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National Pest Management Association

Best Management Practices for Bed Bugs

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1. Introduction and Purpose

The resurgence of bed bugs in North America and elsewhere has resulted in much anxiety for the general public as well as significant concern in the pest management industry about successful control. The control and elimination of this pest can be very difficult, invasive and expensive due to a number of factors including, but not limited to, resistance to certain pesticides, labor costs, reintroductions and the necessity for good client cooperation as part of the treatment process. Cooperation of the occupants and management of infested sites through preventive measures including clutter reduction, and key preparation elements as well as facilitation are critical in enabling successful control in individual homes as well as in multi-dwelling sites and other infested sites.

Multiple products, methods and technologies may be employed as part of a successful bed bug treatment plan. There are many factors that should be considered when determining which products or methods are the best option to control a given bed bug infestation.

These guidelines are intended to help pest management professionals control bed bugs effectively, responsibly, and safely. This document has been prepared by the National Pest Management Association (NPMA) to present the practices that are effective in controlling bed bugs (*Cimex lectularius*). These guidelines are intended to reflect the best practices at the time of publication and it is acknowledged that novel research and innovations in pest management techniques may provide additional effective methods in the future which will be incorporated into the document upon revision.

2. Business Practices

2.1. When providing bed bug service, pest management firms should:

- 2.1.1. Acquire and maintain appropriate licenses or certifications (requirements may vary)
- 2.1.2. Practice fairness and honesty in all advertising and transactions with clients and the general public.
- 2.1.3. Maintain a high level of moral responsibility, character, and business integrity.

2.2. Pest management firms should provide bed bug services safely and efficiently in keeping with NPMA's best management practices.

2.3. Pest management firms should strive to remain current on the rapidly evolving technology of managing bed bugs.

2.4. Pest management firms should document reasons for proactive or remedial treatment, including the presence or absence of bed bug evidence, potential for infestation, etc.

2.5. Before beginning the service, firms should provide the following information in writing to the client:

- 2.5.1. The cost of service, including fees for additional services if necessary.
- 2.5.2. The kind of service to expect (number of visits, estimated length of time until successful control).
- 2.5.3. Details of the service, including information about tools, methods and tactics to be used.
- 2.5.4. The preparation required by the client or tenant.
- 2.5.5. Realistic expectations, including obstacles to success such as lack of client cooperation, the potential for bed bug reintroduction following treatment, etc.

3. Service Agreements

- 3.1. A pest management firm should use a written service agreement designed specifically for bed bugs, or attach an addendum to a standard service agreement that addresses specific bed bug issues.
- 3.2. In addition to the typical wording found in standard service agreements, the bed bug service agreement should include the following information:
 - 3.2.1. A proposed schedule for completion of services.
 - 3.2.2. A description of the service that will be provided and the specific areas to be serviced.
 - 3.2.3. A description of the client's responsibilities, including preparations for service and obligations to keep the site in a condition that does not promote future bed bug infestations.
 - 3.2.4. Limitations of liability (except for gross negligence) for damages from bed bug bites, disease, injuries, contamination, property damage, loss of income, etc.
 - 3.2.5. Exclusions for damages for replacement of mattresses, furniture, bedding, clothing, and other infested items.
- 3.3. Exclusions for damage expenses for bed bug bites and other health-related issues. Many service agreement issues are unique to bed bug service (difficult pest to control, probability of reinfestation, need for cooperation, etc.).
 - 3.3.1. All service agreement wording related to bed bugs should be prepared or reviewed by an attorney licensed in the state(s) in which you intend to perform services and familiar with the critical factors associated with bed bug service.
 - 3.3.2. All documents should be consistent with best management practices and in compliance with any state and local laws and regulations specific to structural pest control and bed bugs.

4. Recordkeeping

- 4.1. A pest management firm providing bed bug service needs to maintain accurate, professional documentation in order to:
 - 4.1.1. Document actions taken by the pest management firm to control bed bugs at the site.
 - 4.1.2. Document the location of bed bugs at the site.
 - 4.1.3. Protect the pest management firm from liability and billing disputes.
 - 4.1.4. Document other information that may contribute to successful control. Additional documentation may include:
 - 4.1.4.1. The extent of infestations
 - 4.1.4.2. The level of client and/or tenant cooperation
 - 4.1.4.3. The environmental or living conditions that may contribute to lack of treatment success (clutter, structural deficiencies, etc.).
- 4.2. Various types of records may be used for bed bug service, depending on the site, and may include, but are not limited to:
 - 4.2.1. Service reports, including Pesticide application records, methods and non-chemical control methods, and recommendations for additional service.
 - 4.2.2. Inspection reports, including details regarding location of inspections and pest management efforts, and recommendations for inspections or service in adjacent rooms or apartment units.

- 4.2.3. Specialized treatment records
- 4.2.4. Some specialized treatment methods require additional documentation including but not limited to:
 - 4.2.4.1. Fumigant concentration levels over time
 - 4.2.4.2. Temperature readings and location of sensors for whole room or container heat treatments
- 4.2.5. Integrated Pest Management (IPM) recommendations for reduction of clutter, improved sanitation, and habitat modification (exclusion)
- 4.2.6. Level of client and/or tenant cooperation
- 4.2.7. Client education records
- 4.2.8. Staff training records, including topics covered and attendance verification

