors (schools, homes, and water bodies/flood plains, etc.)?	Yes	No			
				Distance to nearest sensitive receptor (meters)	Number	
				Photo showing layout		
3	Are there double locks on insecticide storage?	Yes	No			
				If no, Delivery date for locks	____/____/_____	
4	Are there signs of water leakage on the walls, floor or roof?	Yes	No	**Date renovation will be completed**	____/____/_____	
5	Windows barred and screened?	Yes	No	**Date renovation will be completed**	____/____/_____	
6	Is the lighting adequate?	Yes	No			
				If no, completion date for lighting improvement	____/____/_____	
7	Danger signs with skull and crossbones posted?	Yes	No			

		Response		Follow Up Question	Follow up Response	#
				If no, delivery date	____/____/_____	
				If no, installation date for signs	____/____/_____	
8	Correct insecticide 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, Delivery date for laminated and posted insecticide health and safety sheets	____/____/_____	
9	Emergency response procedure with phone numbers posted?	Yes	No			
				If no, date form will be delivered and posted	____/____/_____	
10	Spill response procedure posted?	Yes	No			
				If no, date form will be delivered and posted	____/____/_____	
11	Recording thermometer on wall?	Yes	No			
				If no, delivery and installation date	____/____/_____	
Mobile Soak Pits						
12	Is the chosen mobile soak pit location an adequate distance from water bodies, steep slopes or flood prone areas?	Yes	No			
				Take 2 photos from different angles to show the proposed location of the MSP.		
13	Has the team identified an adequate water supply for cleaning PPE and triple rinsing of pumps?	Yes	No			
				If yes, Identify the water supply	Text	
				If no, delivery date	____/____/_____	
14	Is the identified area for the MSP marked for the spray operator teams?	Yes	No	If yes, Photo of the marking		
15	Is the MSP located in a high foot or vehicle traffic area?	Yes	No	**If yes, this is not an appropriate MSP site. Skip to question 57**		
16	Can the ground at the proposed MSP site be easily cleared and sloped for installation?	Yes	No	**If no, this is not an appropriate MSP site. Skip to question 57**		
17	Will the MSP site be negatively affected by heavy rains (flooded or mud washed in)?	Yes	No	**If yes, this is not an appropriate MSP site.** **Skip to question 57**		

		Response		Follow Up Question	Follow up Response	#
Traditional Storeroom Questions						
18	Is there a storage facility at this location?	Yes	No	**If no, Skip to question 43.**		
19	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)	Number	
				Photo showing layout		
20	Is the storage facility fenced?	Yes	No			
21	Are there double locks on insecticide storage?	Yes	No			
				If no, Delivery date for locks	____/____/_____	
22	Leak-free floor and roof?	Yes	No			
				If no, Picture of defect		
				If no, completion date for repairs	____/____/_____	
23	Windows barred and screened?	Yes	No			
				If no, Picture of windows		
				If no, number of windows	Number	
				If no, work completion date	____/____/_____	
24	Adequate lighting?	Yes	No			
				If no, completion date for lighting improvement	____/____/_____	
25	Will facility be guarded 24 hours a day?	Yes	No			
				Training date for guards	____/____/_____	
26	Adequate PPE in inventory for Storekeeper and Visitors (Coveralls, gloves, boots, nose masks)? Check all that are present	☐ Coveralls ☐ Gloves ☐ Boots ☐ Nose masks ☐ Goggles/Safety glasses ☐ None of above				
				If no, PPE delivery date	Coveralls: ___/____/_____ Gloves: ____/____/_____ Boots: ____/____/_____ Nose masks: ___/____/_____ Goggles/Safety glasses: ____/____/_____	

		Response		Follow Up Question	Follow up Response	#
27	Are the chain of custody and stock management forms (e.g., goods receipt note, stock cards, ledger book, daily team leader distribution forms, etc.) in the store?	☐ Store ledger (register) ☐ Stock cards ☐ Requisition forms ☐ Issue notes ☐ Delivery notes ☐ Receipt notes (GRN) ☐ Daily insecticide tracking forms ☐ Daily team leader distribution forms ☐ None of above				
				If no, when will they be delivered?	____/____/_____	
28	Are any insecticides currently in the storeroom?	Yes	No			
				If yes, date of insecticide arrival at store	____/____/_____	
				If yes, Picture of insecticide inventory		
				If no, when will insecticide arrive?	____/____/_____	
				If no, skip to question 33		
29	Insecticides to be used this year properly labeled?	Yes	No			
				If yes, Photo of insecticide label		
				If no, Photo of absent/defective label		
				Insecticide expiration date (If Actellic, state 2 years after date of manufacture)	____/____/_____	
30	Are there obsolete or expired insecticides in store?	Yes	No			
				If yes, Photo of insecticide type and expiration date		
				If yes, Photo of amount and condition of expired insecticide		
				If yes, name/type of obsolete or expired insecticide	Text	
				If yes, quantity of sachets or bottles	Number	
				If yes, specify unit of measure	Text	
				If yes, insecticide expiration date	____/____/_____	
31	Insecticide stacked on pallets with intact packaging?	Yes	No			
				If no, Photo of defects		
32	Maximum storage height (2 m) exceeded and/or aisles blocked?	Yes	No			
				Photo of defects		
33	Soap, water and tubs available?	Yes	No			
				If no, delivery date for soap and tubs	____/____/_____	
34	Danger signs with skull and crossbones posted?	Yes	No			
				If no, delivery date	____/____/_____	

		Response		Follow Up Question	Follow up Response	#
				If no, installation date for signs	____/____/_____	
35	Correct insecticide 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, Delivery date for laminated and posted insecticide health and safety sheets	____/____/_____	
36	Emergency response procedure with phone numbers posted?	Yes	No			
				If no, date form will be delivered and posted	____/____/_____	
37	Spill response procedure posted?	Yes	No			
				If no, date form will be delivered and posted	____/____/_____	
38	Recording thermometer on wall?	Yes	No			
				If no, delivery and installation date	____/____/_____	
39	Fire extinguisher inside and outside storeroom?	Yes	No			
				If no, delivery and installation date	____/____/_____	
40	Fully stocked spill kit (Sand bucket, long handle brush with stiff bristle, shovel, and short brush) and first aid kit (band aids, gauze, Vitamin E cream, eye wash,)? Check all that are present	☐ Sand Bucket ☐ Long Handle Brush with Stiff Bristles ☐ Shovel ☐ Short Brush ☐ Band Aids ☐ Gauze ☐ Eye Wash ☐ Vitamin E cream ☐ None of above				

		Response		Follow Up Question	Follow up Response	#
				If no, date of delivery to storeroom	Sand bucket: ____/____/_____ Long handle brush: ____/____/_____ Shovel: ____/____/_____ Short brush: ____/____/_____ Band aids: ____/____/_____ Gauze: ____/____/_____ Eye wash: ____/____/_____	
41	Containers for contaminated wastes available and clearly marked with type of contamination and quantity (empty sachets, masks, etc.)	Yes	No			
				If no, delivery date for containers	____/____/_____	
				If no, date to be labeled	____/____/_____	
42	Storekeeper trained on signs of poisoning and location of nearest treatment facility	Yes	No			
				Date storekeeper was or will be trained	____/____/_____	
43	Antidotes to insecticides available nearby?	Yes	No			
				If yes, Distance to nearest health facility (kilometers)		
				If no, antidote delivery date	____/____/_____	
44	Pregnancy tests administered?	Yes	No			
				Date of pregnancy testing	____/____/_____	
Fixed Soak Pits						
45	Is there a soak pit at this location?	Yes	No	**If no, end of questionnaire (skip to question 57)**		
46	Is the soak pit located away from water bodies, steep slopes or flood prone areas?	Yes	No			
				If no, Photo of defects		
47	Are soak pit and surroundings cleared of vegetation and cleaned?	Yes	No			
				If no, date for cleaning/clearing	____/____/_____	

		Response		Follow Up Question	Follow up Response	#
48	Is the soak pit correctly fenced, gated, locked & strongly built to hang pumps?	Yes	No			
				If no, date of repair	____/____/_____	
				If no, Photo showing defects		
49	Is there an adequate water supply for personnel and clothes washing and triple rinse of pumps?	Yes	No			
				If no, delivery date	____/____/_____	
50	Are the washing areas properly sloped to drain to the soak pit, with no leaks or cracks?	Yes	No			
				If no, date of repair	____/____/_____	
51	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	____/____/_____	
52	Are there seven progressive rinse barrels and overall wash tubs?	Yes	No			
				If no, delivery date	____/____/_____	
53	Are there lines to dry the clothes and are they strong enough to carry the load?	Yes	No			
				If no, installation date	____/____/_____	
54	Are there skull and crossbones hazard signs on the fence?	Yes	No			
				If no, delivery date	____/____/_____	
				If no, installation date	____/____/_____	
55	Are there separate washing facilities designated for use by women?	Yes	No			
				If yes, Do the facilities for women provide adequate and complete privacy of the users (e.g., are the walls built up from the ground and high enough to ensure that the user cannot be seen from the outside)?	Yes / No	
				If no, completion date	____/____/_____	
56	How many wash areas are available at this operations site?					
56a	How many fixed soak pits are available at this operations site?					
56b	How many mobile soak pits are available at this operations site?					
56c	How many large capacity mobile soak pits are available at this operations site?					

