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1. Armed Forces Pest Management Board

The Armed Forces Pest Management Board (AFPMB) recommends policy, provides guidance, and coordinates the exchange of information on all matters related to pest management throughout the Department of Defense (DoD). The AFPMB's mission is to ensure that environmentally sound and effective programs are present to prevent pests and disease vectors from adversely affecting DoD operations.

1.1 Technical Guides

This is one of a series of Technical Guides (TGs) published by the Information Services Division (ISD), AFPMB. The AFPMB is a directorate within the Office of the Assistant Secretary of Defense for Energy, Installations and Environment that recommends policies and procedures, provides guidance, and coordinates the exchange of information related to pest management throughout the DoD. The ISD Collects, stores and disseminates published and unpublished information on arthropod vectors and pests, natural resources, and environmental biology important to the DoD. Other ISD products include country- or region-specific Disease Vector Ecology Profiles (DVEPs). All TGs and DVEPs are available at the AFPMB Web site, http://www.acq.osd.mil/eie/afpmb.

TGs are not policy documents; rather, they provide technical guidance for the use of the DoD pest management community and others. Accordingly, TGs should not be construed or referenced as policy, unless cited in a policy document. DoD pest management policies may be found in DoD Directive 4715.1E, “Environment, Safety, and Occupational Health,” and DoD instruction 4150.07, “DoD Pest Management Program,” and component implementing directives, instructions, or regulations.

Inquiries, comments or suggestions for improving TGs may be directed to the Chief, ISD, at (301) 295-7476, FAX: (301) 295-7473.

1.2 Acknowledgements

This Technical Guide was prepared by Mr. James Butler, US Army Public Health Command–Atlantic, Fort Meade, Maryland. Members of the AFPMB Installation Advisory Committee and the AFPMB staff have reviewed this document. Special thanks go to Jim Harrison, Anne Radavich, Jerold Spohn, Dr. Doug Burkett and many others who contributed to the development, review, and improvement of this TG.

1.3 Disclaimer

Trade names are used in the TG to provide specific information or examples, and do not imply endorsement of the particular items or products named, or any criticism of similar ones not mentioned. Any reference to trade names does not constitute a guarantee or warranty of the products by the author, the AFPMB, the Military Services, or the DoD.
2. **Intended Audience**

This technical guide is written to help food service managers understand modern Integrated Pest Management and identify the characteristics of an affective program. Most food service managers do not have pest management background, so this technical guide defines pest management, details the roles and responsibilities of all major players, and provides guidance on common issues in food service pest management. This document will enable the reader to use this information to improve their own program.

3. **Introduction**

Pest management in food service locations is a top priority for the U.S. military. Improper food-service sanitation and poorly maintained facilities promotes pest infestation, and increases the risk of food-borne illness for Soldiers, Sailors, Airmen, Marines, their families, and other facility patrons. Effective pest management requires cooperation between many people and is not the sole responsibility of pest management professionals. This document covers the roles and responsibilities of key personnel, provides an overview of pest management practices in food-service locations, and allows the reader to understand their own role ensuring patrons are provided safe and wholesome food.

4. **Integrated Pest Management (IPM)**

4.1 **Is there a need for pest management?**

Food service locations are responsible for providing safe food to their customers. This process incorporates many food safety factors, from proper temperature and storage, to sanitary preparation and service. Pest infestations at food-service locations can contaminate customers' food and damage the facility’s reputation. Pests will often walk from unsanitary surfaces, such as the floor, directly onto food or food-contact surfaces. This behavior increases the risk of food-borne illness through cross-contamination. If left unchecked, a minor pest infestation can become a major infestation, increasing risks to patrons and staff at the food service location.

An affective integrated pest management program identifies conducive conditions for pest infestations and works with the appropriate personnel to remove or reduce these conditions appropriately. Additionally, routine monitoring and inspection can identify pest infestations earlier, when they are easier to control and have not placed patrons at risk. These practices help reduce food service pest hazards and decrease the risk of food-borne illness.

4.2 **Traditional Pest Management versus IPM**

DoDI 4150.07 mandates that IPM methods be used on all DoD-owned property. Many people are unaware of the benefits of IPM and how it differs from traditional pest management methods. All major players in food service pest management should
understand the differences between the two approaches. The general mindset of these two methods is outlined below.

Traditional Pest Management:

- Encourages personnel to apply pesticides when no pests are present.
- Stresses using liquid pesticides around baseboards and in other locations to prevent infestations.
- May or may not use monitors and visual inspections.
- Applies pesticides as the primary control method, including using extensive liquid applications or fogging.
- Does not emphasize non-chemical controls such as sanitation and decluttering.

Integrated Pest Management:

- Forbids pesticide application when no pests are present.
- Uses visual inspections and monitoring to identify problems and evaluate control method success.
- Selects the most effective tools to achieve long-term control.
- Controls pests using multiple methods, including improving sanitation, modifying habitats, repairing buildings, and changing human behaviors before resorting to chemical applications.

Traditional pest management thinking remains prevalent in the food service industry today. Food service workers expect pest management personnel to come in and “spray” to solve any pest problems, and often overlook their own responsibilities in the process. This is antiquated thinking and often leads to unnecessary pesticide exposure and future pest occurrences.

Figure 1. Comparison of non-IPM focused (disorganized, overstocked, inaccessible) and IPM-focused (clean, well-organized, easily accessible) storage areas. Photo courtesy of James Butler, PHC-Atlantic
4.3 What is Integrated Pest Management?

Integrated Pest Management is a science-based approach that reduces pest populations through a variety of controls focusing on surveillance, prevention, and most effective/lowest risk treatment methods. Control measures fall under four broad categories: cultural, physical/mechanical, biological, and chemical control. Cultural controls reduce pest occurrence by modifying people’s behaviors in the environment, such as keeping exterior doors closed or cleaning underneath kitchen equipment. Physical/mechanical controls modify the facility to reduce movement into—or harborage within—the structure, such as door sweeps and caulking. Biological control uses organisms to feed on pests or reduce favorable conditions, such as the use of bacterial agents to break down organic material. Chemical control uses pesticides to kill or deter pests.

For a more in-depth discussion of IPM, refer to AFPMB Technical Guide #29, “Integrated Pest Management In and Around Buildings.”

4.4 Steps of an IPM Program

Every food service location is different, but the basic steps of an IPM program remain the same. There are six fundamental steps to an effective IPM program, and if any one step is not performed adequately, then the program may fail. The following describes each step in the IPM program:

a. **Surveillance:** The first step is to assess the current state of the facility. A typical pest management service begins with a visual inspection of the location. The technician inspects to identify pest activity, find issues that might contribute to pest infestations, and determine appropriate actions. Often times, supplementary methods, such as insect monitors and staff interviews, are used to help determine if there are any ongoing issues within the facility.

b. **Identification:** Identifying pests is of utmost importance when the technician finds evidence of pest presence. A cockroach is not just a cockroach, and an ant is not just an ant. Each species has unique behaviors and characteristics that must be taken into consideration when determining effective control strategies. It is
easy to identify pests when they are seen during inspection, but much harder when only evidence of pest activity is present, such as gnaw marks on a food container, or droppings (fecal material).

c. **Prevention**: An ineffective IPM program waits for pest infestation to occur before taking action. By that point, patrons and staff are already at risk, and the costs to control the infestation can skyrocket depending on the extent of the infestation. Effective IPM programs continually use surveillance to identify environmental conditions or cultural behaviors that contribute to pest infestations. Modifying the environment and cultural practices to reduce pest harborage locations or food sources can stop an infestation before it starts, thus not only reducing the risk, but eliminating it.

d. **Treatment**: Despite a program's best efforts, pests may still infest a facility. When this occurs, treatments are necessary to remove the pest and associated risks. Chemical treatments are only one option within an IPM program. In fact, chemicals are usually the last resort, and successful programs focus on preventive measures and non-chemical methods such as traps and exclusion first. Pests should be identified and targeted using the lowest risk, most effective method to achieve control.

e. **Reporting and Documentation**: It is essential to document deficiencies, pest presence, and control measures performed at each service, and to convey that information to the appropriate stakeholders. Pest control technicians, Preventive Medicine, and Veterinary Services should provide documentation directly to the Food service manager after each service. Sharing the inspection findings among all the players will help identify issues and get them corrected early.

f. **Evaluation**: An IPM program is not step-by-step recipe with a finished product. Each step in the IPM program is an ongoing process and each process needs to be continuously reevaluated to ensure it is working properly. The evaluation stage is where an IPM program adapts to the dynamic environment of a dining facility. Evaluation may show that traps or monitors should be moved to better locations based upon the current needs. Pest services may need to shift priority to a different area while prevention and treatment activities are occurring. Facility requirements vary from day to day, and all players need to evaluate the current needs and adapt their responsibilities to support a successful IPM program.