5. Technician and Sales Staff Training

- 5.1. All pest management firm representatives who may encounter bed bugs or be asked about bed bugs need basic training in bed bug biology and habits, elements of control, signs of bed bug infestation, the detailed and labor intensive nature of bed bug work, and how to inspect for bed bugs.
- 5.2. Technicians and sales personnel regularly involved in bed bug control or sales need advanced training in all aspects of bed bug control.
 - 5.2.1. Technicians need to be knowledgeable enough to address typical bed bug problems encountered within his or her scope of work, or know how to find additional resources to help solve the problem.
 - 5.2.2. Sales personnel need enough training to accurately bid jobs, set reasonable expectations, accurately describe to the prospective client the service that will be provided, and communicate any client cooperation that is required.
- 5.3. At a minimum, advanced bed bug training should include the following:
 - 5.3.1. Identification, biology and habits
 - 5.3.2. Methods of dispersal and spread
 - 5.3.3. Bites and other medical issues including, but not limited to:
 - 5.3.3.1. Bed bugs are not known to transmit pathogenic organisms to humans. Consult the Centers for Disease Control and Prevention or World Health Organization for more information.
 - 5.3.3.2. Reactions to bed bug bites vary from person to person, including the fact that some people have delayed, or no reactions to bites
 - 5.3.3.3. The appearance of bites or skin reactions are not a reliable way to identify bed bug infestations and PMPs should not attempt to diagnose bites or skin reactions.
 - 5.3.4. How to inspect for bed bugs and the limitations of visual inspections.
 - 5.3.5. Specific terms included in the pest management firm's bed bug service agreement.
 - 5.3.6. Client preparations and responsibilities, including what steps to take if a client is unwilling or unable to prepare for service.
 - 5.3.7. Bed bug control methods used by the pest management firm.
 - 5.3.8. How to determine the treatment options and best control strategy for each situation.

- 5.3.9. Safety precautions needed for bed bug service. For more information on technician safety see section 15.
- 5.3.10. Strategies for bed bug prevention and minimizing spread (for communication to clients).
- 5.3.11. How to evaluate success.
- 5.3.12. Local, State, or Federal laws, ordinances, and regulations related to bed bugs that may impact the technician or the pest management firm.

6. Client Education

- 6.1. A pest management firm providing bed bug service should make education available their clients and prospects to ensure that expectations are reasonable.
- 6.2. A pest management firm providing bed bug service should offer to educate its clients and prospects on the following issues:
 - 6.2.1. Basic identification, biology and habits of bed bugs.
 - 6.2.2. Why bed bug infestations can be difficult to detect and to eliminate.
 - 6.2.3. Techniques for preventing future bed bug introductions.
 - 6.2.4. Specific actions that might be required from the client or resident such as:
 - 6.2.4.1. Providing access, authorization, and cooperation for service.
 - 6.2.4.2. Reducing clutter, laundering clothing, making repairs, etc.
 - 6.2.4.3. Not removing items known to be or suspected of being infested from the treatment site.
- 6.3. Education should start during the initial contact with a client about bed bugs, and should continue throughout the process using tools such as:
 - 6.3.1. Verbal communications
 - 6.3.2. Handouts, including links to online resources
 - 6.3.3. Website information
 - 6.3.4. Meetings
 - 6.3.5. Staff training sessions
 - 6.3.6. Status reports on services performed and next steps
- 6.4. PMPs should recommend that property managers:
 - 6.4.1. Inform occupants of the surrounding units that a neighboring unit has bed bugs.
 - 6.4.2. Educate the occupants about bed bugs, including recognition and prevention.
 - 6.4.3. Allow follow-up inspections of surrounding units until bed bugs have been eliminated.

7. Disposal of Beds, Furniture, Possessions

- 7.1. Disposal of beds, furniture, clothing, and other items because they are infested with bed bugs should generally be discouraged in residential situations and should be evaluated on a case-by-case basis.
 - 7.1.1. Disposal of infested items does not guarantee bed bug control.
 - 7.1.2. Disposal of these items can result in a serious financial burden for residents, particularly in lower income areas.
 - 7.1.3. Replacement items may become infested if brought into a room prior to control of the infestation.

- 7.1.4. Improper disposal may result in spread of bed bugs to new locations.
- 7.2. Mattress, box spring and furniture encasements can be a cost-effective alternative to disposal.
- 7.3. Some clients will prefer to dispose of infested items even after assurance that they can be successfully treated.
- 7.4. Hotels and other sensitive sites may prefer to dispose of all bed bug-infested furniture to avoid negative public relations.
- 7.5. When disposal of infested materials is necessary, steps should be taken to minimize the likelihood of spreading bed bugs in accordance with applicable laws or ordinances for discarding bed bug-infested items.
 - 7.5.1. Items that are badly damaged and deteriorated may not justify the effort and expense to treat them and should be discarded.
 - 7.5.2. Visible or readily accessible bed bugs should be eliminated by vacuuming, steaming, freezing, insecticide treatment or other methods.
 - 7.5.3. Prior to removal from the infested area, mattresses, box springs, and furniture should be sealed in plastic to trap bed bugs inside.
 - 7.5.4. If left for pick-up, furniture should be labeled as bed-bug infested, and then damaged to render it unsalvageable.
 - 7.5.5. Disposal should be coordinated with trash pick-up, or items should be taken directly to a disposal site.
- 7.6. Commercial clients should develop a written disposal policy for bed bug infested items.