		Response	Follow Up Question	Follow up Response	#
57	Additional Comments:				

Pre-contract Transport Vehicle Inspection

Date of Inspection :		**Vehicle Make:**	
Country:		**Model:**	
Level 1:		**License Plate:**	
Level 2:			
Level 3:			
Level 4:			
Name(s) of Inspector(s):			
Name of Vehicle Lessor (Business Name):			
GPS Coordinates			
Latitude:			
Longitude:			

Instructions: Use the Pre-Contract Transport Vehicle Inspection Form to ensure vehicles used during IRS and IRS-related activities adhere to the PMI Best Management Practices Manual. This form must be completed by the ECO or the ECO designee prior to signing a contract to use a vehicle for IRS or IRS-related activities. Complete one form per vehicle.

	Question	Response		Follow Up Question	Follow up Response		Corrective Action
1	Is a special license or certificate needed for the driver or vehicle transporting hazardous goods or numerous people?	Yes	No				
1a				If "yes", "Does the driver and/or vehicle have the necessary 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."
1b				If 1a is yes, 'Date of Expiration:'	__/__/_____		

	Question	Response		Follow Up Question	Follow up Response		Corrective Action
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."
2a				If "Yes", "Provide expiration dates of vehicle documents."	Insurance: __/__/____ Inspection: __/__/____		
3	Does the driver have a valid license that is on file and a cell telephone? (Please provide check boxes. Include "None of the above")	☐ License ☐ Cellphone		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."
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."
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 insecticides and before using truck to transport food products, animal feed, or consumer goods."
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."

	Question	Response	Follow Up Question	Follow up Response	Corrective Action
6b			If 6a is yes, 'Date for completing repairs:'	__/__/____	
7	Is there a fully-stocked first aid kit in the vehicle?	☐ Eye wash ☐ Band aids ☐ Gauze			If unchecked boxes, "Inform logistics manager to provide (list missing items) for the vehicle."
7a			If unchecked boxes, "Delivery date for (list missing items) "	__/__/____	
8	Do drivers have appropriate PPE (helmet, face shield, boots, gloves, and filter mask) in case of a spill or accident?	☐ Helmet ☐ Face shield ☐ Dust mask ☐ Gloves ☐ Boots			If unchecked boxes, "Inform logistics manager to provide (list missing items) for the vehicle."
8a			If unchecked boxes, "Delivery date for (list missing items) "	__/__/____	
9	Can the insecticides be adequately secured and tied down (using ties and tarpaulins) in the vehicle?	Yes / No			If "no", "Advise logistics coordinator to provide materials for securing and tying down insecticides 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."
11	Does the insecticide 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."
12	Is there evidence of chemical spill in the vehicle?	Yes / No			If "yes", "Advise driver and vehicle owner that vehicle will not be used for IRS unless it is decontaminated."
13	Does vehicle pass all criteria?	Yes / No			

	Question	Response		Follow Up Question	Follow up Response		Corrective Action
13a				If “yes”, “What is the maximum number of workers this vehicle will be allowed to carry?”			"Provide a numbered certificate to be kept in vehicle during campaign. Certificate must have a VectorLink stamp, list make and model of vehicle, the maximum number of passengers, as well as the license plate number."
13b				If "no", "Can vehicle be modified to meet all criteria?"	Yes	No	If no, "This vehicle cannot be used for IRS."
13c				If 13b is yes, 'Date modifications will be complete.'	__/__/____		
14	Was a certificate issued and placed in the glove compartment?	Yes	No	If “no”, let the vehicle owner know that the vehicle cannot be used until a certificate is issued.			
Additional Comments:							

Spray Operator Transportation Vehicle Inspection

Date of Inspection :		**Vehicle Make:**	
Country:		**Vehicle Model:**	
Level 1:		**License Plate Number:**	
Level 2:			
Level 3:			
Level 4:			
GPS Coordinates			
Latitude:			
Longitude:			
Name(s) of Inspector(s):			

Instructions: This checklist may be used to assist supervisors with verifying that each Spray Operator is in the best condition for spray activities and to identify additional training opportunities. Designated supervisors must complete this form at the operations site while observing morning mobilization activities.

	Question	Response			Follow-up Question	Follow-up Response	Corrective Action
1	Is the current certificate of inspection in the vehicle?	Yes	No				If "no", "Perform full Pre-contract vehicle inspection. Contact Logistics and notify of vehicle substitution, and of inspection results."
2	Does the driver and/or vehicle have the special certification (driver's license, etc.) for transporting hazardous goods or numerous people?"	Yes	No	NA			If "no", 'Contact operations coordinator immediately and advise of violation.'
2a					If "yes", 'Date of expiration:'	__/___/_____	
3	Has the driver attended safety training?	Yes	No				If "no", "Provide safety training for driver"

	Question	Response	Follow-up Question	Follow-up Response	Corrective Action
3a			If "yes" or "no", "Date of training:"	__/___/_____	
4	Other than the insecticide sachets or bottles for the day's use, are any insecticides transported in the same vehicle with the operators?	Yes No			If yes, "Notify driver and site supervisor of violation. Supervise correction of the problem."
5	Are food products, animal feed, or consumer goods transported in the same truck as insecticides?	Yes No NA			If "yes", immediately remove all food products, animal feed, and consumer goods from all trucks transporting insecticide. Instruct driver and logistics personnel about prohibition.
6	Do drivers have a cellphone 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. Driver should have a cellphone for emergencies."
7	If this vehicle transports insecticide, can the insecticides be adequately secured and tied down in the vehicle?	Yes No NA			If "no", "Provide materials for securing and tying down insecticides in the vehicle"
8	Does the vehicle have a fire extinguisher?	Yes No			If "no", "Instruct the driver to get a fire extinguisher from stores."
9	If this vehicle transports operators, does the spray operator transport vehicle have seats and railings?	Yes No NA			If "no", "Arrange for vehicle to be fitted with seats and railings ASAP"
9a			If "no", "Date vehicle will be fitted with seats and railings."	__/___/_____	
10	Is there a fully-stocked first aid kit in the vehicle? (Check box if present).	☐ Eye wash ☐ Band aids ☐ Gauze ☐ Vitamin E cream			If "no", "Provide missing items (list missing items) for first aid kit for the vehicle."
10a			If "no", "Date for delivery of missing first aid kit items: "	__/___/_____	

	Question	Response		Follow-up Question	Follow-up Response	Corrective Action
11	Is there a 1. spill kit, and 2. spill/emergency/accident response procedures in the vehicle? (Check box if present).	☐ Sand ☐ Shovel ☐ Bucket ☐ Spill response procedure ☐ Emergency response procedure ☐ Accident response procedure				If "no", "Provide (List unchecked items) for the vehicle."
11a				If "no", "Date of delivery:"	__/___/_____	If no, "Call main stores to determine delivery status of missing item(s)."
12	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."
13	Is the vehicle overcrowded?	Yes	No			If "yes", "Find alternate transportation for some operators. Take a picture of the problem "
14	Is there evidence of insecticide leakage in the trucks?	Yes	No			If "yes", Instruct driver to decontaminate the vehicle before next use"
Additional Comments:						

Spray Operator Morning Mobilization Inspection	
Date of Inspection :	
Country:	
Level 1:	
Level 2:	
Level 3:	
Level 4:	
GPS Coordinates	
Latitude:	
Longitude:	
Number of spray operators:	
Name(s) of Inspector(s):	

Instructions: This checklist may be used to assist supervisors with verifying that each Spray Operator is in the best condition for spray activities and to identify additional training opportunities. Designated supervisors must complete this form at the operations site while observing morning mobilization activities.