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5. **DoD Food Service Pest Management**

Pest management on a DoD facility may differ greatly from the private sector. In the private sector, laws and regulations governing pest management operations are minimal, focusing primarily on public safety and not on sound IPM practices. While the pest management industry has established best practices, there is no governing force that ensures pest management companies follow these guidelines. Private sector pesticide applicators are not required to follow
a specific facility management plan unless agreed upon by both the company and their customers. In contrast, pesticide applicators working in a DoD facility are held to strict standards set forth by a formal IPM plan.

For further guidance on DoD-specific IPM programs, refer to AFPMB TG 18, “Installation Pest Management Program Guide.”

5.1 Installation Pest Management Plan

All DoD installations must have an approved and implemented Installation Pest Management Plan (IPMP). This plan establishes the roles and responsibilities of key personnel involved with installation pest management operations. It also includes specific documentation requirements, approved pest management operations procedures, safety guidelines, and installation-specific concerns. The IPMP is intended to be a living document with up-to-date information on both who and how all pest management is conducted at that location.

5.2 Who are the team players?

Effective IPM in a food service location involves many players. Primary players include the Food Service, Facilities Maintenance, and Pest Management personnel. Secondary players include public health assets, Quality Assurance Evaluators (QAE), third-party auditors, equipment-maintenance personnel, food-delivery personnel, and patrons. All of these personnel must work cooperatively for a pest management program to be effective.

5.3 Players’ Responsibilities

a. **Integrated Pest Management Coordinator (IPMC):** The IPMC oversees all pest management operations at the installation. They compile all pesticide application records and send them to the AFPMB for archiving. They maintain the approved pesticide list and evaluate requests to use novel pesticides on the installation.

b. **Food Service:** Food service personnel are responsible for preparing, cooking, and serving safe food to the customers. To do this, they must maintain a clean environment and are therefore ultimately responsible for the cleanliness of the facility, either through a dedicated cleaning crew or by personally cleaning between food preparation and service activities.

c. **Pest Management:** Pest management technician inspects the facility for pests or pest evidence, identify contributing or conducive factors leading to pest infestations, and recommend or conduct treatments to reduce or prevent pest infestations. An efficient pest management technician identifies problems and communicates corrective actions to the appropriate personnel. They are the sole entity allowed to apply pesticides in the facility if chemical treatments are warranted.
d. **Facility Maintenance:** The installation public works or civil engineers are responsibility for all building maintenance and repair. Most installations utilize a work order-based system where service requests are made through phone call or an online portal. Once a work order has been generated, appropriate facilities personnel are notified and the request is fulfilled. Facilities personnel may conduct periodic scheduled inspections of the buildings to identify and correct emerging issues before they become a problem. If this does not occur, a service request should be generated when food service, public health, or veterinary services personnel identify an issue.

e. **Public Health:** Installation public health assets ensure food safety. They conduct monthly facility inspections for proper food handling practices, facility sanitation and repair, pest management, and other practices that affect the wholesomeness of food. Public health assets may also conduct food handing and safety courses, and coordinate with the key players when issues arise.

f. **Quality Assurance Evaluator (QAE)/ Contractor Officer Representative (COR):** A QAE/COR oversees the work of contracted pest control services. In many instances, the QAE/COR is the signature authority for services rendered and may work in a different building. They ensure contract compliance and should conduct on-site inspections of pest management contracted services.

g. **Veterinary Services:** Veterinary food inspectors oversee food safety from production through final storage. They conduct inspections to ensure the food is wholesome, unexpired, and without pest infestations. When food is found to be unsafe, inspectors will condemn the affected products and recommend remediation if needed.

For further guidance on food condemnation levels, refer to MIL-STD-904C, “Department of Defense Standard Practice: Detection, Identification, and Prevention of Pest Infestation of Substance.”

5.4 **Components of a Food Service IPM Program**

a. **Building Structural Integrity and Pest Exclusion:** A primary IPM preventive measure is ensuring the building is structurally sound and that pests are excluded from potential entry points including pipe chases, door thresholds, windows, and other structural entryways. All buildings fall into disrepair over time. When
structural components wear out or get damaged, it is imperative to submit a work order to correct these deficiencies. A seemingly insignificant hole can provide entry into wall voids, where cockroaches can harbor and become an infestation. A water leak can degrade floor tiling, which accumulates food debris and becomes a food source for pests. These issues should be addressed as soon as they are discovered. Work orders should be submitted and followed up on to ensure the work is completed.

b. **Environmental Sanitation:** Poor sanitation practices are the number one cause of pest infestations. When a facility is unsanitary, organic material builds up, providing an attractive food source for pests. Certain control measures, such as insecticidal baits, are ineffective when other food sources are readily available to pests. Why would a cockroach eat bait when they have a smorgasbord of tasty food debris throughout the facility? Good sanitation practices are essential and should include daily, weekly, and monthly cleaning programs to ensure all areas of a facility are cleaned on a routine basis.

c. **Cultural Behaviors:** Personal behaviors can unintentionally let pests into facilities and allow them to persist. Pests have easy access to a building through open and unattended doors or windows. It is surprising just how many will walk right through an unattended back door. Harborage locations are created when unnecessary items are stored in a disorganized manner, providing homes for pests to proliferate. Cluttered areas are often not cleaned adequately or inspected properly for pests. Keeping doors closed when not in use, decluttering, and keeping exterior lights off when unnecessary can make facilities less attractive to pests and reduce the chances they will enter facilities.
d. **Pest Surveillance:** Pest surveillance can be divided into two categories: visual surveillance, and monitoring. Visual surveillance is analogous to taking a photograph: it is a snapshot of what is occurring at the time of the inspection. Pest monitors are analogous to a video camera because they are constantly monitoring the situation. Monitoring can be sub-divided into two methods: long-term and short-term. Pest management companies prefer to use continuous, long-term monitoring, which is when monitors are checked for pest presence during each service. Alternately, preventive medicine inspectors usually employ short-term, threshold-based monitoring. They use precise timeframes and threshold limits to determine the extent of an infestation and decide if control measures are necessary.

e. **Reducing Conducive Conditions:** All players involved should document conducive conditions and report them to the appropriate personnel for remediation. Building disrepair, sanitation deficiencies, and poor cultural practices all contribute to pest presence and correcting these issues in a timely manner reduces the potential for new infestations. A bulk of the time in a high functioning IPM program is devoted to surveying for and reducing factors that contribute to pest infestations. In contrast, a poorly run IPM program ignores this component in favor of treating infestations as they develop.

f. **Chemical Control:** Chemical control should only be used as a last resort in DoD food service locations. NO ROUTINE PREVENTIVE CHEMICAL CONTROL is allowed on federal facilities. Unlike commercial pest control in the civilian sector, where routine preventive applications are common, federal facilities use an IPM approach and only use chemical control when pest are present.

g. **Follow up:** Follow-up surveillance and inspections are essential components of a pest management program. Adjusting the monitoring program can enhance its effectiveness. Assessing chemical and non-chemical control measures ensures the program is effective and provides valuable information about pest harborage hotspots and provides insight as the effectiveness of control measures. You cannot determine if a control measure was effective without proper follow-up. In essence, follow-ups tie the program into a continual cycle of good pest management practices.

h. **Public Health and Veterinary Services Inspections:** Public health and veterinary service assets conduct extensive inspections of your facility and should be providing feedback on conducive pest conditions. As with pest management service reports, you should be notified of the results of these inspections and any deficiencies that need to be addressed.
6. Common Items Used in an IPM Program

The pest management industry has a wealth of available equipment and materials to manage pests. From time-tested to state-of-the-art, these devices come in all shapes, sizes, and functionalities. The breadth of available equipment is too wide to cover in one technical guide, so the following sections provide generic descriptions of common equipment used in a food service IPM program.

6.1 Equipment

Pest management personnel employ traps, monitors, and exclusionary devices within food service establishments. The following items are commonly used in an IPM program.