8. Client Cooperation and Treatment Preparations

- 8.1. Cooperation from residents, their guests, staff, and management is critical for success when controlling bed bugs. Involvement from property owners, hotel managers, office managers, and other responsible parties is essential and includes:
 - 8.1.1. Communicating with tenants, clients, employees, etc.
 - 8.1.2. Allowing inspection and treatment (as needed) of adjoining sites.
 - 8.1.3. Permitting adequate follow-up services.
 - 8.1.4. Correcting structural deficiencies that may contribute to bed bug problems such as loose molding, peeling wallpaper, etc.
 - 8.1.5. Instituting housekeeping practices to prevent or reduce the spread of bed bugs.
 - 8.1.6. Educating staff on prevention and control of bed bugs.
 - 8.1.7. Educating staff and tenants on the importance of immediate reporting of suspicious insect activity in a building
- 8.2. Typical failures of cooperation include lack of preparation or lack of access to infested and adjacent rooms, or failure to follow IPM recommendations to eliminate conditions conducive to infestation.
- 8.3. When agreeing to provide a bed bug service, a pest management firm should clearly delineate the preparations that the client must make and the preparations that the pest management firm will perform.
 - 8.3.1. Preparation recommendations vary based on the site, company protocol, and treatment type or methods.
 - 8.3.1.1. Some pest management firms require the client or resident to prepare infested rooms by performing tasks such as: stripping the bed, emptying closets, dressers and nightstands, bagging and cleaning clothes and linens,

vacuuming and reducing clutter. The client should be educated about how to avoid translocating bed bugs during the preparation process.

8.3.1.2. Some pest management firms have determined that their technicians should do some or all of the preparation to ensure thoroughness of preparations, to minimize the risk of translocating bed bugs or disturbing populations prior to treatment.

8.3.1.3. Whole-room heat and fumigation treatments require most belongings and furnishings to be left in place, however additional treatment-specific preparation may be required.

8.4. Any treatment preparations should be reasonable and appropriate to the type of site being treated (single family home, multi-family housing, hotel/motel, office, etc.) and discussed by client and PMP prior to the initiation of service.

8.5. Treatment preparation instructions should be communicated before the technician arrives to perform the service.

9. Bed Bug Detection

9.1. Before providing bed bug control service, a pest management firm should determine whether treatment is necessary based on a careful inspection and the needs and concerns of the client.

9.2. Multiple stages of a bed bug life cycle are evidence of an active infestation, but sometimes are difficult to observe in low-level infestations.

9.3. Intact, unhatched, or viable bed bug eggs are evidence of an active bed bug infestation.

9.4. Bed bug cast skins, bed bug fecal staining on sheets, and fecal staining near typical harborage sites may be considered evidence of an active infestation if the area has not been previously treated.

9.5. When a live bed bug or viable eggs cannot be located during an inspection, the technician should make further effort to confirm the infestation through a more aggressive inspection or other methods that have proven effective for bed bug detection.

9.6. Some clients may elect to have an area treated based on reports of bites or the proximity of other infested areas, even if visual evidence of infestation cannot be confirmed. Such requests should be documented in any report of findings.

9.7. The presence of skin reactions or assurances by residents that bed bugs are present should be considered carefully.

9.7.1. It is not possible to tell from an apparent bite if it was caused by a bed bug because skin reactions vary, and skin reactions from other insects may have similar appearance to those of bed bugs.

9.7.2. Skin infections and conditions can also look like insect bites.

9.8. Confirm that the pest is the bed bug, *Cimex lectularius*, and not any of the closely related bugs that infest bats and birds, which require different control tactics.

9.9. In addition to visual inspection, supplemental information may be useful including:

9.9.1. Reviewing pest control records for a building to track previous bed bug complaints, confirmed infestations and prior bed bug treatments or services including any self-treating by tenants and/or management.

9.9.2. Speaking with building owners, occupants, and staff about the history of bed bug problems at the site.

- 9.9.3. In residential accounts, determining where people sleep and rest outside of the bedrooms.
- 9.9.4. In large buildings, mapping infested rooms to identify trends and determine the extent of the infestation.
- 9.10. A powerful flashlight is an important inspection tool. Other inspection tools may be useful to allow the pest management professional to access hidden or partially inaccessible critical areas. Optional tools may include:
 - 9.10.1. Screwdrivers, pliers, pry bar, multi-tool, crescent wrench, staple gun
 - 9.10.2. Hand lens or other magnifier
 - 9.10.3. An inspection (mechanic's) mirror
 - 9.10.4. Gloves, shoe covers/booties, and knee pads
 - 9.10.5. Forceps, 70%-90% ethyl alcohol or isopropyl alcohol, and containers or vials for specimen collection
- 9.11. Bed bug inspections will vary in complexity depending on:
 - 9.11.1. The site (private home, apartment unit, hotel, office, etc.)
 - 9.11.2. The purpose of the inspection:
 - 9.11.2.1. Confirming an infestation
 - 9.11.2.2. Identifying all infested areas to determine treatment tactics
 - 9.11.2.3. Verifying that an infestation has been managed
 - 9.11.3. The extent of the infestation (low-level infestations are typically more difficult and time consuming to inspect than are widespread, heavy infestations).
- 9.12. An initial bed bug inspection should include, at a minimum:
 - 9.12.1. Carefully inspecting sheets, pillowcases, and other bed linens, mattresses, box springs, bed frames and headboards by checking all seams, piping, straps, and other common hiding places for live bed bugs, cast skins, fecal staining, and eggs.
 - 9.12.2. Looking for evidence of bed bugs in cracks, crevices, and other typical bed bug hiding places near the beds, and areas where people have reported seeing bed bugs or being bitten.
- 9.13. In addition to the tasks above, inspections may include, depending on the site, and if necessary, such things as:
 - 9.13.1. Inspecting inside and underneath furniture, including the removal of drawers from dressers and other items.
 - 9.13.2. Removal of headboards to inspect the support bar and screws for eggs and live bed bugs as well as on the back side of the headboard
 - 9.13.3. Inspecting behind pictures, wall hangings, and drapes.
 - 9.13.4. Lifting the edge of carpeting and inspecting behind baseboards in suspected areas.
 - 9.13.5. Inspecting for bed bugs on, under, and inside upholstered furniture.
 - 9.13.6. Further investigation of any site where bed bug fecal material is observed.
- 9.14. Bed bug inspection should include areas outside of bedrooms where people spend time resting.
 - 9.14.1. In commercial settings, depending on the extent of the infestation, inspections may be expanded to other areas which may include:

