



**NPMA BED BUG BEST
MANAGEMENT PRACTICES**
A GUIDE FOR PEST MANAGEMENT PROFESSIONALS

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INTRODUCTION AND PURPOSE

The resurgence of bed bugs in North America and elsewhere in the early 2000s was a turning point in pest management. This pest had been uncommon from the late 1960s to the 1990s, and its return highlighted a knowledge gap for pest management professionals (PMPs) as well as the public. This pest is most prevalent in areas not traditionally serviced as part of routine pest management activities (i.e. beds and upholstered furniture). Bed bugs are a difficult and expensive pest to control because of their cryptic nature, ability to rapidly develop resistance to insecticides, and unique behavioral ecology that allows this pest to thrive. Since the resurgence the industry has developed integrated pest management (IPM) techniques that, when combined with client cooperation, can lead to successful control.

The guidelines presented here are intended to help pest management professionals control bed bugs effectively, responsibly, and safely while assisting the public in identifying practical methods to address bed bug infestations. This document has been prepared by the National Pest Management Association (NPMA) in cooperation with industry representatives and subject matter experts 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.



1. BUSINESS PRACTICES PREREQUISITES AND RECORDKEEPING

While there may not be a single best way to run a pest management company, reputable firms should have processes in place to manage and accomplish the items outlined below.

GENERAL EXPECTATIONS FOR PEST MANAGEMENT FIRMS & EMPLOYEES

- 1.1. Advertising, transactions with clients, and the general public should be fair and honest.
- 1.2. Appropriate licenses and certifications must be acquired and maintained as required by state regulations.
- 1.3. Businesses should support ongoing training and education of relevant employees on the evolving technology of managing bed bugs.
- 1.4. Products used must be registered by the EPA and approved for use in the State (or exempt from registration), and reasonably believed to give the desired results.

SERVICE AGREEMENTS AND ACCOMPANYING DOCUMENTS

- 1.5. A pest management firm should use a service agreement designed specifically for bed bugs or attach an addendum to a standard service agreement that addresses specific bed bug issues.
- 1.6. Service agreements related to bed bugs should be prepared or reviewed by an attorney who is familiar with the risk factors associated with bed bug service, and who is licensed in the state(s) in which the services will be performed.
- 1.7. Service agreements should be in compliance with state and local laws and regulations specific to structural pest control and bed bugs.
- 1.8. The following components should be agreed on in advance by all parties:
 - The cost of service to be provided, including fees for additional services, if necessary, and what events would trigger additional services.
 - Any warranties or guarantees associated with the service.
 - A proposed schedule for completion of services.
 - Details of the service, including information about areas included/excluded from coverage, tools, methods, and tactics to be used.
 - Obligations of the client or tenant and how failure to comply may result in modifications to pricing, anticipated results, and warranties or guarantees.
 - Limitations of liability for damages from bed bug bites, disease, injuries, contamination, property damage (including structure or contents), loss of income, etc.



RECORDKEEPING

- 1.9. Accurate recordkeeping is an essential component of bed bug management. Recordkeeping benefits all parties, allowing the recipient of services to verify that all promises were fulfilled and providing the pest management firm protection from liability, billing disputes, and regulatory enforcement.
- 1.10. Establish a document retention policy that balances the needs of the client, company, and state regulations.
- 1.11. Documentation may be recorded in a variety of acceptable formats, including written, electronic, or printed service reports. Important information to record for bed bug services includes:
 - The date of and total time spent rendering the service.
 - Inspection methods used.
 - Estimation of infestation level and location of bed bugs found.
 - Actions taken by the pest management firm to control bed bugs, the areas the actions took place, and details of any materials used.
 - Any conditions or client actions that could influence treatment success.
 - Any additional client directives (re-entry intervals, instructions not to move devices, how to deal with infested items, etc.).
- 1.12. Specialized treatments, such as heat treatment or fumigation, may require additional documentation. See Control Section for more information.



2. EDUCATION

All relevant staff should be trained in a manner that enables them to effectively carry out their job duties. There should be a mechanism to ensure that staff understand the training and that retraining is available, should it be needed.

STAFF TRAINING

- 2.1. Training should be documented using sign-in sheets, digital time stamps, or other verification methods. This documentation should include an overview of the material covered and who was present.
- 2.2. Staff should be trained to communicate with clients dealing with bed bugs in an understanding, helpful, and empathetic manner. Some topics that staff should be trained in may include:
 - Bed bug biology and control, including but not limited to lifecycle, basic identification characteristics, behavior, and signs of infestation.
 - Effective remediation techniques including any relevant safety concerns.
 - Medical significance (i.e., bed bugs are not known to transmit human pathogens, however they may negatively impact human health, including mental health. Bite reactions are variable, and bites are not a reliable way to identify bed bug infestations.) For more information refer to the Centers for Disease Control and Prevention.
 - Client preparations and responsibilities, including what steps to take if a client is unwilling or unable to prepare for service.
- 2.3. Staff regularly involved in bed bug control or sales need advanced training in all aspects of bed bug control.
- 2.4. Advanced bed bug training should include the following for each market serviced:
 - Bed bug identification, biology, and behavior.
 - Methods of dispersal and spread.
 - How to inspect for bed bugs and the limitations of various inspection techniques.
 - Viable treatment options.
 - Strategies for bed bug prevention and minimizing spread (for communication to clients).
 - Why bed bug infestations can be difficult to detect and to eliminate.
 - How to evaluate success.
 - Specific terms included in the pest management firm's bed bug service agreement Local, State, Federal, or Provincial laws, ordinances, and regulations related to bed bugs that may impact the technician or the pest management firm.
- 2.5. Due to differences in the dynamics of bed bug infestations based upon the nature of the infested environment, advanced bed bug training should be designed to address specific differences in bed bug management for each of the markets serviced by the company. (i.e. single family residences, multi-family housing, hospitality, commercial office buildings, medical facilities, public transportation etc.).