![Figure 5. Insect monitor with German cockroaches. Inspecting trap catches can indicate the severity of the infestation and suggest the direction of the infestation source. Photo courtesy of James Butler, PHC-Atlantic](image)

**a. Monitoring:** Monitoring devices, commonly some sort of passive sticky trap come in a variety of shapes and sizes, but they all have the same basic functionality, a substrate with adhesive designed to capture pests. Insect monitors should not be used as a method for control, they are used as part of a strategic plan to identify pest infestations early and gain insight on their presence and location within the facility. These are placed in areas where the target pest is likely to be found and inspected/replaced at each service. Depending on pest,
monitors should be placed parallel with walls or other structural edges that common pests use during foraging activities. The adhesive effectiveness diminishes over time due to dust or other contaminants and must periodically be replaced.

Whereas visual inspections are much like taking a photograph of the situation, monitoring devices function much like a video camera, continually recording data when present. These devices should be dated when initially placed out and again at each servicing. Longevity of the device is valuable information and should be noted when assessing the overall pest situation.

Figure 5. Insect monitor placed underneath sink where suspected cockroaches were harboring. Correct placement is key for early detection of infestations. Photo courtesy of James Butler, PHC-Atlantic

Figure 6. Insect monitor without proper dating. Photo courtesy of James Butler, PHC-Atlantic
There are two approaches to insect monitoring used in a food service location and it is important to distinguish between the two. The first, and most common strategy, is the continual use method. This is typical of pest control, where monitors are left out indefinitely and inspected for activity at each service. Monitors used in this manner help to identify pest infestations early. The second method is a threshold test. This method is typically used by preventive medicine assets and involves placing insect monitors out for a set amount of time, usually 24 hours, and comparing the number of captured pests to a threshold level. If the level is exceeded, it justifies treatment.

### Twenty-Four Hour German Cockroach Trap Thresholds

<table>
<thead>
<tr>
<th>Less than 1 cockroach per trap</th>
<th>1-3 cockroaches per trap</th>
<th>3 or more cockroaches per trap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicates no infestation or a minor occurrence of cockroaches in facility</td>
<td>Indicates that the facility has a moderate risk of increase in the cockroach population.</td>
<td>Indicates the presence of a significant cockroach population, and without control measures, an unacceptable population will develop.</td>
</tr>
</tbody>
</table>

Figure 8. German cockroach trap thresholds as suggested by Army TB MED 561.

Cooperative Extension Publications or Army Technical Bulletin 561 provides excellent best management practices and further guidance on cockroach IPM and surveillance to include guidelines for establishing a cockroach surveillance program, surveillance floor plans, threshold monitoring and overall IPM recommendations for cockroaches.

b. **Glueboards:** Glueboards have the same sticky material as insect monitors, but are laid flat to trap rodents. These are an effective alternative to snap traps in areas where there is not enough clearance above the trap for the snapping arm to function. They can be slid underneath shelving or placed inside devices such as a TIN CAT® (see below) to protect the sticky material. Glueboards for rodent control/monitoring are only allowed in CONUS installations. They have been prohibited throughout Europe and many other countries.

c. **Pheromone Traps:** Pheromone traps are insect monitors paired with a lure that releases an attractive odor for specific pests. Many pheromone lures mimic scents produced by females and only attract males. Pheromone trap are most commonly used for stored product pests because it is difficult to identify which product is infested. Placing traps in a grid pattern allows pest controllers to systematically narrow down where the infested products are. Like other insect monitoring
devices, pheromone traps alone are not an effective control method, but are a useful tool to help identify infested food products.

d. **Snap traps**: The spring loaded snap trap continues to be a primary tool for control of mice. These devices should be placed perpendicular along common runways such as walls and pieces of equipment, where mice tend to run. Bait traps with attractant for rodents. Cheese, although common in lore, is not an effective attractant for rodents. Peanut butter has been a preferred attractant; however, the increase in peanut allergies have made it less favorable in recent years. There are many professional rodent lures on the market that are more effective than peanut butter and should be used in its place.

Setting of snap traps can be somewhat tricky and once tripped, they are ineffective until reset. Some versions of the snap trap are sensitivity adjustable for use in areas where high vibration may accidently set them off. Snap traps tend to have a fairly high clearance requirement, making them unusable in certain areas where glueboards can be used instead.

![Figure 9. Two versions of the traditional mouse trap. The one on the left is a basic trap that mice can often feed off without tripping. The trap on the right lets personnel adjust the sensitivity level to adapt the trap to the environment. Photo courtesy of James Butler, PHC-Atlantic](image)

e. **TIN CAT® Live Trap**: These are low-profile boxes typically placed along the floor underneath kitchen equipment for the capture and monitor of mice. They use a weighted ramp system to allow mice into the device, but not back out. A glueboard can be placed inside the device to facilitate capture of mice and ensure they do not escape when the device is opened. Unlike snap traps, these are a multi-catch device and can capture many mice at a time. These devices should be
dated at each service and if a glueboard is used, each glueboard should be dated when replacing. Cockroaches and drain flies are commonly captured in these devices when placed in an infested facility making them a duel-purpose pest control device.

f. **Ketch-all® Live Trap**: Like TIN CATs®, Ketch-Alls® are a multi-catch device for mice. Unlike a TIN CAT®, they do not contain glueboards. They function using a spring-loaded platform that flings the mouse into the reservoir area when tripped. Pest management inspects these devices at each service and removes captured mice; however, without a glueboard, mice easily escape when the device is opened.

![Image of open TIN CAT® with glue board and drain flies](image1)

*Figure 7. The left photo shows an open TIN CAT® with glue board. Notice the Service date sticker and drain flies on the glue board. The right photo shows common placement of these devices underneath kitchen sinks along the floor. Photo courtesy of James Butler, PHC-Atlantic*

![Image of Ketch-all® placed along the floor of a kitchen](image2)

*Figure 11. An example of a Ketch-all® placed along the floor of a kitchen. Photo courtesy of James Butler, PHC-Atlantic*
g. **Bait Stations (Rodents):** Rodent bait stations are essentially lockable boxes placed on the ground that house poisonous bait blocks for rodent control. Stations must be tamper-resistant, secured, and labeled with the rodenticide information. Some specialized bait stations may also contain snap traps, but this is uncommon. Baiting for rodents is not a preferred control method in food service locations; however, it sometimes occurs. These devices are commonly used on building exteriors to control rodents before they enter. When used indoors, they should not be placed in food prep areas to lower the risk of food contamination.

![Bait Stations (Rodents)](image)

Figure 8.2. The left photo shows an open exterior rodent bait station that needs servicing. The box should be cleaned, dated, and filled with fresh rodent bait. The photo on the right shows an improperly placed exterior bait station. The openings should be flush with the wall. Photo courtesy of James Butler, PHC-Atlantic

h. **Bait Stations and Gel Baits (Cockroaches):** Baiting is a primary chemical control measure for cockroaches, especially for German cockroaches in dining facilities. Bait stations are a physical device and often mistaken for traps. These are usually small, hockey puck-shaped containers with entrances for cockroaches to access a pesticide-containing bait formulation. Bait stations are easy to use, protect the bait, and preventing possible food contamination. For severe infestations, a successful technique is to use lines of gel bait formulated and applied using a syringe. Bait lines are applied diagonally to 2-inch-by-2-inch squares of wax paper that have been pre-folded in half into triangles. The folded wax paper are then left open at a 90-degree angle to give cockroaches easy access. Place several wax paper packets in each cabinet, behind stoves, refrigerators, underneath microwaves and even slipped into stacks of boxes or canned goods where the cockroaches are harboring.

i. **Insect Light Traps (ILTs):** The most effective monitoring and control in interior areas where food is processed, packaged, or otherwise exposed can be achieved by installing a mobile glue board containing insect light trap (ILT). This ILT design provides monitoring by attracting flies using the same BL type bulbs proven effective in other units, but uses a glue pad to capture the insects rather than the electrocution grid found in other units. This is the only method acceptable to the FDA in sensitive
food handling areas because flies are not exploded, scattering insect fragments which may contaminate food. See DoD Pest Management Materiel Other Than Pesticides list for recommendations of approved ILTs available through the DoD stock system for use in food handling facilities. Additional general filth fly IPM information can be found in AFPMB Technical Guide 29, Integrated Pest Management in and Around Buildings, and various cooperative extension publications containing best management practices for filth flies and other pests in and around food handling facilities.