- 9.14.1.1. Laundry carts, laundry rooms, janitorial closets, and storage areas.
- 9.14.1.2. Common areas such as recreation rooms, break rooms, social centers, lounges, and waiting rooms where people congregate.
- 9.14.2. Obtain authorization to inspect rooms or apartment units next door, above, and below, the infested room(s).
- 9.14.3. In residential settings:
 - 9.14.3.1. Inspect hallways, closets, storage boxes, pet beds/cages, desks, and other areas that may harbor bed bugs.
 - 9.14.3.2. Inspect the living room, family room, and other non-sleeping areas.
 - 9.14.3.3. Inspect the hollow areas in wheelchairs.
- 9.15. The goals of a comprehensive bed bug inspection should be:
 - 9.15.1. To determine if treatment is necessary or warranted.
 - 9.15.2. To attempt to identify human populations and/or individuals with special considerations such as health issues, pets, or young children, when possible.
 - 9.15.3. To determine the best methods of control and estimate the amount of labor that will be needed.
- 9.16. Bed bug monitoring tools may detect bed bug activity over time (days or weeks). Not all monitoring tools work the same or have the same efficacy in detection. Choose monitoring devices that have been shown to be effective in published research, as discussed in pest control meetings, from your own experiences, and that of other pest management professionals.
 - 9.16.1.1. The use of bed bug monitoring devices may not be practical in all situations.
 - 9.16.1.2. Monitoring tools may be useful for confirming that a site has bed bugs, but the failure to trap a bed bug does not mean that bed bugs are not present.
 - 9.16.1.3. The type of site, room or configuration of bed frames and other furniture may limit the usefulness of monitoring devices
- 9.17. Monitoring devices may include passive, active, or moat style traps:
 - 9.17.1. Moat-style traps intercept bed bugs between their harborage areas and their host. Moat-style traps are typically placed under the legs of beds and other furniture to capture bed bugs moving up or down the legs and can also be placed adjacent to furniture where infestations are suspected.
 - 9.17.1.1. Because moat traps only capture bed bugs traveling in their immediate area; a lack of bed bugs in these devices should not be construed to mean that there is not an infestation.
 - 9.17.1.2. Effectiveness of moat-style traps may be limited by the architecture of the furniture or other factors.
 - 9.17.2. Active monitoring devices typically use heat, carbon dioxide, or chemical attractants to lure and capture bed bugs.
 - 9.17.3. Passive traps catch insects that accidentally encounter the trap and include traditional sticky traps as well as other traps specifically designed for bed bug monitoring.
 - 9.17.3.1. Sticky traps have a low level of effectiveness but may catch bed bugs if placed in enough locations.

- 9.17.3.2. Because of their low efficiency, a lack of bed bugs in sticky traps should not be construed to mean that there is not an infestation.
- 9.18. Monitoring devices should be inspected periodically to evaluate bed bug populations.

10. Bed Bug Scent Detection Canine Teams

- 10.1. Bed bug infestations can be detected by specially trained bed bug scent detection canine teams. Because of their abilities, bed bug detection canine teams can be particularly useful in the following circumstances:
 - 10.1.1. When bed bugs are suspected but no live bugs or viable eggs can be found through visual inspection.
 - 10.1.2. For building-wide comprehensive inspections to locate all infested rooms.
 - 10.1.3. In non-bedroom sites such as offices, theaters, schools, public transportation and other unconventional areas.
 - 10.1.4. As an additional method to confirm that bed bugs have been successfully controlled or are not present.
- 10.2. Bed bug detection canine teams must be able to detect live bed bugs and viable eggs.
- 10.3. Canine detection teams should be certified in accordance with the guidelines outlined in the Minimum Standards for Canine Bed Bug Detection Team Certification because:
 - 10.3.1. Certification demonstrates the canine team's competence by an independent, third-party.
 - 10.3.2. Certification confirms the ability of the team to locate live bed bugs and viable eggs in real world environments.
 - 10.3.3. Certification confirms the canine team's ability to differentiate live bed bugs and eggs from other odors in structures.
- 10.4. 10.4 State laws and regulations may require licensing for canine scent detection services
- 10.5. Canine handlers should inform the client of the canine team's certification status.
- 10.6. Canine handlers should be trained in bed bug biology, behavior, inspection methods and identification.
- 10.7. Effective bed bug detection canine teams must be well trained and their training must be kept up-to-date.
- 10.8. Distractors should be employed as part of the canine teams' ongoing training program.
- 10.9. Prior to making a treatment, the canine handler or a pest management professional should attempt to confirm the canine alert by:
 - 10.9.1. Visually inspecting the area to confirm the presence of an active infestation, or
 - 10.9.2. Using monitoring devices, or,
 - 10.9.3. Utilizing additional canine scent detection teams, or,
 - 10.9.4. The client may elect to have the room(s) treated without secondary confirmation.
- 10.10. When a scent detection canine team is used for bed bug detection, it shall be performed by a canine team that holds a current, independent, third party certification in accordance with the guidelines outlined in the Minimum Standards for Canine Bed Bug Detection Team Certification. The Minimum Standards for Canine Bed Bug Detection Team Certification is contained in Appendix A of these best practices.