	Question	Response		Follow Up Question	Follow up Response	ECO Action
1	Have the Team Leaders performed a physical inspection of each SO, looking for symptoms such as nausea, dizziness, confusion, breathing problems, skin irritation, excessive sweating, fatigue, weakness, alcohol intoxication, etc.?	Yes	No			If "no", "Advise team leaders that they must check daily on the health of each of their spray operators for these symptoms, and any others."

	Question	Response		Follow Up Question	Follow up Response		ECO Action
1a				"Were any health problems observed among the spray operators?"	Yes	No	If "yes", "Ensure that team leaders have determined the need to refer sick operators to the nearest health clinic for evaluation, and that the site supervisor has completed an Incident Report Form, if symptoms are possibly work-related. Communicate to spray operator that they will continue to receive daily wages while out for work-related illness."
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? (Check box if present).	☐ Helmet ☐ Face shield ☐ Overalls ☐ Boots ☐ Gloves ☐ Mask ☐ Neck protection ☐ Flashlight/torch					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 operators fill spray pumps using the contents of drums 1, 3, and 5 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."
6	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."

Question	Response	Follow Up Question	Follow up Response	ECO Action
Additional Comments:				

Homeowner Preparations and Spray Operator Performance

Date of Inspection :		**Spray Operator ID number:**	
Country:		**Household ID Number:**	
Level 1:			
Level 2:			
Level 3:			
Level 4:			
Name(s) of Inspector(s):			
Latitude:			
Longitude:			

Instructions: This checklist may be used to assist supervisors with identifying training opportunities for spray operators. This form helps the user to verify safety measures and spray quality. Designated supervisors must complete this form while observing during the course of spraying.

	Question	Response	Follow-up Question	Follow-up Response	Corrective Action
Household Preparation					
1	Have all moveable items 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"
2	Have all non-moveable furniture items been moved to the middle of the room and properly covered with a plastic sheet?	Yes / No / NA			If "no", "Direct spray operator to move and cover all furniture items that cannot be removed with a plastic sheet before spraying the structure"
3	Are there any items on the walls or hanging from the ceiling (shoes, toothbrushes, etc.)?	Yes / No			If "yes", "Direct spray operator to remove all items from the wall and ceiling"
4	Are there any rooms in the house that are used as food stores at the time of spraying?	Yes / No			
4a			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."

	Question	Response		Follow-up Question	Follow-up Response		Corrective Action
5	If there are people (sick, elderly, or babies) who cannot be moved in a structure, is this structure being sprayed?	☐ No people who cannot be moved ☐ Yes ☐ No					If "yes", "Stop spray operator immediately. Direct spray operator not to spray structures where people (sick, elderly, babies) cannot be moved"
Insecticide Preparation & Pump Safety							
6	Is the spray operator in full PPE? (Check box if present).	☐ Helmet ☐ Face shield ☐ Overalls ☐ Boots ☐ Gloves ☐ Mask ☐ Neck protection ☐ Flashlight/ torch					If unchecked boxes, "Direct SO to wear full PPE throughout spray operations."
7	Is the insecticide packaged in bottles (e.g., Actellic)?	Yes	No				If “no”, skip to question 8
7a				If "yes", "Does the operator triple-rinse the bottle while preparing the insecticide in the tank?"	Yes	No	If "no", "Direct spray team supervisor to demonstrate the correct procedure for rinsing the bottle while preparing the insecticide tank."
8	Is the final tank volume, including water and insecticide, observed to be 7.5L?	Yes	No				If "no", "Direct spray operator on how to fill the tank to the correct volume."
9	Is the tank shaken to mix the contents before pressurizing?	Yes	No				If "no", " Direct spray operator to properly mix insecticide before pressurizing tank."
10	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 on correct procedure for preparing the insecticide tank."

Question		Response			Follow-up Question	Follow-up Response		Corrective Action
Spray Observation								
11	Is the spray operator in full PPE? (Check box if present).	☐ Helmet ☐ Face shield ☐ Overalls ☐ Boots ☐ Gloves ☐ Mask ☐ Neck protection ☐ Flashlight/ torch						If unchecked boxes, "Direct SO to wear full PPE throughout spray operations."
12	Is the spray operator smoking, eating, or drinking during household preparation or spraying?	Yes	No					If "yes", "Direct spray operator not to smoke, drink, or eat during household preparation or spraying."
13	Have all immovable items been moved to the center of the room (bed, dresser, etc.) and covered?	Yes	No					If "no", Instruct the spray operator to move all immovable items to the center of the room and cover them.
14	Have all loose items (clothes, mosquito nets, posters/pictures on the wall) been taken out of the house?	Yes	No					If "no", Instruct the spray operator to remove clothes, mosquito nets, posters/pictures on the wall before spraying
15	Are there any leaks from the pump?	Yes	No					
15a					If "yes", "Does the operator service the pump before proceeding?"	Yes	No	If "no", "Direct operator to immediately service leaking pump."
16	Is the spray operator 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."
17	Is the spray operator 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 him/her with counting 5 seconds and estimating 2 meters."
18	Is there a 5 cm overlap with each successive swath?	Yes	No	NA				If "no", "Direct operator to ensure that there is a 5 cm overlap with each successive swath. Assist them in estimating 5 cm of swath."
19	Is the spray operator spraying all the recommended surfaces? (walls, inside of doors, ceiling)?	Yes	No					If "no", "Discuss with spray operator the correct surfaces to spray."

	Question	Response		Follow-up Question	Follow-up Response		Corrective Action
20	Is the spray operator 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 operator the areas that should not be sprayed."
21	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 the spray operator the correct pressurization procedure for spraying homes."
22	Were the eaves of the house sprayed?	Yes	No				
22a				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."
23	Did the spray operator correctly mark the house after they competed spraying?	Yes	No				If “no”, Instruct the spray operator how to properly mark structures.

End of Day Cleanup

Date of Inspection :		**Spray team ID number:**	
Country:			
Level 1:			
Level 2:			
Level 3:			
Level 4:			
Name(s) of Inspector(s):			
GPS Coordinates			
Latitude:			
Longitude:			

Instructions: This checklist may be used to assist supervisors with the compliance elements to be verified during spray operator cleanup activities. This form will assist in identifying training opportunities for spray operators and team leaders. Designated supervisors must complete this form at the operations site while observing the end of day cleanup activities.

	Question	Response		Follow Up Question	Follow up Response	ECO Actions
Observations and Record Management						
1	Do the spray operators continue to wear PPE on the way back to the operations site?	Yes	No			If "no", "Flag the spray operator(s) to the supervisor and insist the all spray operators 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."

	Question	Response		Follow Up Question	Follow up Response		ECO Actions
3	Check if the following criteria has been met: - Team Leaders are supervising the cleaning and wash-up - Wash facilities with soap and water are available for operators - All people (spray operators, washers, maintenance techs) in the wash/soak pit area are wearing full PPE	Yes Yes Yes	No No No				-If "no", "Instruct the Team leaders to supervise all cleaning and wash-up." -If "no", "Notify site supervisor to provide soap and water for the wash facilities for operators." -If "no", "Instruct site supervisor to ensure that all people (spray operators, washers, maintenance techs) in the wash/soak pit area wear full PPE."
4	Have there been any accidents today? (Insecticide exposure, vehicle accidents, other injuries or property damage)	Yes	No				
4a				If "yes", "Has an incident report form been filed?"	Yes	No	If "no", "Instruct SO and supervisor to file accident form immediately."
4b				If "yes", "What type of accident?	1. Insecticide Exposure 2. Vehicle Accident 3. Property Damage 4. Other injury		
5	Have any spray operators complained of irritation (throat, skin, etc.)?	Yes	No				If "yes", "Check on status of spray operator(s) complaining of irritation and file report with Operations Manager."
6	Check if the following criteria has been met: - SOs completed their daily report forms - Forms are checked by spray supervisors	Yes Yes	No No				-If "no", "Instruct spray supervisor to ensure that all SOs complete the daily report forms." -If "no", "Instruct supervisor to check all daily forms."