Figure 13. Insect light trap placed at correct height and not over any food contact surfaces. Photo courtesy of James Butler, PHC-Atlantic

Trap effectiveness and suitability depends on proper ILT placement. They should not be placed over any food-contact surfaces, to include prep tables, condiment stands, or dining tables. ILTs should be placed between three and six feet off the ground, where filth flies spend the majority of their time. ILTs should not be placed near exterior glass doors where the UV light may attract flying insects towards the door.

Insect Light Traps require routine maintenance. Traps should be inspected monthly during warm weather because captured insects can quickly cover the glueboard. As with other monitoring devices, ILT glueboards should also be dated when replaced for long-term surveillance data. Ultra-violet output from bulbs diminishes over time with the average bulb loosing effectiveness in approximately a year. Bulbs should be checked for maintained approximately every six months and changed accordingly.
j. **Air Curtains**: Opening exterior doors is unavoidable, and allows flying insects into facilities. An air curtain prevents flying insects from entering facilities using a forced air current that blows downward and out. These devices attach above doorways and are either triggered when the door opens (preferred), or manually turned on by employees prior to using the door. In either case, air curtains are installed by an electrician and hardwired to the building. The air curtain vents are then calibrated to be effective at the average height of a flying insect, or approximately three feet above the floor.

Figure 15. Tin Cat® showing dated service sheet indicating a consistent monthly service of the device.
k. **Door Sweeps:** There should be no gap between the bottom of external doors and the threshold. This serves two functions: to keep heating/cooling costs down, and to prevent insect and rodent entry. Door sweeps are available in rubber squeegee-like strips or in bristles. The bristle-type excludes rodents better because they can chew through the rubber-style sweep and enter to the facility. Bristle sweeps also conform to the contours of the threshold better and are not easily deformed. Mice and insects may enter through a ¼ inch-high gap. Having correctly fitted door sweep will help to exclude these pests from the facility.

![Figure 16. Examples of improperly installed door sweeps. Mice can enter through the gaps between both doors. The photo on the left is a bristle-type of sweep. Notice how the bristles are beginning to wear. The photo on the right is of a rubber-type door sweep. Photo courtesy of James Butler, PHC-Atlantic](image)

### 6.2 Chemicals

When needed, there are many chemical control options available, and each is applied based on the pest’s biology or behavior. Pesticides come in many formulations and while specific chemicals may vary in their mode of action, you can organize them by how they physically control pests. The basic types of chemical control are as follows:

a. **Liquid Repellent Insecticides:** This traditional application both kills and provides a repellent effect to keep future pests from entering the location. Application of this type can push pest infestations into other areas.

b. **Liquid Non-repellent Insecticides:** This insecticide kills pests, but has no repellent effect. It does not disrupt the insect’s behavior, and does not spread the infestation like liquid repellent insecticides.

c. **Insect Growth Regulators (IGRs):** These are not technically insecticides, but instead, impair an insect’s development to adulthood. They are less toxic to non-target arthropods, and are slower acting than traditional pesticides. These are often used in conjunction with liquid insecticides to further stress pest populations, reducing their ability to reproduce.
d. **Insecticidal Dust**: Dusts work well to treat inaccessible areas such as wall voids. In food service facilities, dust treatments should be limited to inaccessible areas due to pesticide contamination risk on food contact surfaces.

e. **Baits**: Insecticidal baits are the primary method of cockroach control. Small drops of bait can be applied on food service equipment (not on food preparation surfaces) where cockroaches typically occur. Baits do not work if poor sanitation creates alternate food sources. For baits to be effective, no food debris should be present.

f. **Fogging**: Fogging treats broad areas using suspended liquid insecticides. These applications are messy and will contaminate food preparation surfaces. As the liquid settles, all surfaces will be covered in residual insecticides, necessitating in-depth cleaning. This method should only be used after other options have been exhausted.

g. **Fumigation**: Fogging and fumigating are often confused. While fogging involves suspension of liquids, fumigation uses poisonous gas. Fumigation easily penetrates void areas and leaves no residue post-treatment; however, fumigation is very expensive, high risk, and requires specialized certifications and equipment to use it. Fumigation should be the last method used to treat a pest issue.

### 6.3 Communications

a. **Service Reports** - Recording pesticide applications is required by law, but only captures a fraction of the data required to conduct affective IPM. Personnel should also document inspection notes including conducive conditions, deficiencies, pest populations, non-chemical and chemical control measures, time spent conducting the service, and contacted personnel. This documentation should be reviewed and signed by a food service manager and left inside the facility for future reference. Furnish copies of these documents to the public health assets, Installation Pest Management Coordinator (IPMC), Contracting Officer Representative (COR), and pest management personnel. Share findings to ensure adequate pest prevention and elimination measures and document all pest management actions, not just chemicals applications.
Figure 17. Example of a pest management service report designed to effectively communicate service accomplishments and observations.
b. **Pest Sighting Log:** Food service employees are on the front lines and tend to see pest issues early; however, they may not be present to tell the pest management technician what they have seen while they are servicing the facility. A Pest
Sighting Log can be used to communicate observed pest issues. The log is designed for all personnel working in the facility to document pest sightings, to include what, where, when, and who saw it. This log should be posted in a common area and always be accessible. Employees should be trained to promptly document all pest sightings. When the pest management technician arrives to service the facility, they can review this log for any observed pest issues.

c. **Pest Management Repository** – A centrally located binder helps facilitate all pest management communication. This repository is maintained at the facility and should include the following components: a Pest Sighting Log for food service personnel to report pest sightings; pest management service reports; pesticide labels; and pest management certifications and liability insurance verification (for commercial contractors only). Food service managers may not have time to address issues identified in pest service out-briefs until later. Giving them all documentation in a log book allows them to address the issues in the report when they have more time.

7. **Pests Associated with Food Service**

A wide range of pests are associated with food establishments. Some, such as the German cockroach, are closely tied to poor sanitation and poor cultural practices. Others, such as crickets, are incidental pests that find their way into a facility, but are not associated with food. In either case, pests are unwanted “guests” and their presence compromises the wholesomeness of the food and the establishment’s reputation.

Effective pest management relies on correctly identifying the pest and using their biology and behavior to implement specific control measures. The following sections discuss common food establishment pests, including a general description (for identification purposes), conditions that attract infestations, and common pest management prevention and control practices.

7.1 **Cockroaches**

Cockroaches are the most common pests in food establishments, where they are both a nuisance, and can also carry many common food-borne disease pathogens including the genera *Staphylococcus*, *Salmonella*, *Clostridium*, and *Escherichia*. Not only can cockroaches mechanically vector these diseases, their presence can severely impact the facility’s reputation if they are noticed by the general public.
a. **German Cockroach** *(Blatella germanica)*

- **Description** - The German cockroach is a small species, approximately 13-16 mm (1/2 - 1/3 in.) long. It is light brown with two dark strips on the pronotal shield (the section directly behind the head). Female German cockroaches carry the egg case (ootheca) protruding from their abdomen until the eggs are ready to hatch. Eggs cases typically contain 30-40 eggs.

- **Conducive Conditions:** German cockroaches are closely associated with poor sanitation and clutter. Insufficient cleaning allows organic residue to build up on kitchen equipment and floors, providing a food source for German cockroaches. A cluttered facility with excess boxes and unused equipment in undisturbed areas creates harborage for cockroaches. The clutter helps hide the infestation until it grows to larger sizes. Worn caulking, damaged or missing floor tiles, or broken wall coverings in kitchens allow cockroaches to enter void spaces and avoid most pest management control measures.

- **Prevention:** Employ daily, weekly, and monthly cleaning routines that hit hard-to-reach locations and remove all residual food to prevent German cockroaches. Pay particular attention to cracks and crevices where German cockroaches prefer to harbor. Prevent cockroaches from entering voids by regularly identifying and repairing worn caulking or other structural damage.