11. Integrated Pest Management and Methods of Control

- 11.1. Integrated Pest Management (IPM) combines several strategies to achieve long term solutions. Components of an IPM program may include a combination of education, structural repair, physical control techniques, mechanical control techniques, cultural control techniques, and/or pesticide application.
- 11.2. Integrated Pest Management (IPM) as it relates to bed bugs includes all or most of the following:
 - 11.2.1. Educating and communicating with all affected parties on the biology and habits of bed bugs, their prevention and control.
 - 11.2.2. Making recommendations to residents about reducing clutter, laundering of clothing and bed linens, and other tasks.
 - 11.2.3. Making recommendations to property managers about sealing cracks and crevices, correcting structural deficiencies, making mechanical alterations or modifying architecture to prevent or reduce the likelihood of infestation.
 - 11.2.4. Emphasizing inspection as part of the management program.,
 - 11.2.4.1. The use of nonchemical tools, strategies and technologies as well as insecticides to kill bed bugs where they hide and travel.
- 11.3. The goal of a bed bug management program should be to —
 - 11.3.1. Physically remove or kill visible and accessible bed bugs and their eggs.
 - 11.3.2. Kill bed bugs and eggs that are hidden in cracks, crevices, voids, and other harborages, either immediately or through residual effects of insecticides or with bed bug traps.
 - 11.3.3. Stop the dispersal of bed bugs out of the service area.
 - 11.3.4. Prevent the reintroduction of new bed bugs from other sites by providing education and working with the client.
 - 11.3.5.
- 11.4. Multiple methods of control are available to the pest management professional, multiple methods may be combined to achieve control including:
 - 11.4.1. Vacuuming
 - 11.4.1.1. Physical removal of large numbers of bed bugs can quickly reduce populations in heavy infestations.
 - 11.4.1.2. Vacuuming will cause the area to appear less infested when bed bug debris has been removed and it will be easier to identify new activity.
 - 11.4.1.3. Vacuum recommendations:
 - 11.4.1.3.1. Consider using a high-powered vacuum designed for pest control, outfitted with a HEPA filter.
 - 11.4.1.3.2. Use a crevice tool for corners, edges, seams, cracks, and crevices.
 - 11.4.1.3.3. Scrape the tool along the surface to dislodge bed bugs and eggs.
 - 11.4.1.3.4. Vacuum upholstered furniture, the floor under and around the bed and furniture, along the baseboards, and anywhere fecal material is observed.
 - 11.4.1.4. Be careful not to accidentally spread bugs to other sites or locations via the vacuum.
 - 11.4.1.4.1. Discard vacuum bags inside a sealed plastic bag.
 - 11.4.1.4.2. Check brushes and filters for live bugs or eggs.

- 11.4.1.5. It is difficult to eliminate every bed bug using vacuums alone.
 - 11.4.1.5.1. Bed bugs may be located in inaccessible sites.
 - 11.4.1.5.2. Bed bugs can hold tight to rough surfaces and resist vacuuming.
 - 11.4.1.5.3. Vacuuming provides no residual effect.
- 11.4.2. Steam treatment
 - 11.4.2.1. Steam can kill all stages of bed bugs when temperatures reach critical levels as outlined in Appendix B
 - 11.4.2.2. The use of a commercial-grade “dry steam” unit can be a useful tool for bed bug control.
 - 11.4.2.3. When steaming, follow these procedures:
 - 11.4.2.3.1. Place the steamer head in direct contact with the surface.
 - 11.4.2.3.2. Move the head slowly across the surface (about 1 foot every 10-15 seconds).
 - 11.4.2.3.3. Apply steam treatments to areas where live bed bugs or eggs have been observed and critical areas where bed bugs are suspected.
 - 11.4.2.3.4. Pull out furniture drawers and steam inside, then turn over and steam underneath.
 - 11.4.2.3.5. Steam potential harborage sites where you see bed bug fecal material.
 - 11.4.2.4. When in doubt about the risk of heat or moisture damage, first steam an inconspicuous area and then check for damage. Avoid steaming heat-sensitive items such as:
 - 11.4.2.4.1. Leather, acrylic, vinyl, linen
 - 11.4.2.4.2. Painted surfaces
 - 11.4.2.4.3. Finished wood, laminated wood, or simulated wood veneers
 - 11.4.2.4.4. Plastic
 - 11.4.2.4.5. Wallpaper and other glued surfaces
 - 11.4.2.4.6. Electronics
 - 11.4.2.5. Instruct the client to allow mattresses and furniture to completely dry before covering with linens or encasements.
 - 11.4.2.6. This treatment method provides no residual and is used for killing bed bugs and eggs on contact
- 11.4.3. Heat Treatments
 - 11.4.3.1. Heat treatment can be used to treat and control bed bugs in:
 - 11.4.3.1.1. A whole structure.
 - 11.4.3.1.2. An apartment unit, a room, or a portion of a room.
 - 11.4.3.1.3. A compartment containing furniture and possessions.
 - 11.4.3.2. Heat treatments typically provide more flexibility for use in cluttered environments than traditional pesticide applications
 - 11.4.3.3. Research and understand applicable fire codes, and local ordinances regarding the use of portable heaters, fire suppression systems and other heat treatment related concerns.
 - 11.4.3.4. Only equipment designed and tested for use as an insect control device should be used for whole room bed bug heat treatments.