	Question	Response		Follow Up Question	Follow up Response	ECO Actions
Fixed Soak Pits (*Only answer the following question if returned to a fixed soak pit for end of day cleanup)*						
7	Is there adequate gravel to act as a filter?	Yes	No			If "no", "Provide adequate gravel for filter"
8	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 insecticides handed out and returned."
9	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."
10	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."
11	Is all insecticide remaining in pumps emptied into the #1 drum?	Yes	No			If "no", "Notify site supervisor, retrain spray operators and team leaders."
12	Are spray pumps triple rinsed using the progressive rinse method?	Yes	No			If "no", "Instruct spray supervisor to demonstrate correct triple-rinse procedure"
13	Are the outsides of the pumps rinsed off into the soak pit?	Yes	No			If "no", "Instruct spray supervisor to demonstrate correct washing procedure."
14	Are the helmets, face shields, boots, and gloves rinsed off into the soak pit?	Yes	No			If "no", "Ask spray supervisor to demonstrate correct rinsing procedure"
15	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."
16	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."
17	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."
18	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, boot wash may be needed, or consider relocating soak pit"
19	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"
20	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"
21	Are the covers placed on the 7 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"

	Question	Response		Follow Up Question	Follow up Response		ECO Actions
Mobile Soak Pits ***Only answer the following question if returned to a mobile soak pit for end of day cleanup.***							
22	Is the mobile soak pit located away from water bodies, steep slopes or flood prone areas?	Yes	No				If “no”, “Discuss the location of the MSP wash area with the team leader. Notify the ECO.”
22a				Please take a photo to show the MSP with the surroundings.			
22b				Please take a second photo to show the MSP with the surroundings from a different angle.			
23	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."
24	Is this the first day of operations at this site?	Yes	No				
24a				If "no", "Is there any water in the collection barrel at the beginning of clean up?"	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."
25	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."
26	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."
27	Is all insecticide remaining in pumps emptied into the collection drum?	Yes	No				If "no", "Notify site supervisor, retrain spray operators and team leaders."
28	Are spray pumps triple rinsed using the progressive rinse method?	Yes	No				If "no", "Instruct spray supervisor to demonstrate correct triple-rinse procedure"
29	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."
30	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."
31	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."
32	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"

	Question	Response		Follow Up Question	Follow up Response		ECO Actions
33	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."
34	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."
35	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."
36	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."
37	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"
38	Is this the last day of spray operations at this site?	Yes	No				
38a				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."
38b				If "no", Has the MSP been pulled out of the ground with the hole covered and site secured?"	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 the site."
39	Are you able to view where the MSP is being stored?	Yes	No				If “no”, confirm with ECO that the MSP is being stored in a secure room.
39a				If “yes”, 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."
40	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"
41	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."
Additional Comments:							

Storekeeper Performance

Date of Inspection :		
Country:		
Level 1:		
Level 2:		
Level 3:		
Level 4:		
GPS Coordinates		
Latitude:		
Longitude:		
Name(s) of Inspector(s):		

Instructions: This checklist may be used to assist supervisors in verifying compliance with the appropriate safety and recordkeeping practices at the store. This form will also assist with identifying possible training opportunities for the storekeeper. Designated supervisors must complete the form while observing storekeepers in the store, inspecting the facility, and reviewing records.

	Question	Response			Inspector Action
Stock Audit (Mandatory)					
1	Is a stock ledger/register present?	Yes	No		If "no", "Alert/Assist storekeeper with creating a ledger."
2	Is the store ledger book fully updated?	Yes	No		If "no", "Direct the storekeeper in updating the store ledger."
3	Are the stock cards mounted for each item?	Yes	No		If "no", "Instruct storekeeper to mount stock cards."
4	Are the stock cards up to date?	Yes	No		If "no", "Discuss the correct record keeping procedures with storekeeper."
5	Are the separate ledger pages and stock cards for empty bottles/sachets and used dust masks up to date?	Yes	No		If "no", "Direct the storekeeper to complete updated stock cards and ledger pages for these items."
6	If there are insecticides that expire during spray, are there separate stock cards for each group of insecticide?	Yes	No	N/A	If "no", "Instruct storekeeper to create separate stock cards for insecticides that will expire during spray."
7	If there are insecticides that expire during spray, have they been physically separated from the other insecticides in the store room?	Yes	No	N/A	If "no", "Instruct storekeeper to separate insecticide that will expire during spray from the others"

	Question	Response			Inspector Action
8	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."
9	Is the balance in the store ledger book different from the balance on the stock card for all stock items?	Yes	No		If "yes", "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."
10	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."
11	Is the Insecticide Reconciliation Form completed daily?	Yes	No		If "no", "Immediately alert the Logistics Manager and District Coordinator that the Insecticide Reconciliation Form is not completed daily."
12	Is 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 plus any subsequent receipts in the ledger?	Yes	No		If "no", "Immediately alert the Logistics Manager and District Coordinator."
Safety Requirements Compliance					
13	Do people handle insecticides while not wearing masks, gloves, boots and overalls?	Yes	No		If "yes", "Direct all personnel to wear masks, gloves, boots, and overalls when handling insecticides."
14	Do warehouse teams eat inside the warehouse?	Yes	No		If "yes", "Direct warehouse team not to eat inside warehouse while IRS insecticides are in stock."
15	Are storekeepers familiar with the symptoms of insecticide poisoning?	Yes	No		If "no", "Check storekeeper training date. Direct storekeeper to read MSDS for the current insecticide(s) to memorize the symptoms of poisoning."
16	Are the following items in the emergency first aid kit? (Check the box if the item is present.)	☐ Band aids ☐ Gauze ☐ Eye wash ☐ Vitamin E cream			If there are unchecked boxes, "Inform logistics/central storage to replace missing items for this facility."
17	Is there a complete spill kit and a fire extinguisher in the warehouse?	☐ Soil/Sand/Sawdust ☐ Shovel ☐ Bucket			If unchecked boxes, "Inform logistics/central storage to replace missing items."
18	Does the storekeeper know where the nearest health facility is located?	Yes	No		If "no", "Provide information on nearest health facility to storekeeper."
19	Were the antidotes for the insecticide in use provided to the nearest health facility?	Yes	No	N/A	If "no", "Inform logistics/central storage that antidotes may be needed for the health facility."
Materials for Store Facility					
20	Are there soap and water basins available for washing hands?	Yes	No		If "no", "Contact logistics to provide water basins for washing hands."
21	Is the current insecticide Material Safety Data Sheet (MSDS) posted?	Yes	No		If "no", "Obtain the Material Safety Data sheet for the current insecticide from the ECO and have it posted."
22	Is there a functional thermometer for monitoring daily temperature in the storage facility?	Yes	No		If "no", "Inform logistics/central storage to provide thermometer."

Question		Response		Inspector Action
Insecticide Storage and Management				
23	Is there any evidence of insecticide 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 insecticides repackaged as necessary."
24	Are the insecticide and contaminated waste stored away from other materials in the store?	Yes	No	If "no", "Discuss storage of insecticide and contaminated waste with the storekeeper."
25	Are insecticides properly labeled?	Yes	No	If "no", "Obtain insecticide labels and re-label boxes."
26	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 insecticide distribution with storekeeper."
27	Are there any insecticides past their expiration date?	Yes	No	If "yes", "Contact logistics to arrange for disposal of expired insecticide."
28	Are barrels or containers for empty sachets and empty bottles and used masks available and clearly labeled?	Yes	No	If "no", Contact logistic/central storage for barrels or containers for empty bottles and used masks. Clearly label the barrels or containers as contaminated waste. Include type of insecticide on label."
29	Does the number of empty sachets/bottles plus the number of sachets/bottles in the field at this moment equal what the storekeeper indicates as the quantity of stock issued to date?	Yes	No	If "no", "Discuss used sachet/bottle collection and recordkeeping procedure with storekeeper."
30	Is the insecticide stock stored no more than 2 m high and off of the ground?	Yes	No	If "no", "Discuss stacking and/or packing with storekeeper."
31	Is there more than one spray season of accumulated solid waste?	Yes	No	If "yes", "Contact logistics and operations to arrange for the disposal of old waste at the end of the campaign."
Additional Comments:				

Post-IRS EC Inspection

Date of Inspection :	
Country:	
Level 1:	
Level 2:	
Level 3:	
Level 4:	
Name(s) of Inspector(s):	
GPS Coordinates	
Latitude:	
Longitude:	

Instructions: Use the Post-IRS EC Inspection Form to ensure an active operations site is properly decommissioned at the end of the IRS campaign. This form must be completed by the ECO or the ECO designee at the conclusion of IRS or IRS-related activities at the operations site. Complete one form per operations site.