- **Control:** Chemical control of cockroaches is usually conducted using baits first, IGRs second. As mentioned earlier, severe infestations can often be controlled using lines of gel bait formulated into a syringe and applied diagonally to 2-inch-by-2-inch squares of wax paper that have been pre-folded in half into triangles. The folded wax paper is then left open at a 90-degree angle to give cockroaches easy access. Place several wax paper packets in each cabinet, behind stoves,

![Figure 21. German cockroach.](image1)

![Figure 22. Wax paper “Taco” method for applying bait for German cockroaches. Photo courtesy of Dr. Dini Miller, Virginia Tech University](image2)
refrigerators, underneath microwaves and even slipped into stacks of boxes or canned goods where the cockroaches are harboring. Liquid applications can be also be applied to many areas of the kitchen, but caution should be made when using products that repel cockroaches. This can drive an isolated infestation into other areas, making it worse. Dusting may control cockroaches in wall voids when suspected harborage is present. Fogging and other heavy treatments should not be necessary if other non-chemical methods are being used.

b. **American Cockroach (Periplaneta americana)**

- **Description** - The American cockroach is a large cockroach species, approximately 29–53 mm (1 1/5th - 2 in.) long. It is reddish brown with a yellowish margin around the pronotal shield. American cockroaches prefer warm and moist conditions, and are often associated with water sources such as steam rooms and basements.

- **Conducive Conditions:** American cockroaches are not associated with food and poor sanitation like German cockroaches. For the most part, they are occasional invaders of food establishments, coming through drains and other unsealed plumbing.

- **Prevention:** Declutter mechanical rooms and drainage areas, reduce humidity through adequate ventilation, and maintain plumbing to prevent American cockroaches. American cockroaches are often associated with sewer systems and may enter buildings through plumbing and emerge from drains. Prevent floor drain access by adding mesh screens to drain, especially in facilities with chronic American cockroach infestations.

- **Control:** Utilize chemical control for American cockroaches if other preventive measures fail. Bait sewer drains to eliminate incoming cockroaches, and apply liquid pesticides to control American cockroaches already in the facility.

![American cockroach](image)
c. **Oriental Cockroach (Blatta orientalis)**

- **Description**: The oriental cockroach is a large species, approximately 18–29 mm (3/4 - 1 1/5th in.) long. It is dark brown or black in color with a glossy body. Female oriental cockroaches appear wingless with non-functional wing pads. Oriental cockroaches move more slowly than other cockroaches, often appearing lethargic.

- **Conducive Conditions**: Oriental cockroaches thrive in damp, dark areas. Similar to American cockroaches, they enter buildings through sewer systems. Oriental cockroaches are attracted to leaking pipes and will congregate near water puddles.

- **Prevention**: Declutter mechanical rooms and drainage areas, reduce humidity through adequate ventilation, and maintain plumbing to prevent oriental cockroaches. Oriental cockroach infestations can be difficult to identify due to their slow development and minimal movement. Reduce available water and repair plumbing issues to help eliminate infestations.

- **Control**: Chemical control for Oriental cockroaches is the same as for American cockroaches. Bait sewer drains to eliminate incoming cockroaches, and apply liquid pesticides to control cockroaches already in the facility.

7.2 **Flies**

There are two broad categories of pest flies in food service locations. Small flies, such as fruit flies and drain flies, generally occur where organic debris accumulates due to poor sanitation or structural deficiencies. Larger flies, typically called filth flies, such as house flies and blow flies, are occasional invaders, and are often found in dining areas after entering the building from outside. Typically, these flies do not breed indoors.

a. **Fruit Flies (Drosophila spp.)**

- **Description**: Fruit flies are a prolific and ubiquitous pest. They lay eggs on or near fermenting fruit and often enter the facility on fruit shipments. They have a very short life cycle—roughly 5-7 days from egg to adult—which allows infestations to occur rapidly.

There are two common species of fruit flies, and while control measures for both are similar, their breeding sites are not. The red-eyed fruit fly (*D. melanogaster*) is the more common species and prefers to breed in over-ripe
fruit and other sugary items. The black-eyed fruit fly (*D. releta*) prefer to breed in wet, decaying organic material, often in dark, hard-to-reach locations.

- **Conducive Conditions:** Poor sanitation, typically in hard-to-reach areas, not following first-in/first-out (FIFO) practices, and spilled sugary substances such as soda concentrates can lead to fruit fly infestations. Soiled aprons, cleaning rags, and mops can also breed fruit flies.

- **Prevention:** Prevent fruit flies with routine daily, weekly, and monthly cleaning to remove food residues emphasizing hard-to-reach locations. At a minimum, wash soiled linens every five days and clean up any spilled sugary concentrates immediately.

- **Control:** Fruit fly chemical control is usually unnecessary. Identify and remove breeding sites to prevent fruit fly reproduction. Pay special attention to the eye color to determine which fruit fly species and narrow down their breeding site. Specialized traps can be used to attract and remove adults if necessary. Fogging can quickly eliminate adult populations in a heavy infestation; however, fogging requires substantial preparation and clean up. For small infestations, use a spray bottle with soapy water to knock down adult fruit flies (mechanical control).

b. **Drain Flies (*Psychodidae*)**

- **Description:** Drain flies are small, hairy flies with oval-shaped wings covered in scales. They are often called “moth flies” because they resemble tiny moths. Drain flies can grow from egg to adult within two weeks, making them a fairly fast-growing pest, although not as fast as fruit flies.

- **Conducive Conditions:** Drain flies breed in sludgy organic material, which often accumulates in drainage systems. They can also be found breeding in long-term water-damaged areas such as broken pipes or leaking beverage dispensers.

- **Prevention:** Maintain drain cleanliness and inspect equipment for leaks to prevent drain flies.

- **Control:** Eliminate breeding sites to control drain flies. Thoroughly scrub drains to remove all the sludge accumulations; bleach, boiling water, and other such anecdotal methods do not kill the larvae because of their thick
covering of hairs. Once the food source in the breeding site is removed, the adults will die out. Expedite adult removal by using a spray bottle of soapy water, similar to fruit fly control.

c. Large Filth Flies

- **Description**: A variety of large fly species can become a nuisance in food service locations. Biological characteristics vary between species, but all commonly enter the facility through open doors and do not breed inside.

- **Conducive Conditions**: Poorly maintained dumpster areas breed flies and allow populations to grow up around the facility exterior. Food aromas from the facility attract filth flies and open doors and inadequate air curtains allow flies to enter the facility.

- **Prevention**: Cultural controls, such as keeping doors closed when not in use, help prevent large fly issues. Correctly calibrated air curtains to effectively keep flies out of facilities; improperly calibrated devices can inadvertently suck flies into the facility. Use door-switch-activated air curtain because personnel may forget to turn wall-switch-activated curtains on or off.

- **Control**: Large flies rarely require chemical control. When flies enter a facility, they can be eliminated with ILTs. Proper placement of ILTs is essential; if they are visible from outside, they can attract flies into the facility. Maintain ILTs regularly by replacing the sticky strips and the UV bulbs (bulbs typically need replacing at least yearly).

7.3 Rodents

a. **House Mouse** (*Mus musculus*)

- **Description**: The house mouse has small, rounded ears, a pointed snout, and a long, nearly hairless tail. Adult mice have a body length (nose to base of tail) of approximately 9 cm (3.5 in.) and a tail length of 5–10 cm (2 – 4 in.).

- **Conducive Conditions**: Poor sanitation creates a food source for mice. Cluttered areas and open wall voids provide harborage. Mice are closely associated with human activities and may occupy an area even if it is clean and uncluttered.
• **Prevention:** Employ daily, weekly, and monthly cleaning routines to reduce house mouse food sources. Appropriately seal facilities to exclude the house mouse and declutter the facility to reduce indoor harborage.

• **Control:** Control house mice with traps. The most common control methods are snap-traps and glueboards. Multi-catch devices, such as Tin Cats® and Ketch-alls®, can trap many mice and are more difficult to disturb than snap-traps and glueboards. Mice can also be controlled with rodenticides; however, rodenticides should not be used in food-service locations, and when used, pest management must adhere to strict guidelines.

b. **Norway Rat** (*Rattus norvegicus*)

- **Description:** Norway rats are a brown or grey with body lengths up to 25 cm (10 in.), and similar length tails. Norway rats are typically an exterior pest, but they can come indoors and infest food service locations.

- **Conducive Conditions:** Norway rats primarily enter facilities through open doors and unsealed pipes. Rats will harbor in clutter and voids. Rats require water to survive and are attracted to leaking pipes or other water sources.

- **Prevention:** Use exclusion techniques first, because rats typically breed outside and enter facilities looking for food. Inside the building, employ daily, weekly, and monthly cleaning routines and declutter the facility to reduce harborage. Norway rats prefer to live outdoors.

- **Control:** While Norway rat control is similar to house mouse control, there are some differences. Mice are curious, and will readily investigate new items in their environment; rats are very shy, and must become comfortable with traps or baits before investigating them. Consequently, initial rat-trapping program success is slower than with mouse trapping programs. There are specific large snap traps and glueboards available to accommodate the larger size of rats.