- 11.4.3.5. Heat equipment should be carefully inspected before use to ensure that it is in proper working order and no foreseeable fire hazards exist.
- 11.4.3.6. When conducting whole-room heat treatment ensure that the equipment has the capacity to raise and hold the temperature in the treated area to a level lethal to bed bugs.
 - 11.4.3.6.1. Ensure, through the use of heat sensors, that bed bug harborage areas are raised to a lethal temperature and held for a sufficient period of time to kill all bed bugs and eggs.
 - 11.4.3.6.2. Because some areas are insulated, or slower to heat, sensors should be placed in areas that ensure that the core temperature of the treated item reaches lethal levels for a sufficient period of time.
 - 11.4.3.6.3. Ambient air and/or surface temperature should be monitored to avoid damage to heat sensitive items.
 - 11.4.3.6.4. Recommended temperature and exposure periods are provided in Appendix B.
- 11.4.3.7. Heat treatment can be limited by these factors:
 - 11.4.3.7.1. Insulated areas where it is difficult to raise the temperature to levels sufficient to achieve complete kill.
 - 11.4.3.7.2. Poor air flow in a room or container resulting in cool spots.
 - 11.4.3.7.3. Poorly insulated rooms or containers during cold weather
 - 11.4.3.7.4. Construction features that may contribute to heat loss or insulated cold spots.
 - 11.4.3.7.5. The possible ability of bed bugs to move out of heated areas in whole-room treatments.
 - 11.4.3.7.6. Potential heat damage to certain materials, including the risk of activating automatic fire suppression systems (sprinklers). Care should be taken to safeguard these materials and systems.
- 11.4.3.8. For whole-room heat treatment, the preventive use of insecticide in walls and under carpet edges, prior to treatment, may complement treatment by killing bugs attempting to move away from the heat.
- 11.4.3.9. Containerized heat treatment can be used to supplement traditional bed bug service by killing bed bugs and eggs in items that are difficult to treat using other methods.
 - 11.4.3.9.1. Typical items to be heat treated include beds, furniture, personal possessions, clothing, shoes, appliances, and equipment.
 - 11.4.3.9.2. Various enclosures can be used including trucks, trailers, shipping containers, storage pods, specially designed self-contained heating units, or tarps.
- 11.4.4. Mattress and Box Spring Encasements
 - 11.4.4.1. Mattress and box spring encasements can be a useful tool for bed bug control.
 - 11.4.4.2. Encasements create a barrier to bed bug movement in and out of the mattress, box spring, and pillows.
 - 11.4.4.3. Encasements make subsequent inspection easier because bed bugs are more visible on the encasement by eliminating harborage areas in the box spring and mattress.

- 11.4.4.4. Not all encasements protect against bed bugs; only use those demonstrated as being “bed bug-proof,” “bite-proof,” and “escape-proof.”
- 11.4.4.5. Encasements allow residents to salvage an infested bed rather than dispose of it.
- 11.4.4.6. Before encasements are installed, a pest control professional should vacuum, steam or treat the mattress and box spring to remove and kill as many bugs as possible.
- 11.4.5. Cold “Freeze” Treatments
 - 11.4.5.1. Freeze treatments use extreme low temperatures to kill bed bugs and eggs on contact.
 - 11.4.5.2. Freeze treatments can be applied to most surfaces and may be beneficial in treating bed bug-infested items that otherwise are difficult to treat including toys, plastics, books, and other items.
 - 11.4.5.3. This treatment method provides no residual and is used primarily for killing bed bugs and eggs on contact.
- 11.4.6. Fumigation
 - 11.4.6.1. Both whole structure and chamber fumigation are effective methods of controlling all bed bug life stages.
 - 11.4.6.2. Fumigation is a specialized treatment method, not all pest management firms perform fumigation services.

12. Insecticides

- 12.1. Insecticide options include, but are not limited to dusts, liquids, aerosols, impregnated fabrics, slow release vapors and/or fumigants.
- 12.2. Only use insecticides registered in the locality in which the product will be used. Always read and follow all labeling instructions when applying insecticides and follow all instructions on the label including:
 - 12.2.1. Special instructions related to bed bugs, including whether and how the product can be applied to beds and furniture and in living areas.
 - 12.2.2. Specific instructions as to how much time must pass before reapplication, keeping in mind that alternative products may be used, if necessary, in the interim.
- 12.3. Choose products that have been shown to be effective in published research, as discussed in pest control meetings, from your own experiences, and/or that of other pest management professionals.
- 12.4. Choose products labeled for the target site.
- 12.5. If acceptable results are not obtained, consider using alternative products, formulations, or non-chemical methods.
- 12.6. Apply insecticides to places where bed bugs hide, travel, and deposit eggs, carefully following all labeling instructions.
- 12.7. Typical treatment sites include, but are not limited to the following:
 - 12.7.1. Bed frames, particularly cracks, crevices, holes, and wherever two surfaces join together.
 - 12.7.2. Mattresses and box springs.
 - 12.7.2.1. Some pest management firms have policies that prohibit the treatment of mattresses and/or box springs

12.7.3. Other furniture

12.7.3.1. Treat cracks, crevices, voids, drawer slides, and the undersides of horizontal surfaces.

12.7.3.2. Treat under cushions, behind skirting, in seams, underneath, and inside voids in upholstered furniture.

12.7.4. Cracks and crevices near infested areas along baseboards, crown moldings, window and door frames, as well as nail holes, damaged walls, chipped paint, etc.

12.7.5. Under carpet edges, tack strips of wall-to-wall carpeting, cracks and seams in hardwood floors, etc. near infested areas.