	Question	Response		Follow Up Question	Follow up Response		ECO Action
1	Is this a temporary store?	Yes	No	**If "yes", skip to question 2**			
1a				Is there a full-time year-round storekeeper?	Yes	No	
1b				Will insecticides be stored here in the off-season?	Yes	No	If "yes", "Inspect the stores Stock card & Ledger book to confirm correct recording."
1c				How much insecticide will be stored?			
1d				What are the expiration dates of the insecticides?	__/__/____; __/__/____; __/__/____		

	Question	Response			Follow Up Question	Follow up Response		ECO Action
1e					Are guards at this facility 24 hours a day?	Yes	No	If “no”, “This has to have a guard 24 hours a day, if insecticides will be in the store.”
2	Have all the IRS items, signs, insecticides and wastes been removed from this store?	Yes	No					If "no", "Notify operations coordinator to arrange for removal of IRS items, signs, insecticides and wastes from the store and soak pit."
2a					If "no", "Date IRS items will be removed:"	___/____/_____		
3	Has the insecticide storage area been washed with soap and water?	Yes	No					If "no", "Notify operations coordinator to arrange for store to be washed with soap and water."
3a					If "yes" or "no", "Date store was or will be washed"	___/____/_____		
4	Is the soak pit covered and the gates locked?	Yes	No					If "no", "Contact operations coordinator to arrange to have soak pit covered and locked.
4a					If "yes" or "no", "Date soak pit was/will be covered and gates locked."	___/____/_____		
5	Are the soak pit and its surroundings left clean?	Yes	No					If "no", "Arrange to have the surroundings of the soak pit cleared."
5a					If "no", "Date soak pit and surroundings will be cleared."	___/____/_____		
6	Was the working relationship between the IRS team and owners of the store good?	Yes	No	N/A				If "no", "Investigate reason(s) for working relationship between the IRS and the store owner not being good."
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							

ANNEX B: INSECTICIDE TRACKING TOOLS

- Daily Tracking Form for Insecticide returned from the field
- Serialized Insecticide Tracker

INDOOR RESIDUAL SPRAYING PROGRAM
DAILY MIXED INSECTICIDE RETURNED FROM FIELD TRACKING FORM

County:_____Sub-county:_____ Operation Site: _____

Supervisor's name:_____ Signature: _____

Spray Date	Team Number	Name of Team Leader	Amount of insecticide returned (in Liters)	Reasons	Action taken	Signature
Total						

SERIALIZED INSECTICIDE BOTTLE/SACHET TRACKER

Team Leader Name _____

Team Leader Code: _____

Total number of bottles received by TL from store: _____

(This form should be filled by the team leader each day. In the morning, at the point of issuance of full insecticide bottles or sachets to the spray operator and in the evening to account for each insecticide bottle or sachet. Each leaf of the booklet represents a day's work)

KEY: F **Full bottles/sachets** E **Empty bottles/sachets**

County _____ *Sub County*_____ *Ward* _____ *Operation Site*_____

#	Issuance in the morning							End of Day Return						
	Bottle or Sachet 1	Bottle or Sachet 2	Bottle or Sachet 3	Bottle or Sachet 4	Bottle or Sachet 5	Bottle or Sachet 6	SOP Authentication	Bottle or Sachet 1	Bottle or Sachet 2	Bottle or Sachet 3	Bottle or Sachet 4	Bottle or Sachet 5	Bottle or Sachet 6	SOP Authentication
1	F E	F E	F E	F E	F E	F E	Name 1_____ SOP Code_____ Signature_____	F E	F E	F E	F E	F E	F E	Name 1_____ SOP Code_____ Signature_____
2	F E	F E	F E	F E	F E	F E	Name 2_____ SOP Code_____ Signature_____	F E	F E	F E	F E	F E	F E	Name 2_____ SOP Code_____ Signature_____
3	F E	F E	F E	F E	F E	F E	Name 3_____ SOP Code_____ Signature_____	F E	F E	F E	F E	F E	F E	Name 3_____ SOP Code_____ Signature_____
4	F E	F E	F E	F E	F E	F E	Name 4_____ SOP Code_____ Signature_____	F E	F E	F E	F E	F E	F E	Name 4_____ SOP Code_____ Signature_____
5	F E	F E	F E	F E	F E	F E	Name 5_____ SOP Code_____ Signature_____	F E	F E	F E	F E	F E	F E	Name 5_____ SOP Code_____ Signature_____
6	F E	F E	F E	F E	F E	F E	Name 6_____ SOP Code_____ Signature_____	F E	F E	F E	F E	F E	F E	Name 6_____ SOP Code_____ Signature_____

Team Leader Signature: _____ **Date:** _____

(This section should be signed by the team leader at the end of each day's operations)

ANNEX C: INCIDENT REPORTING

Standard Operating Procedure for IRS Incident Reporting

Purpose and scope

The purpose of this Standard Operating Procedure (SOP) for Indoor Residual Spraying (IRS) Incident Reporting is to formalize and document reporting and communication processes for incidents occurring under the U.S. President's Malaria Initiative (PMI) IRS programs implemented by the United States Agency for International Development (USAID). Appendix A includes the Incident Report Form template for documenting and reporting incidents.

The scope of this SOP includes incidents that occur in PMI IRS programs during the course of USAID spray operations. The primary focus is on incidents with an actual or potential environmental or human health impact, as further defined and described below in Table 1. However, the procedure also applies to incidents that may not have environmental or human health impacts.

While this SOP is focused on PMI IRS operations in Sub-Saharan Africa, the SOP is not limited to these countries and can be applied to any country conducting IRS activities under PMI.

This SOP does not alter or supersede any existing emergency response or notification procedures.

BACKGROUND

USAID must ensure that all project activities are conducted in accordance with USAID regulatory requirements and standards, host country laws, and applicable international conventions. Federal Regulation in Title 22 Code of Federal Regulations Part 216 (22 CFR 216), as authorized by the Foreign Assistance Act, Section 117, establishes USAID's environmental requirements.

The Bureau for Global Health (GH) documents, analyzes, and responds to incidents that occur during implementation of IRS activities using a variety of means, including a 48-Hour Incident Report, follow-up information collection, and Corrective Action Plans (CAPs). In October 2017, the Global Environmental Management Systems II project (GEMS II) completed an IRS Incident Study Report (Incident Study) on behalf of USAID, which included a systematic review of 59 Incident Reports occurring from January 2015 through March 2017 under the PMI Africa Indoor Residual Spraying (AIRS) project. One of the Incident Study's primary recommendations was to establish this SOP with comprehensive guidelines for IRS Incident Reporting.

INCIDENT CATEGORIES AND PRIORITY LEVELS

The Incident Study grouped incidents reviewed into five PMI Incident Categories and established a priority rating system. This SOP expands on that system in order to establish reporting protocols for incidents based upon Incident Category and Priority Level. The table below shows the five PMI Incident Categories, their definitions, and the threshold for a High Priority incident. All Incident Reports that do not meet the High Priority threshold will be classified Low Priority.

TABLE 4: INCIDENT CATEGORY DESCRIPTIONS AND HIGH PRIORITY THRESHOLDS

Incident Category	Description	High Priority Threshold
Theft or Fraud	All incidents of theft or fraud occurring during or related to spray operations. Includes incidents in which a spray operator is found to have either stolen insecticide for re-sale and/or falsified spray data to show houses sprayed where such spraying did not occur. Includes intentional pouring of insecticide resulting from theft or fraud.	Involves multiple responsible individuals in a single incident or multiple cases in the same area.
Insecticide Exposure due to Equipment or PPE Malfunction or Misuse	Insecticide exposure due to equipment malfunction/misuse, such as over pressurization of a spray pump, or misuse of personal protective equipment (PPE), such as lifting a face shield.	Involves death or major injury/illness*, or shows consistent pattern of equipment or PPE malfunction or misuse.
Other Health and Safety Concerns	Situations where a spray team member is injured or falls ill for reasons not related to insecticide exposure. General safety issues are included in this category.	Involves death or major injury/illness*.
Vehicle and Transport Accidents	All incidents involving vehicles or transport related to spraying. Includes PMI Best Management Practices (BMP) definition of bulk "transport" (motorized vehicles, such as 10-ton trucks and pickup trucks), as well as transport of program personnel or spray operators.	Involves death or major injury/illness*.
Insecticide Spills	Accidental spill incidents resulting in chemicals released to the environment.	Insecticide spills of greater than 7.5 liters (i.e., entire contents of a spray tank) or with significant potential environmental, health, or safety impacts.