Figure 29. Norway rat
7.4 Stored Product Pests

Stored-product pests are insects that feed on or foul food. In addition to eating the food itself, stored-product pests also leave feces (frass), bodies/body parts, shed skins, silk, and mold in food. Two specific groups of stored-product pests also negatively impact human and animal health. Dermestid beetle larvae shed barbed hairs in food that can cause severe allergic and gastrointestinal reactions, while flour beetles secrete cancer-causing benzoquinones.

Figure 30. Hazardous stored-product pests (from left to right): warehouse beetle adult, warehouse beetle larva, confused flour beetle, and red flour beetle. Photos courtesy of Graham Snodgrass, Army Public Health Center

a. **Description:** Almost all stored-product pests are either beetles or moths, and both go through the same life cycle: egg, larva, a non-feeding pupa, and adult. Adults lay eggs in or near food. When the eggs hatch, the larvae begin to feed on the food. The larval stage varies significantly from insect to insect. Some larvae are highly mobile and can invade other packages, while others remain in the original infested food until they reach adulthood.

Stored-product pests are small insects, commonly ranging from 1.5mm to 10mm (less than 0.4 inches) in length. They can be brought into a facility in infested food products, but may also occur naturally outside the facility, and come inside through open doors, windows, or structural flaws. Stored-product pests can live on tiny quantities of spilled food accumulated in cracks and crevices. Some stored-product pests can chew through packages, while others enter through minute imperfections in seams or through damage from rough handling. Insects inside packages reproduce until the food becomes too crowded, and leave the package looking for more suitable food.

Stored-product pests fall into three groups: processed-food feeders, damaged-grain feeders, and whole-grain feeders.
b. **Processed-food Feeders** prefer processed or refined products such as flour, breakfast cereal, corn meal, bread crumbs, dog food, powdered milk, and chocolate. Many processed-food feeders have a broad diet, and are common pests in Commissaries and dining facilities. Common processed-food feeders include the Indian meal moth, cigarette beetle, drugstore beetle, red flour beetle, confused flour beetle, and warehouse beetle.

![Common processed-food feeders](image1)

Figure 31. Common processed-food feeders (from left to right): Indian meal moth, cigarette beetle, drugstore beetle, confused flour beetle, red flour beetle, and warehouse beetle. Photos by Graham Snodgrass, Army Public Health Center

c. **Damaged-grain Feeders** feed on broken grains in the bottom of packages but are unable to feed on whole, undamaged grains. They are common in products like oatmeal and rice. Common damaged-grain feeders include the merchant grain beetle, sawtooth grain beetle, and rusty grain beetle.

![Common damaged-grain feeders](image2)

Figure 32. Common damaged-grain feeders (from left to right): merchant grain beetle, sawtooth grain beetle, and rusty grain beetle. Photos courtesy of Graham Snodgrass, Army Public Health Center
d. **Whole-grain Feeders** are insects that require whole grains or legumes (peas, beans, lentils) to complete their life cycle. Adults lay eggs on or near the grains, and the larvae bore inside the grain and feed until they become adults. Whole grain feeders leave round holes in grains and legumes, and may completely hollow out the inside. Commonly encountered whole-grain feeders include the weevils (granary weevil, maize weevil, rice weevil, bean weevil, and cowpea weevil) and the borers (larger grain borer and lesser grain borer).

![Figure 33. Whole-grain feeders (from left to right): granary weevil, maize weevil, rice weevil, bean weevil, cowpea weevil, larger grain borer, and lesser grain borer. Photos courtesy of Graham Snodgrass, Army Public Health Center](image)

e. **Conducive Conditions:** Facilities with poor sanitation, poor warehousing practices (not using first-in/first-out (FIFO) rotation, storing food on the floor and against walls, not removing damaged packages), excess clutter, and structural deficiencies are at risk of significant stored-product pests infestations. All these conditions allow insects to become established, and keep infestations hidden for extended periods of time.

f. **Prevention:** Inspect all food on arrival, follow FIFO policies, seal all open products in pest-proof containers, minimize clutter, and place and follow up on facilities repair requests. Clean up all spilled food daily, and identify and remove damaged packages immediately.

g. **Control:** Contact the veterinary food inspectors and local preventive medicine for infestations in DoD-owned food. Only the veterinary food inspectors can determine the ultimate disposition of infested food, and can help decide if the food must be destroyed or can be repurposed for troop feeding under specific conditions.

It is far cheaper and easier to prevent infestations than control them after they become established in the facility. Segregate infested food from uninfested food. If possible, store the infested food in a freezer for two weeks at 0°F to kill all life stages of the insects and prevent spread to other products. If freezer or refrigerator space is not available, move the infested food as far from uninfested products as possible, and temporarily seal with plastic wrap or other available methods to prevent insects from leaving the products. Work with preventive
medicine and contacted pest control personnel to determine if chemical treatments are appropriate.

AFPMB TG 27, “Stored-Product Pest Monitoring Methods” goes into more specific details on monitoring techniques and strategies.

7.5 Occasional Invaders

Occasional invaders are arthropods that typically do not infest food service locations, but will occasionally enter facilities in search of food.

![Figure 34. Left to right, Odorous House Ant, field cricket, and wolf spider.](image)

a. **Description:** The biology of occasional invaders varies greatly, but the consistent theme is that while these insects enter food service facilities, they don’t need food from the facility to reproduce and they typically do not infest the facility.

b. **Conducive Conditions:** Occasional invaders are not directly attracted to food service areas; however, certain conditions can be attractive to them. Spiders are carnivorous and will be attracted to facilities with other pest infestations. Certain ant colonies, such as Odorous House Ant, can forage great distances and scouts may find their way into food establishments. Spilled food can induce them to recruit more workers, bringing in large numbers in a short amount of time.

c. **Prevention:** Manage indoor pest infestations to reduce food for spiders and other predators. Use good sanitation to eliminate food sources for ants and other external pests. Apply general exclusion techniques to help prevent incidences of occasional invaders.

d. **Control:** Chemical control is generally unnecessary for occasional invaders. Occasional invaders do not reproduce inside facilities, and usually die without using any control measures. For persistent issues, apply a liquid application to baseboards and exterior thresholds to repel potential invaders. Control ants using baits, but exercise caution to avoid attracting additional ants into the facility. Baiting is preferred outside instead of inside for this reason.

8. Common Pitfalls in Food Service Pest Management

Failed IPM programs can have a significant impact on the wholesomeness of food and the reputation of a food service establishment. More often than not, when a pest infestation occurs,
there is more than one deficient area in the IPM program. It is essential to bring all key players together and address these weak areas immediately to get the program back on track. Otherwise, the infestation may escalate. The following sections describe some of the common issues found within a pest management program that can lead to infestation.

8.1 Structural

Buildings often have exterior openings that allow easy pest access. Pests enter new and existing buildings through gaps around pipes, inappropriately sized or missing door sweeps, and ineffectively large mesh screens.

As buildings age, structural components fail, necessitating repairs. Promptly submit repair requests (“work orders”) to prevent pests from exploiting these issues. Follow up on these work orders if the issue is not addressed in a timely manner.

a. **Worn Caulking:** Caulking throughout kitchen areas is prone to peeling away from the wall over time. This allows pests to slip behind it and enter voids or easily climb under sinks. When caulking begins to separate from a substrate in one area, it inevitably spreads down the entire length of the caulking and should be completely replaced. Applying a patch to the section is not sufficient and should be avoided.

![Figure 35. Examples of damaged and moldy caulking around kitchen sinks. Once caulking begins to pull away, the entire length must be replaced. Photos courtesy of James Butler, PHC-Atlantic](image)

b. **Door Sweeps:** Door sweeps keep rodents and insects out, but if not installed properly or maintained, can allow pest entry. Sweeps must be installed flush with the threshold with less than a ¼ inch gap; mice can squeeze through ¼ inch gaps. Rodents often chew on rubber door sweeps, which eventually provided access to the building. Bristle sweeps are pinched at the end to hold the bristles in place. Over time, this loosens and allows the bristles to fall out, and creating gaps where pests may enter the building.
c. **Unsealed Pipes:** Openings in buildings designed for pipes are rarely a perfect fit. In most cases, these openings are usually at least an inch larger than the pipe. A common method to seal this gap is stuff rubberized material around the pipe. Seasonal temperature fluctuation and humidity can cause this material to degrade or pull away from the pipe, which provides an entry point for pests and should be checked periodically.