12.7.6. Inside receptacles and switch plates, light fixtures, wire runs and pipe runs near infested areas.

12.7.7. In severe infestations, treatment sites may include inside wall voids of infested rooms, drapes, ceiling/wall intersections, drop ceilings over beds, and many sites too numerous to list.

12.7.8. In hotels, treatment sites often include service carts, laundry carts, and luggage racks.

12.8. Access to treatment sites may require the removal of carpets, molding, baseboards, wallpaper, and other major actions.

13. Surrounding Units

13.1. Bed bugs commonly spread from infested areas into new locations by moving from room to room, through pipe runs and wall voids, along electrical wires, and through other connections between rooms.

13.2. In apartments, condominiums, hotels, and other multi-unit buildings, when a unit is discovered to have bed bugs, the surrounding units should be included in the service or inspection area.

13.2.1. One or more of these surrounding units—

13.2.1.1. May have been infested by bed bugs that have traveled from the unit with a confirmed bed bug infestation.

13.2.1.2. May be the originating source of the bed bugs.

13.2.2. Surrounding units include adjacent units beside and directly above and below.

13.2.3. Inability to inspect surrounding units, and to service any surrounding units found to have bed bugs, increases the risk of—

13.2.3.1. Re-infestation of the original unit.

13.2.3.2. The bed bug infestation spreading further through the building.

14. Post-Treatment Evaluation

14.1. Multiple service visits may be required to manage bed bug infestations. The reasons include, but are not limited to:

14.1.1. Some bed bug harborage areas may be missed during initial service.

14.1.2. Any eggs not destroyed may hatch and subsequent nymphs may not be controlled by residual material.

14.1.3. Bed bugs may escape treatment inside protected harborages.

14.1.4. Insecticide resistance.

- 14.1.5. Insecticides with poor residual effects.
- 14.1.6. Clients may re-introduce bed bugs from other infested sites.
- 14.2. The goal or objective of treatment is to provide control of bed bugs in the environment. It is difficult to confirm elimination of infestations due to the cryptic nature of the pest.
- 14.3. Success in bed bug service is generally declared when no new evidence of bed bugs can be found and verified, as determined by your service contract or protocol.
- 14.4. PMPs should base their schedule of follow-up inspections on the treatment process they use and the biology of bed bugs. Follow-up services may include:
 - 14.4.1. Interviewing occupants and staff to see if there has been any recent activity (bites, new bed bug fecal stains on sheets, visual sightings, etc.).
 - 14.4.2. Inspection of treated rooms and adjacent areas
- 14.5. The appearance of new evidence of bed bugs after a series of service visits does not necessarily indicate a service failure: the new bed bugs might be re-introductions from other infested locations or a re-introduction by the tenant, client or others.
- 14.6. Document all actions to demonstrate that the pest management firm has taken reasonable steps to ensure that the bed bugs have been eliminated, and highlight any problems encountered (lack of cooperation, structural problems, conducive conditions that have not been corrected).

15. Health and Safety of Technicians

- 15.1. Technicians should be trained in recognizing the health and safety concerns associated with inspecting and treating for bed bugs.
- 15.2. Technicians should be aware that the client may have already performed insecticidal treatments and surfaces may be contaminated with insecticidal residues.
- 15.3. When working in bed bug-infested sites, technicians run the risk of carrying bed bugs in their clothes and equipment to their homes, office, vehicles, or to other sites. To prevent this they should be trained to:
 - 15.3.1. Assume beds and other items are infested and act accordingly.
 - 15.3.2. Avoid leaning across or sitting on infested beds or furniture; minimize contact between their clothes and equipment and infested items.
 - 15.3.3. When bringing equipment into an infested room place it in an open and uninfested area.
 - 15.3.4. Perform an inspection of their clothes and equipment before leaving an infested site.
 - 15.3.5. Bed bugs should be eliminated from clothing by placing items in a dryer on high heat for 30 minutes, or other appropriate technique, as soon as possible upon returning from an infested location.
 - 15.3.6. Consider carrying an extra set of clothes to change into after working in a badly infested location.
- 15.4. Strains and back injuries are a risk in bed bug work because technicians often move mattresses, box springs, furniture, etc.
 - 15.4.1. Technicians should be trained in proper lifting techniques for beds and furniture.
- 15.5. Bed bug work in residential settings involves handling other people's bed linens, dirty clothes, shoes, and other most personal possessions, which exposes technicians to human pathogens, particularly blood-borne pathogens. Special precautions may need to be taken including, but not limited to:

15.5.1. Wearing appropriate personal protective equipment.

15.5.2. Using caution when reaching into or behind furniture.

16. Health and Safety of Clients

16.1. Bed bug service often involves the use of insecticides. Before any insecticide application, speak to the occupants or management to determine if anyone might have health concerns that would be cause for concern if pesticides were used.

16.1.1. If the client has specific health concerns with regard to insecticide treatment, recommend that they consult with a physician prior to treatment. In these cases, it is advised that treatments be made in accordance with a physician's recommendation.

16.2. Reduce all occupants' risk of insecticide exposure by advising them which areas have been treated and by informing them when they can re-enter the treated room and what special precautions (if any) should be followed.

16.3. Technicians should reduce the risk of insecticide exposure to pets by advising occupants to keep pets out of treatment areas as directed by pesticide label directions.