* "*Major injury/illness" for the purposes of this SOP, is defined as an injury or illness resulting in overnight medical stay lasting multiple days or that results in severe impairment, such as bone fracture, loss of function, loss of ability to work for an extended period, etc.*

I.D INCIDENT IDENTIFIER

The Incident Identifier (Incident ID) for IRS incidents provides a consistent naming convention to assist PMI staff in communicating incident response efforts to USAID management, improve the effectiveness of management tracking, and enhance USAID's ability to quantify and analyze incident types for corrective actions. When preparing the Incident Report, each incident is assigned an Incident ID that includes the country code, date, and category descriptor. "KEN_020817_Insecticide_Exposure" is an example Incident ID for an incident occurring in Kenya on February 8, 2017, in which a spray operator had insecticide exposure due to a pump malfunction. Refer to Appendix C for additional details on the Incident ID format.

ROLES AND RESPONSIBILITIES

The roles and responsibilities of the key personnel involved in the Incident Reporting process are described below.

USAID and PMI Staff

1. **Contracting Officer's Representative (COR)**

   The COR oversees the Incident Reporting process. Following receipt of the 48-hour Incident Report, the COR ensures documentation of all corrective actions and ensures communication of High Priority incidents to appropriate parties. The COR is responsible for ensuring appropriate implementation of this SOP.

2. **GH Bureau Environmental Officer (BEO)**

   The GH BEO coordinates with the COR to ensure that adequate policies and procedures are in place to support appropriate incident response and reporting. High Priority Incident Reports will be provided to the GH BEO.

3. **Mission Environmental Officer (MEO)**

   The MEO will receive 48-hour Incident Reports for all High Priority incidents from the PMI In-Country Activity Manager. The MEO will also receive Low Priority Incident Reports occurring in his/her country of operation at the discretion of the PMI In-Country Activity Manager.

4. **PMI In-Country Activity Manager**

   The PMI In-Country Activity Manager refers to either the USAID or CDC PMI Resident Advisor (RA), or designated Foreign Service National staff that are responsible for the day to day oversight of project activities in-country. The PMI In-Country Activity Manager receives all Incident Reports for incidents occurring in their country, and is responsible for communicating High Priority incidents to the MEO and other country-level stakeholders at their discretion (for example, Mission leadership or National Malaria Control Program management).

5. **Regional BEO**

   The Regional BEO coordinates with the COR to ensure adequate regional response to High Priority incidents. High Priority Incident Reports will be submitted to the appropriate Regional BEO by the COR.

6. **USAID Health Office Director**

   The USAID Health Office Director receives High Priority Incident Reports for review from the PMI In-Country Activity Manager.

Implementing Partner (IP) Headquarters Staff

1. **Director of Environmental Compliance and Safety (DECS)**

   The DECS has overall responsibility for ensuring environmental, health, and safety compliance of project activities. This position provides oversight and coordination in the Incident Reporting process and assists with preparation of the 48-hour Incident Report and corrective actions as needed.

   Environmental Compliance Manager

   The ECM coordinates with the COP and TPM to edit initial reports and elicit additional information to complete the 48-hour report

2. **Project Director**

   The Project Director receives the draft 48-hour Incident Report for review and comment during its development.

3. **Technical Program Manager (TPM)**

   The TPM coordinates with the ECM and COP to prepare and transmit the 48-hour Incident Report. The TPM is responsible for final review and transmittal of the draft report prepared by the ECM and COP to the appropriate parties.

Implementing Partner (IP) In-Country Staff

1. **Chief of Party (COP)**

   The in-country COP coordinates with the ECO and TPM to prepare and transmit the 48-hour Incident Report. The COP sometimes provides final review of the 48-hour Incident Report and coordinates with the TPM on transmittal to the COR.

2. **Environmental Compliance Officer (ECO)**

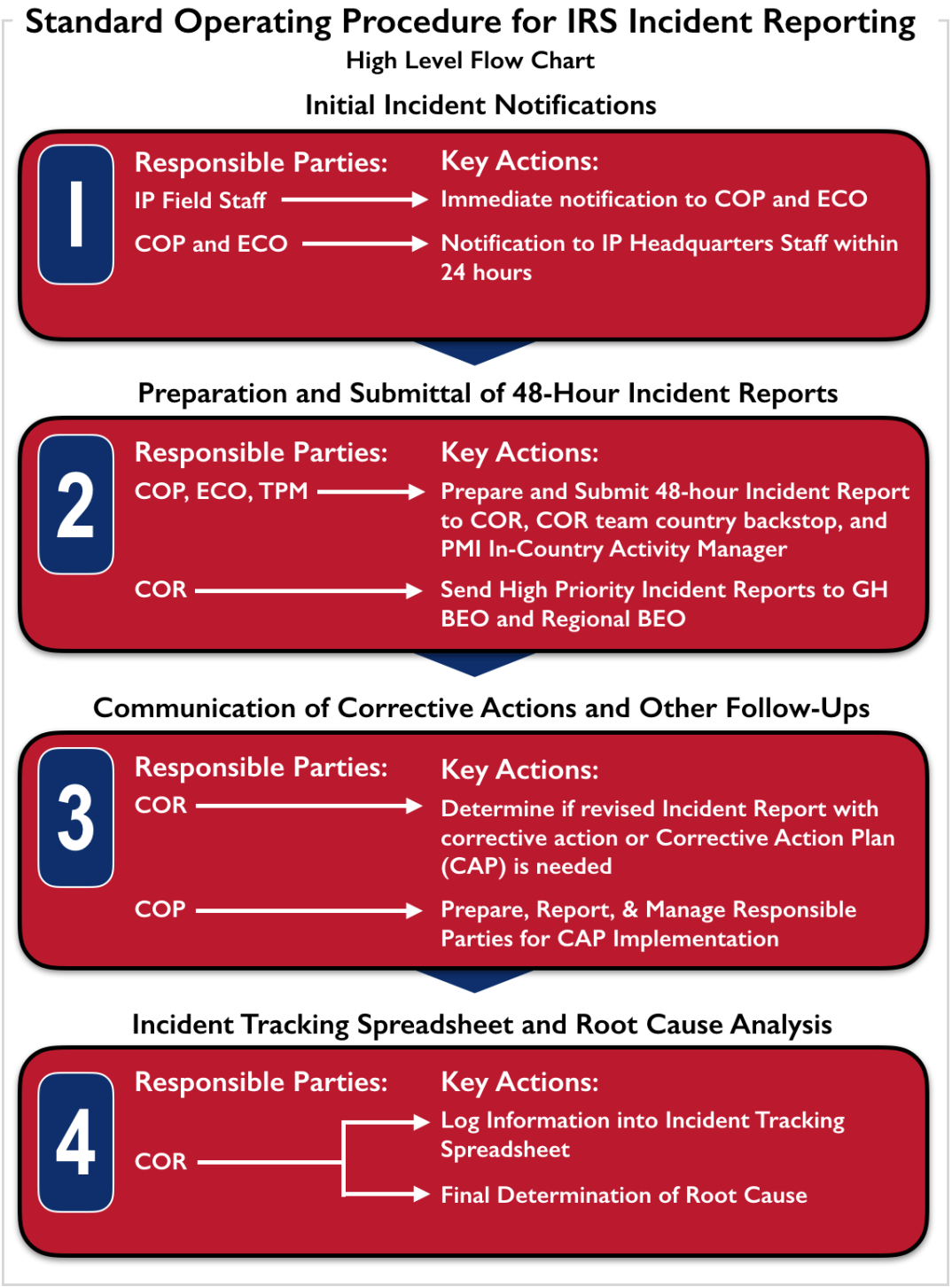
   The in-country ECO coordinates with the COP and TPM to prepare and transmit the 48-hour Incident Report. The ECO and/or COP work(s) with the TPM and ECM to collect information and prepare the 48-hour Incident Report.

3. **IP Field Staff**

   IP field staff, in the context of this SOP, refers to any and all IP field staff that observe an incident in the field, including field supervisory staff. These individuals are responsible for immediate notification of the incident to the COP and ECO.

Detailed Incident Reporting Procedure Steps

This section describes each of the procedural steps in the incident reporting process, summarized in the SOP High Level Flow Chart below (Figure 1). Roles and responsibilities are further defined within each step. Detailed procedures for specific incident categories are included, where appropriate.



STEP 1 – INITIAL INCIDENT NOTIFICATIONS

This step emphasizes appropriate and timely initial notification from IP field staff to responsible IP and PMI staff, including COP and ECO, particularly for High Priority incidents.

EMERGENCY RESPONSE

In case of emergency, contact local emergency responders immediately.

Refer to local laws and guidelines for contacting authorities.