*Figure 36. Example of improperly installed door sweep. The gap must be less than ¼ inch to effectively exclude mice. Photo courtesy of James Butler, PHC-Atlantic*

*Figure 37. Openings in walls for piping are often made much larger than needed. If let open, such as this, then pests may enter. Photo courtesy of James Butler, PHC-Atlantic*
d. **Wall Damage:** Daily activities in a food establishment can result in minor accidents that damage walls. Carts can bump into tile and break it. Leaking water can soften drywall, allowing small impacts to penetrate through the wall. Over time, damage to walls is inevitable in high activity locations such as kitchens. When damage occurs, it provides entry points into the wall voids and creates pest harborage. Place a work order to repair the damage as soon as wall damage occurs.

![Figure 38. Examples of broken wall tiles. When the wall integrity is compromised such as this water may enter, further damaging the structure. Photos courtesy of James Butler, PHC-Atlantic](image)

e. **Damaged or Worn Floors:** Most kitchen areas have tile floors. These tiles are held in place with grout that can wear thin through repeated floor mopping. In older facilities, the grout can deteriorate enough that tiles break loose. When the floor integrity is compromised, water penetrates underneath tiles, causing more damage and loosening other tiles. Organic debris often accumulates in these cracks and crevices and provides food for pests. In some cases, this can also create breeding sites for drain flies. If grout is damaged, a work order should be placed immediately to prevent breakage and further damage. Worn grout is much easier to repair than loose or broken tiles.
f. **Leaking Pipes:** Plumbing leaks are common in kitchen areas. When a pipe leaks, water floods the area. If the leak is small and dripping, this leak can go unnoticed for a long time. When this happens, standing water and high humidity conditions occur, which attract many pests. A slow-leaking pipe can quickly turn into a flood if not promptly repaired. Personnel may attempt to stop a leak by wrapping cloth or other material around the pipe. This is not an appropriate repair: place a work order to fix the leaking pipe properly.

8.2 **Sanitation**

Sanitation issues are the most common pitfalls in a pest management program. Pests take advantage of available food sources if adequate, timely sanitation is not performed. Conduct routine daily, weekly, and monthly cleaning. Focus on hard-to-reach locations such as underneath automatic dishwashers, behind heavy equipment, and inside kitchen equipment to prevent sanitation failures. These areas are difficult to keep clean and personnel may become lazy, allowing food debris and organic residue to accumulate. It is essential for these areas are kept clean. Here are common sanitation issues found in food establishments.

a. **Spilled Food:** Spills are a problem throughout the day in a food establishment. During high volume times, spills are often left to clean up later and food works its way into cracks and crevices, underneath equipment, or other hard to clean areas where it can build up, providing food sources for many pests. It is imperative to clean up spills as quickly and thoroughly as possible.
b. **Accumulated Food Residue:** Spilled food inevitably get stepped on and organic residues spread throughout the facility. In a well-maintained facility, the residue is routinely scrubbed loose and mopped up. This residue builds up when employees do not clean effectively, creating food for pests. Over time, residue accumulates and creates visible dark areas on the floor. This is most common in areas where scrubbing and mopping are difficult, and a distinct color difference can be seen between well-cleaned and dirty areas.

Figure 40. The photo on the left shows fruit dropped on the floor underneath shelving. This fruit can spoil and breed fruit flies. The photo on the right shows spilled grease from a fryer. Grease can become a food source for cockroaches. Photos courtesy of James Butler, PHC-Atlantic

Figure 41. Excessive buildup of organic residue on floors where mopping has been neglected. This takes months, if not years to build up to this level. This is a clear indicator that employees are not mopping in these hard to reach areas. Photos courtesy of James Butler, PHC-Atlantic
c. **Floor Drains:** Unmaintained floor drains in kitchens are notorious breeding sites for pests. Food service personnel typically keep the surface grate clean as a part of their daily cleaning routines. Most personnel do not know who cleans from inside the grate to the top of the plumbing waterline, and this area does not get cleaned. It is imperative to determine who is responsible for this short—but important—part of the system. Drain flies breed in the accumulated organic debris on the inner walls of the pipe, and cockroaches harbor in and feed on the buildup.

d. **Leaking Soda Concentrate:** Soda concentrate boxes are prone to leaking, and the thick, syrup-like material can drip onto lower boxes, the shelving, and the floor. Fruit flies will feed on and breed in this syrupy material is not cleaned up. This becomes a significant problem when the syrup drips into cracks and crevices in the floor grout.

Figure 42. Interior of unmaintained floor drain. Buildup of organic material such as this can breed drain flies and needs to be scrubbed out. Photo courtesy of James Butler, PHC-Atlantic

Figure 43. Spilled soda concentrate on boxes below. Spillage like this can seep into the floor grout and breed fruit flies. Photo courtesy of James Butler, PHC-Atlantic
8.3 Clutter

Excessive unused items create pest harborage and prevent pest management personnel from adequately servicing a facility. Reduce unnecessary equipment and properly store items so pests cannot use them for harborage. Excessive inventory also creates pest harborage and potential food sources. First-in/first-out methods and minimal food inventory reduces facility clutter and helps prevent pests. The following are a few of the common items that can clutter a facility and hinder pest management operations.

a. **Excessive Cardboard Boxes:** Significant cardboard boxes and other shipping containers can be left in a facility after food shipments arrive. Employees may store them for bulk disposal, allowing them to sit for extended periods of time, which creates harborage for rodents and cockroaches. In some instances, excess cardboard boxes can get wet and begin to break down, creating another food source. Expedient disposal of these materials will reduce clutter and harborage.

b. **Overstocked Inventory:** Pest management is one excellent reason to maintain minimal inventory. When a facility is overstocked, personnel may compromise proper storage methods to find places to store everything. This creates harborage for pests and reduces pest management’s ability to properly service the facility.

c. **Old Equipment Storage** - Storage of outdated, broken, or unnecessary equipment also can create harborage and hinders pest management operations. Facilities that host events may store items such as extra chairs, podiums, and other ornamental or occasional-use items. While these locations may have to store this material, it should be done in an organized and efficient manner.

![Figure 44. Storage room with excessive clutter. Most of these items are unnecessary and should be disposed of properly. Under these conditions, pest management surveillance cannot be accomplished. Photo courtesy of James Butler, PHC-Atlantic](image-url)
8.4 Cultural

People’s behavior directly impact the cleanliness of a facility and likelihood of a pest infestation. It is of utmost importance to ensure employees follow proper cleaning and facility maintenance procedures. Over time, employees tend to slack off on cleaning, especially in hard-to-reach areas. Other cultural behaviors can also affect pest’s ability to enter and infest a facility. The following list includes some of the common cultural behaviors that contribute to pest infestations.

a. **Mop Buckets/Brooms**: Store cleaning tools, such as brooms and mops, in the mop closet when not in use. These items are often forgotten behind equipment and become food sources for pests because they contain organic debris. When the cleaning is finished, tools should be cleaned and stored in the proper location. Dustpans, in particular, are notorious for not being cleaned. Organic residue accumulates inside them and must be cleaned out routinely.

![Figure 45. Storing mops and brooms behind equipment (photo on the right) allows these items to be forgotten, and can breed fruit flies and cockroaches. Dust pans and trashcans need routine cleaning, but are often neglected by employees simply dump out the contents into the next stage of trash disposal. Photo courtesy of James Butler, PHC-Atlantic](image)

b. **Trash Containers** – Trash receptacles should be checked regularly and cleaned when necessary. Trash bags tear easily and are prone to leaks and spillage. When these occur, the entire container must be taken away for cleaning, not just the trash bag.
c. **Power Washing** - Kitchens may contain a power washing hose to scrub items. Power washing the floors is not an acceptable alternative to traditional floor mopping. It can be used to help scrub the floor when necessary, but when it is used to clean floors, it shoots food debris underneath equipment, whereas proper mopping physically removes food debris.

d. **Doors Left Open**: Keep all exterior doors and windows closed when not currently in use. Unattended openings allow both crawling and flying pests to enter a facility. Propping open doors during the summer months for ventilation is unacceptable. Place a work order if the facility’s HVAC system cannot maintain proper temperatures.

e. **FIFO** - Food items should be rotated using the FIFO method – First In, First Out. When food sits for extended periods of time, the risk of stored-product pest infestation increases. This is especially true for open bulk items such as flour. FIFO procedures require personnel to use up all product in a container and wash the container before refilling it with fresh product. A common negative practice is to dump new product directly on top of old product when the container is getting low. Stored-product pest infestations thrive in the bottom of these containers, making it hard to identify infestations before it grows and spreads to other products.