Appendix A- Minimum Standards for Canine Bed Bug Scent Detection Team Certification

1. Definitions
 - 1.1. Alert - A characteristic change in canine behavior in response to an odor, as interpreted by the handler.
 - 1.2. Canine Team - A human and working canine that train and work together as an operational unit.
 - 1.3. Distractor- Non-target odor sources placed within a search area, such as, but not limited to empty training vials, pet food, human food, dead bed bugs and non-viable eggs.
 - 1.4. Extract – odor extracted from an actual insect.
 - 1.5. Handler - The trained person who works with the canine.
 - 1.6. Hide –A container that allows free movement of air containing between five (5) and twenty (20) live bed bugs or viable eggs.
 - 1.7. Pseudo-scent – Man-made compound that mimics the target odor.
2. Purpose of Certification
 - 2.1. To demonstrate the canine team's ability to perform an accurate search for live bed bugs and viable eggs.
 - 2.2. To demonstrate the handler's ability to accurately interpret the canine's changes in behavior and final response associated with bed bug odor.
3. General Guidelines
 - 3.1. Only canine teams are certified under these guidelines, canines or handlers alone do not qualify for certification.
 - 3.2. Canine team certifications are valid for one year, at which time certification is required again.
 - 3.3. Certification does not relieve the canine team from the obligation to perform and document regular maintenance training and conduct periodic assessments to maintain high levels of operational proficiency.
 - 3.4. Handler is responsible for describing to the evaluator the specific kind of passive or active alert that is expected from the canine.
 - 3.5. Pseudo-scents and extracts are prohibited for certification purposes.
4. Testing Guidelines
 - 4.1. Certification tests should be designed to accurately evaluate the ability of a canine team to perform as trained.
 - 4.2. Testing must take place under field conditions where bed bugs may be found.
 - 4.3. Tests should consist of a minimum of four (4) areas designed to restrict odors from moving between areas.
 - 4.4. Each area described in 4.3 should contain at least one distractor or hide.
 - 4.4.1. Evaluator must place hides in the testing rooms at least thirty (30) minutes before testing begins.
 - 4.4.2. Distractors should represent of the typical odors encountered (under field conditions) by canine teams in the region(s) the team operates.
 - 4.4.3. When dead bedbugs are used as a distractor, the bugs must have been dead for at least forty-eight (48) hours.
 - 4.5. Time Limit

4.5.1. Time limit for completion of test (all rooms) is twenty (20) minutes of total search time.

4.5.2. Time spent between rooms is not counted toward total time.

4.6. Evaluation

4.6.1. Certification tests will result in a grade of pass or fail.

4.6.1.1. Handler will interpret the canine’s response by identifying the specific location of the hide.

4.6.1.2. There are multiple combinations of outcomes that may result from the certification test. These are described in Section 4.6.2

4.6.2.

Odor	Canine Response	Handler Response	Test Result
Live Bed Bug or Viable Eggs	Alert	Interprets Live Bed Bugs or Viable Eggs	PASS
Live Bed Bug or Viable Eggs	Alert	Does Not Confirm Presence of Live Bed Bugs or Viable Eggs	FAIL
Live Bed Bug or Viable Eggs	No Alert	Interprets Live Bed Bugs or Viable Eggs	FAIL
Live Bed Bug or Viable Eggs	No Alert	Does Not Confirm Presence of Live Bed Bugs or Viable Eggs	FAIL
Other Odor	Alert	Interprets Odor as Other Odor	PASS
Other Odor	Alert	Incorrectly Identifies Live Bed Bugs or Viable Eggs	FAIL
Other Odor	No Alert	Incorrectly Identifies Live Bed Bugs or Viable Eggs	FAIL
Other Odor	No Alert	Interprets Odor as Other Odor	PASS

4.6.3. To achieve a passing grade for certification:

4.6.3.1. Test outcome must result in pass (as described in Section 4.6.2) in all rooms.

4.6.3.2. One false alert is allowed, however it cannot be on a placed distractor.

4.6.4. Mistreatment of canines during the testing process will result in failing score.

5. Certification Test Proctors

5.1. A minimum of two (2) people must conduct each certification test (one evaluator and one witness). Evaluators shall meet the credentials outlined in Section 5.2.

5.2. Evaluators will have a minimum of five (5) years’ experience (total) in scent canine handling and evaluation in one or more of the following fields:

5.2.1. Law enforcement

5.2.2. Government agency

5.2.3. Military

5.2.4. Other comparable and verifiable experience in canine scent detection training or evaluation.

- 5.3. Certification test proctors may not be the canine's current or former trainer.
- 5.4. Certification test proctors may not have any conflict of interest with regard to the canine, handler or handler's business.
- 6. Certification Organizations
 - 6.1.1. Pest management firms should avoid conflict of interest when choosing a certification organization.
 - 6.1.2. Certification organizations may have requirements that are stricter than those outlined in these standards.

Appendix B- Recommended Temperature and Exposure Periods for Bed Bug Control ^A

Temperature/ Exposure Time Required to Kill All Bed Bug Stages*	
Temperature	Exposure Time
113° F (45° C)	7 hours
118° F (48° C)	90 minutes
122° F (50° C)	< 1 minute

*Note: Recommendations refer to temperatures at bed bug harborage areas, not ambient air temperatures

For steam treatments surface temperatures should reach 160 - 180° F (71 - 82° C) to ensure that surface temperatures rapidly exceed 122° F (50° C).^B

^A Kells, S.A. and M.J. Goblirsch. 2011. Temperature and Time Requirements for Controlling Bed Bugs (*Cimex lectularius*) under Commercial Heat Treatment Conditions *Insects* 2(3): 412-422.

^B Kells, S.A. 2010. Control of Bed Bugs in Residences: Information for Pest Control Companies. University of Minnesota Fact Sheet, St. Paul, MN. www.bedbugs.umn.edu