1. If necessary, IP field staff follow local procedures for basic emergency notifications (e.g., emergency response for a traffic accident).

2. IP field staff contact the COP or ECO via phone immediately to provide initial notification of the incident. IP field staff review the High Priority column of Table 1 above and provide any information relevant to High Priority incident classification, so that the ECO and COP can quickly determine whether a High Priority incident has occurred (See 2.2 below for Priority determination).

3. COP and/or ECO report all incidents to Implementing Partner Headquarters Staff, including the TPM, DECS, ECM, and Project Director, within 24 hours.

When should I notify my managers?

IP field staff should notify the COP and/or ECO immediately if an incident has occurred.

STEP 2 – PREPARATION AND SUBMITTAL OF 48-HOUR INCIDENT REPORTS

This step describes actions by IP responsible parties to draft, finalize, and submit the 48-hour Incident Report. The purpose of the 48-hour Incident Report is to convey critical incident information from the IP to PMI, including Incident Category, Priority Level, persons involved, and initial incident response. Refer to Table 2 below for Incident Category-specific information requirements for preparation of the 48-hour Incident Report.

1.1. The COP and ECO coordinate to collect essential incident information via phone and email from IP field staff and prepare the draft 48-hour Incident Report using the Incident Report Form (Appendix A). The TPM and the DECS assist in preparing the Incident Report, as needed.

1.2. During the Incident Report drafting process, the COP and ECO establish the Incident Category, Priority Level, and Incident ID. The COP and ECO perform an initial root cause analysis and propose a root cause determination.

- For Incident Category and Priority Level details, refer to section I.C above.

1.3. For Incident ID instructions, refer to Appendix C.
The COP and ECO provide the draft Incident Report to the DECS, the Environmental Compliance Manager, the Project Director, and the TPM for review and comment.

1.4. The TPM finalizes and submits all Incident Reports to the COR, COR team country backstop and the PMI In-Country Activity Manager within 48 hours.

1.5. Upon receipt, the COR immediately forwards High Priority Incident Reports to the GH BEO, the Regional BEO, and the USAID Malaria Division Chief.

1.6. For High Priority Incidents, the PMI In-Country Activity Manager forwards the Incident Report to the USAID Health Office Director and MEO. At his/her discretion, the PMI In-Country Activity Manager may also forward Low Priority Incident Reports to the MEO.

All incidents MUST be reported to PMI within 48 hours. NO EXCEPTIONS.

TABLE 5: CATEGORY-SPECIFIC INFORMATION IN THE 48-HOUR INCIDENT REPORT		
Category	**All Incidents in this Category**	**High Priority Incidents**
Theft or Fraud	Summarize theft and fraud information. Include a description of what was stolen and recovered. Describe police involvement. Provide information required under "Insecticide Spills" category if intentional dumping of insecticide occurred.	Describe history of previous local incidents. List all PMI staff that were involved in the current set of incidents. Attach police report, if available.
Insecticide Exposure due to Equipment or PPE Malfunction or Misuse*	Record circumstances of exposure and signs and symptoms of exposure. Describe timeline for onset of symptoms, advancement of symptoms, provision of medical care, and resolution of symptoms. Record name of medical facility and status of treatment (e.g., on-going, discharged, etc.). Note if individual was able to return to work. Note: Personally identifiable information, including specific medical information or treatment will not be included in the IR to COR, but will be available from the IP if necessary.	Summarize the individual's history of service in spray campaigns and relevant health information. If the PPE malfunction or misuse shows a widespread pattern, describe.
Other Health and Safety Concerns*	Record circumstances of incident or illness, including signs and symptoms. Describe timeline for injury or onset of symptoms, advancement of symptoms, provision of medical care, and resolution of symptoms/ injury recovery. Record name of medical facility and status of treatment (e.g., on-going, discharged, etc.). Note if individual was able to return to work. Note: Personally identifiable information, including specific medical information or treatment will not be included in the IR to COR, but will be available from the IP if necessary .	Summarize the individual's history of service in spray campaigns and relevant health information.
Vehicle and Transport Accidents*	Describe any property damage (PMI and/or third party). Record vehicle decontamination procedures that were completed. Describe number and severity of injuries, provision of medical care, and injury recovery. Record name of medical facility and status of treatment (e.g., on-going, discharged, etc.). Note if individual was able to return to work. Provide information required under "Insecticide Spills" category if a spill occurred.	Summarize emergency response and medical treatment. Attach photos of vehicle incident site, if available. Include close-ups of vehicle damage and wide shot to capture road conditions. Attach police report, if available.
Insecticide Spills	Describe actions to control, contain, and clean up the spill. Describe actions taken to limit public access to contaminated areas. Estimate the volume of insecticide spilled and recovered. Describe the location of the spill, noting proximity to sensitive areas, such as homes and water wells. Describe actions taken, or planned, to dispose of contaminated soil.	Describe local emergency response, if applicable. Describe notifications to local agencies or emergency responders. Attach photos of spill, before and after spill response actions, if available.

**Personally Identifiable Information (PII) and Personal Health Information (PHI) must be stored in accordance with ADS Chapter 508, international best management practices, and host country laws and regulations.*

STEP 3 – COMMUNICATION OF CORRECTIVE ACTIONS AND OTHER FOLLOW-UPS

This step describes the process for documenting corrective actions and other follow-up activities related to the incident after the 48-hour Incident Report has been completed and submitted.

1.7. The COR team reviews the 48-hour Incident Report and determines if corrective action is needed. If no corrective action is needed, follow-up actions can be documented by email communication with the COR or by updating the Incident Report Form.

1.8. If a corrective action is required, corrective actions are documented using either of the following methods:

- For Low Priority incidents, the IP updates the Incident Report Form (Appendix A) using the "Corrective Action and Follow-up Actions" section.
- For High Priority incidents that result in an environmental or human health impact, and where systemic issues within the control of the IP are identified, the COR may request the IP to use the standard USAID CAP template (Appendix D). (Examples: widespread theft occurring in a given country, several instances of PPE non-compliance leading to exposure, etc.)

1.9. If a CAP is required, the responsible party determined in Step 3.2 implements the CAP and notifies the COR of relevant updates.

STEP 4 – INCIDENT TRACKING SPREADSHEET AND ROOT CAUSE ANALYSIS

This step describes the process for logging incidents in the Incident Tracking Spreadsheet and COR assignment of root cause. The Incident Tracking Spreadsheet is the COR Team mechanism for tracking basic incident information. Step 4 can be completed after receipt of the 48-hour Incident Report by the COR team.

1.10. The COR logs summary incident information from the Incident Report Form into the Incident Tracking Spreadsheet.

1.11. The COR makes the final determination of incident root cause (Table 3), which is entered in to the Incident Tracking Spreadsheet as "COR Determination."

TABLE 6: GH STANDARD ROOT CAUSES
• Roles and Responsibilities Not Defined
• Standard Operating Procedures Not Developed
• Not Following Procedures
• Lack of Communication
• Lack of Training
• Lack of Document or Record Control
• Lack of Internal Monitoring
• Inadequate Resources
• No Corrective or Preventive Action

1.12. The COR logs the relevant Category Descriptor (see Appendix C) in the Incident Tracking Spreadsheet.

What is root cause analysis?

Root cause analysis involves the identification of the underlying reason that an incident occurred in order to determine effective and appropriate corrective and preventive actions.

DOCUMENT AND RECORDS MANAGEMENT

The IP documents a summary of incident information, including corrective actions that occur after the initial 48-hour Incident Report period, in the country's End of Spray Report. This is completed within 45 days of the end of each round of spraying. Incidents are summarized in End of Spray Reports, using the Incident ID for reference.

The ECO maintains local copies of incident records and supporting documentation using the Incident ID for reference. This includes the 48-hour Incident Report, corrective action and follow-up reporting, and supporting documentation/records. The IP must make these records available to PMI management upon request.