8.5 **Surveillance**

Misusing monitoring devices contributes to pest issues. Insufficient monitoring allows infestations to go unnoticed and unimpeded. Conversely, over-using monitors is inefficient, and creates an “island effect” if technicians only focus on monitor servicing and do not inspect the areas between. Position monitors correctly to make them effective surveillance tools. For example, placing monitors on the ground fails to detect early
German cockroach infestations because these roaches live inside dirty kitchen equipment. Place monitors in areas where infestations commonly occur, including underneath prep tables, behind cooking equipment, inside electrical panels, and in other harborage locations.

8.6 Control Measures

No single prescribed pest management method controls all pest infestations because each situation is unique. Adequately managed IPM programs use multiple, tailored control methods. Relying solely on chemical control can lead to pesticide resistance and cause unnecessary pesticide exposure, whereas sanitation measures may effectively eliminate the infestation. Chemical control is not a permanent solution. Implementing preventive, non-chemical control measures reduce hospitable conditions for pest populations. If chemical control measures are warranted, correctly identify the pests, and select the appropriate chemical formulation, amount, and application location. Use targeted chemical applications and follow-up treatments to ensure proper pest population management and reduce unnecessary pesticide exposure.

Figure 47. Destroyed insect monitor placed on the ground. Floors are routinely washed and placement of a paper insect monitor will result in its destruction. Concurrently, insect monitors should be places where pests most likely occur first. Photo courtesy of James Butler, PHC-Atlantic
a. **Service Time** - Pest management technicians are often overworked and have multiple facilities to service. Technicians may skimp on time in your facility to squeeze in all their scheduled work. It is important to understanding how long a typical facility inspection service should take to conduct effective and efficient pest management. Conversely, spending too much time dealing with a low-priority issue can result in poor facility management. Affective pest management is a balance between proper time management and prioritizing actions.

b. **Tunnel Vision** - A comprehensive pest management program will survey for and manage a number of diverse pests. When issues arises, the technician may invest a great deal of effort to resolve a particular pest problem. They must not ignore other potential pests in the process. Technicians should continue inspecting the facility for other problems while focusing on priority pest problems.
c. **Pesticide Selection:** Pests can develop resistance to a pesticide if the pesticide is used continuously and the infestation isn’t fully controlled. A thorough IPM program will rotate pesticides at a facility to reduce the risk of pesticide resistance. Additionally, a technician can rely too heavily on a particular formulation. For example, if a German cockroach infestation occurs in a kitchen with significant sanitation issues, then food debris may outcompete the bait, making it ineffective. Utilizing a combination of bait, dusting, and liquid applications will ensure the cockroaches are exposed to a variety of pesticides and reduce potential pesticide resistance.

**8.7 Communication**

All players identified in this document are responsible for pest management. When infestations occur, poor communication between the players is often part of the problem. Any individual who observes an issue must promptly and courteously notify the individual who can correct the problem. When this communication does not occur, existing pest infestations may thrive or new infestations are introduced. Poor communication also leads to poor working relationships between key players, resulting in no communication, or worse still, hostile relationships. Everyone involved has the same goal: eliminating or preventing pest infestations. The best way for this to occur is through transparent and friendly communication when issues arise, not through pointing fingers and blaming others.

**8.8 Follow-up**

Pest management is not a one-time occurrence. Effective IPM programs include frequent inspections and monitoring to prevent infestations and assess the effectiveness of treatments. Infestations may require multiple treatments to fully control pest populations, and follow-up may be necessary the next day, week, or month depending on the issue. Follow-up requirements should be clearly communicated to all key players at the time of treatment.

**9. Pest Management Regulations and Guidance**

**9.1 Department of Defense**

DODI: 4150.07, “DoD Pest Management Program.” 31August 2018  

This document establishes the DoD pest management program including policy, assigned responsibilities, and certification and training for the DoD Pesticide Applicator program.

This standard specifies technical requirements for inspection of subsistence and food service functions to detect, identify, and prevent pest infestations.

**TB MED 530/NAVMED P-5010-1/AFMAN 48-147_IP “Tri-Service Food Code.”** 30 April 2014

Formerly three separate documents, one for each service (TB MED 530/NAVMED P-5010-1/AFMAN 48-147_IP), the Tri-Service Food Code establishes requirements for the production, distribution, and service of food throughout the DoD. In regards to pest management, this document establishes facility maintenance, cleaning, floor storage guidelines.


**9.2 Air Force**


This instruction provides guidance on pest management programs at Air Force installations to include personnel responsibilities and procedures.

**9.3 Army**

https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/r40_5.pdf

This regulation establishes the roles and responsibilities of Army Preventive Medicine assets to include the MEDCOM as a whole, regional support units such as Public Health Commands, and the garrison Preventive Medicine section.

DA PAM 40-11, “Preventive Medicine.” 19 October 2009

This pamphlet defines and establishes programs, services, functions, and procedures for implementing the essential elements of Army Preventive Medicine.

TB MED 561 “Occupational and Environmental Health Pest Surveillance” June 1992

This bulletin outlines the basic principles and standard surveillance techniques to help Army installation preventive medicine personnel establish a pest surveillance program.
conduct surveillance of medically important pests including survey, collection, preservation, and shipment techniques and control recommendations for medically important pests.

9.4 Marine Corps

MCO P5090.2 Environmental Compliance and Protection Program, Volume 14, "Integrated Pest Management.” 26 August 2013

This manual establishes policies and procedures for environmental protection under Marine Corps activities, to include safety and pesticide use.

9.5 Navy

OPNAVINST 6250.4C, “Navy Pest Management Programs.” 11 April 2012

This instruction provides Navy policies and procedures for implementing pest management programs including personnel responsibilities and establishing the Navy Pest Management Program.

http://www.navsea.navy.mil/Portals/103/Documents/SUPSALV/Environmental/OPNAVIST%205090-1D.pdf

This instruction discusses requirements, delineates responsibilities, and issues implementing policy guidance for the management of the environmental, natural, and cultural resources for all Navy ships and shore activities.
# COMMERCIAL KITCHEN PEST MANAGEMENT SERVICE REPORT

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<tr>
<th>LOCATION:</th>
<th>DATE:</th>
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Regular Service [ ] Extra Service [ ]
Reason: [ ]

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<th>EPA #</th>
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**RECOMMENDATIONS/OBSERVATIONS:**

Follow Up Required: Yes / No *(Please circle)*

**COMMENTS:**

Client Signature: __________________________ Technician Signature/ License #

Client Comments: __________________________

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### Site Key

- 01 Cook Line
- 02 Prep Table
- 03 Fryer
- 04 Dish Washer
- 05 Walk in Cooler
- 06 Dry Storage
- 07 Receiving
- 08 Dining
- 09 Serving
- 10 Restroom
- 11 Condiments
- 12 Soda Dispenser
- 13 Cash Register
- 14 Locker Room
- 15 Employee Break Area
- 16 Stairwell
- 17 Trash Room
- 18 Elevator
- 19 Loading Dock
- 20 Offices
- 21 Dumpster
- 22 Other

### Method

- AE Aerosol
- DU Dust
- BP Bait Placement
- BR Broadcast
- CC Crack and Crevice
- FO Fog
- GS General
- IN Inspection
- SP Spot Treatment
- VO Void Treatment
- MP Monitoring Placement

### Target Pest

- 20 Odorous House Ant
- 21 Pharaoh Ant
- 22 Argentine Ant
- 23 Other Ant
- 24 Mice
- 25 Rats
- 26 Other Vertebrate
- 27 German Cockroach
- 28 American Cockroach
- 29 Oriental Cockroach
- 30 Smokey Brown Cockroach
- 31 Other Cockroach
- 32 Fruit Fly
- 33 Drain Fly
- 34 Other Small Flies
- 35 Large Fly
- 36 Stored Product Pest
- 37 Stinging Insect
- 38 Occasional Invader
- 39 Fleas
- 40 Other

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1 Copy – Contractor  1 Copy – Contract Representative (Room #)  1 Copy - General Manager Food Service (Room #)