President's Malaria Initiative (PMI) Indoor Residual Spraying (IRS) Incident Report Form	
PMI Incident ID:	**Incident Category:** ☐ Theft or Fraud ☐ Insecticide Exposure Due to Equipment or PPE Malfunction or Misuse ☐ Other Health and Safety Concern ☐ Vehicle and Transport Accidents ☐ Insecticide Spills
Location (City/Town, Region, Country):	
Incident Date: MM/DD/YY **Time:** (*Use local time zone)*	**Priority Level:** ☐ High ☐ Low

DESCRIPTION OF INCIDENT

Provide brief description of incident. Include as applicable:

- *Background or contextual information required to help understand the incident.*
- *Category-Specific Information listed in SOP Step 2, Table 2.*
- *IP staff and non-IP staff involved in the incident.*
- *Describe the extent of property damage or injury to a third party, if any.*
- *Provide information on:*
  - *Reports filed with the authorities.*
  - *Any information on local procedures, common practices, traditional processes and requirements.*
- *Any further information that would be helpful or questions/requests for guidance.*
- *Any information that is critical to the understanding of the incident that is lacking at the time of submission.*

PROPERTY DAMAGE

Was there any property damage? ☐ Yes ☐ No

If yes, please describe and estimate cost to repair:

INJURY INFORMATION *(Copy and paste this box for multiple injuries)*

Was anyone injured? ☐ Yes ☐ No *(If No, leave the rest of this box blank.)*

Cadre of injured person (i.e., spray operator, washer, homeowner, etc.):

Was the injured person: ☐ Male or ☐ Female?

Description of injury (type, severity, etc.):

Does the injury require physician/hospital visit? ☐ Yes ☐ No

Does the injury require overnight hospital stay or missed work? ☐ Yes ☐ No

Name of physician/hospital:

Address:

Physician/hospital phone number:

Outcome/treatment received:

INITIAL ROOT CAUSE ANALYSIS

(Please provide initial analysis of the root cause of the incident, and select a proposed root cause from the list of GH standard root causes to the right. COR will make final root cause determination.)	**Proposed Root Cause:** ☐ Roles and Responsibilities Not Defined ☐ Standard Operating Procedures Not Developed ☐ Not Following Procedures ☐ Lack of Communication ☐ Lack of Training ☐ Lack of Document and Record Control ☐ Lack of Internal Monitoring ☐ Inadequate Resources ☐ No Corrective or Preventive Action

Corrective Action and Follow-up Actions

Are any corrective actions required beyond the 48-hour Incident Report? ☐ Yes ☐ No

If yes, describe the corrective action needed:

Responsible Parties:

Time Frame for Implementation:

List any press or newspaper reports if applicable.

Note: If corrective action is required, email update on the corrective action taken should be provided to the COR within 2 weeks of the incident.

Notice to IP Field Staff:

All incidents must be reported immediately to the Chief of Party and/or ECO. High Priority incidents must be reported within 24 hours to the relevant IP Headquarters Staff.

All incidents MUST be reported to PMI within 48 hours using this Incident Report Form. NO EXCEPTIONS.

Incident Identifier

The Incident Identifier (Incident ID) will, at a minimum, consist of three elements: Country, Date, and Descriptor. The recommended Incident ID format is as follows:

- [3-digit country code]-[6-digit date]-[Descriptor].
- 3-digit country codes are shown in Table B-1 below.
- 6-digit date is in the MMDDYY format.
- Descriptors are based on an abbreviated version of the Incident Category and can be tailored to the incident as needed. Examples are provided in Table B-2 below.

Table B-1. 3-digit country codes

Country	3 Digit Country Code
Benin	BEN
Burkina Faso	BKF
Burundi	BUR
Cameroon	CAM
Cambodia	CMB
Cote D'Ivoire	CDI
Dem. Repub. Congo	DRC
Ethiopia	ETH
Ghana	GHA
Kenya	KEN
Liberia	LIB
Madagascar	MAD
Malawi	MLW
Mali	MAL
Mozambique	MOZ
Niger	NGR
Nigeria	NGA
Rwanda	RWA
Senegal	SEN
Sierra Leone	SLN
Tanzania	TAN
Uganda	UGA
Zambia	ZAM
Zimbabwe	ZIM

Table B-2. Descriptors

Category	Descriptor
Theft or Fraud	Theft
Insecticide Exposure due to Equipment or PPE Malfunction or Misuse	Exposure
Other Health and Safety Concerns	Health-Safety
Vehicle and Transportation Accidents	Vehicle-Accident
Insecticide Spills	Spill

Incident ID Example:

"KEN_020817_Insecticide_Exposure" is an example Incident ID for an incident occurring in Kenya on February 8, 2017, in which a spray operator had insecticide exposure due to a pump malfunction.

Multiple Incidents Occurring on the Same Day

Closely related incidents occurring on the same day can generally be reported on the same Incident Report with a single Incident ID. For example, an automobile incident with multiple injuries would constitute one incident, duplicating the injury information table for all injured persons. Two or three incidents of theft by a small group of individuals on the same day would be considered one incident.

In cases where unrelated incidents occur on the same day in the same country, add "-IR#" to the Incident ID. For the above Incident ID example, if two unrelated incidents occurred that day in Kenya, the Incident IDs could be "KEN-080217-IR1-Exposure" and "KEN-080217-IR2-Spill".

Best Practices for Document Management and Incident Tracking

To support effective long-term document management, Incident Report supporting documents should be saved with the Incident ID at the start of the file name.

CORRECTIVE ACTION PLAN (CAP)

PROJECT/ACTIVITY DATA

Project/ Activity Name:	
Implementing Partner(s):	
Implementation Start/End Date:	
Contract/Award Number:	
CAP Tracking ID:	
Tracking ID/link of Related IEE:	

ORGANIZATIONAL/ADMINISTRATIVE DATA

CAP Initiated by (Name and USAID title):	
AOR/COR:	
Implementing Operating Unit(s): **(e.g. Mission or Bureau or Office)**	
Lead BEO Bureau:	
Submitted by:	
Date Submitted:	

Purpose and Scope

Corrective Action Plans (CAPs) are used to correct deficiencies, reduce liabilities, and improve environmental compliance. CAPs document corrective and/or preventive actions that are required to address environmental compliance findings and management system breakdowns. They may also provide observations for improvement and recommended Best Management Practices (BMPs).

The CAP demonstrates the collaborative nature of the IEE process and USAID's commitment to be proactive in resolving deficiencies that are identified during monitoring and may be used voluntarily in improve environmental performance. It assists USAID Operating Units to establish formal plans for corrective and preventive actions to help meet the requirements of 22CFR216 and ADS 204. The CAP is mandatory when a project or activity is found to be noncompliant—e.g., failure to comply with IEE conditions, use of pesticides without a PERSUAP, or failure to follow other ADS 204 procedures. The CAP is initiated by USAID and directed to the Process Owner (e.g., AOR/COR, Mission Director, Implementing Partner).

FINDING/OBSERVATION SUMMARY

To be completed by the initiator of the CAP. Explain findings and observations, either associated with deficiencies or opportunities for improvement. Include a description of relevant environmental impacts and applicable compliance requirements, as needed.		
Date of Finding/Observation:		
Finding/Observation Description:		
Root Cause(s):	*Investigate the root cause and describe what steps led to the deficiency. May contain standard root cause categories, which can be customized. Examples include:* • *Roles and Responsibilities Not Defined* • *Standard Operating Procedures Not Developed* • *Not Following Procedures* • *Lack of Communication* • *Lack of Training* • *Lack of Document and Record Control* • *Lack of Internal Monitoring* • *Inadequate Resources* • *No Corrective or Preventive Action*	
Description of Monitoring Measures:		
Actions Already Taken to Address Finding:		
Recommended Corrective and/or Preventive Actions for Compliance:		
Recommended Corrective and/or Preventive Actions for Best Practices:		
CAP Initiator Signature:		**Date:**

DETAILS OF RECOMMENDED CORRECTIVE AND/OR PREVENTIVE ACTION

To be completed by the Process Owner (e.g., AOR/COR, Mission Director, Implementing Partner). Explain actions to be taken to resolve the deficiency and prevent reoccurrence or actions to be taken to affect the opportunity for improvement. Provide the expected completion date.

Description of Required Corrective and/or Preventive Action(s):		
Resources Required (human, financial, etc.):		
Person(s) Responsible:		
Required Completed Date:		
Recommended Verification Measures:		
Process Owner:		**Date:**
Process Owner Signature:		
Actual Completion Date:		**Initial here when complete:**

VERIFICATION OF THE CAP

The USAID responsible person (e.g., MEO and/or REA) shall describe objective evidence that indicates the deficiency has been resolved and/or improvements and preventive actions are reasonable and adequate.

USAID Responsible Person:		
USAID Responsible Person Signature:		

CLOSURE OF THE CAP

Upon verification of the CAP, the BEO shall review the applicable corrective and preventive actions and, when satisfied that they are suitable, adequate, and effective, shall authorize closure of the CAP.

BEO Comments:

BEO:		**Date:**
BEO Signature:		