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- 2.6. Safety training and appropriate PPE should be provided to employees based on their potential exposure to the following hazards. Additional safety training may be required depending on control methods used.
- Dangerous items, which may be concealed in drawers or under mattresses, including sharps and firearms.
 - Potential pathogen transmission from close interactions with people, soiled linens, and other potentially infectious materials.
 - Exposure to heat exhaustion and heat stress.
 - Strains and back injuries are a risk in bed bug work. Technicians should be trained in proper lifting techniques for beds and furniture.
 - Clients may have already performed insecticidal treatments and surfaces may be contaminated with insecticidal residues.
- 2.7. When working in bed bug-infested sites, technicians run the risk of carrying bed bugs in their clothes and equipment to their homes, vehicles, or to other sites. To prevent this, they should be trained to:
- Assume beds and other items are infested and act accordingly.
 - Avoid leaning across or sitting on infested beds or furniture; minimize contact between their clothes and equipment and infested items.
 - When bringing equipment into an infested room, place it in an open and uninfested area.
 - Perform an inspection of their clothes and equipment before leaving an infested site.
 - Consider carrying an extra set of clothes to change into after working in a badly infested location.
 - Bed bugs can 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.

CLIENT EDUCATION

- 2.8. In addition to educating their own staff, pest management firms offering bed bug services should make industry-specific bed bug education such as those items covered in sections 2.1 – 2.7 available to their clients.
- 2.9. It may also be important to communicate specific actions that might be required from the client or resident such as:
- Providing access, authorization, and cooperation for service.
 - Reducing clutter, laundering clothing, making repairs, etc.
 - Steps to reduce the spread of bed bugs from infested areas.
 - Options for addressing infested furniture and personal items and under what circumstances to consider disposal of infested items (see [DISPOSAL OF INFESTED ITEMS](#)).



- 2.10. Education should start during the initial contact with a client about bed bugs, and should continue throughout the process using tools such as:
- Verbal communications
 - Handouts
 - Online resources
 - Meetings or webinars
 - Status reports on services performed and next steps.
- 2.11. PMPs should recommend that property managers:
- Educate occupants about bed bugs, including recognition and prevention.
 - Conduct proactive inspections, including units above/below/adjacent/across from any infested unit, to rapidly identify and characterize the extent of the problem in the building.
 - Allow follow-up inspections of surrounding units until bed bugs have been eliminated.
- 2.12. There are some health and safety considerations to discuss with clients before performing bed bug work.
- 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 as directed by pesticide label directions.
 - 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.
 - If thermal treatments are performed, review procedures for returning the unit(s) to an adequate temperature.
 - Address with the clients any additional relevant safety steps, recommendations, or procedures as indicated on product label instructions or manufacturer's guidelines.



3. BED BUG DETECTION

The primary goal of a bed bug inspection should be to determine the presence of any bed bug evidence, both old and new, at the time of service. Bed bug inspections are a critical component to successful management but are not uniform in scope and should be tailored to individual location needs. No technique is perfect; however, implementation of multiple techniques is generally more effective than any single technique.

- 3.1. In general, inspections should focus on areas where potential hosts spend time sitting, sleeping, or resting. The scope may be expanded depending on the setting, extent of infestation, and objectives of the inspection to include storage areas, common areas, and items that are moved frequently between infested and uninfested areas. For details about common inspection procedures reference NPMA Online Training Resources at www.npmapestworld.org.
- 3.2. An inspection can also be useful to help:
 - Determine the extent of infestation.
 - Identify challenges that could hinder control efforts.
 - Develop an effective management strategy.
- 3.3. Before conducting an inspection consider consulting additional sources of information that may improve the outcome of the inspection Examples include:
 - 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.
 - Speaking with building owners, occupants, and staff about the history of bed bug activity at the site.
 - In residential accounts, determining where potential hosts sleep and rest outside of bedrooms.
 - In large buildings, mapping infested rooms to identify trends and determine the extent of the infestation.
- 3.4. A flashlight and/or headlamp is an important inspection tool as bed bugs harbor in cracks and crevices that are often difficult to see without additional lighting. Other inspection tools may be useful to allow the pest management professional to access hidden or partially inaccessible areas. Other useful tools may include:
 - Hand lens or other magnification device.
 - An inspection (mechanic's) mirror or a digital recording device such as a smart phone with selfie stick to view hard to observe places.
 - Forceps and containers or vials for specimen collection.
 - Screwdrivers, pliers, pry bar, multi-tool, crescent wrench, staple gun.
 - Bed bug monitoring devices to capture bed bugs as they travel from hiding places between service visits.

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- 3.5. Live bed bugs and/or unhatched (viable) eggs are the only types of evidence that can be used to confirm existing bed bug activity. Other types of evidence such as dead bed bugs, hatched eggs, cast skins or fecal staining could be representative of either existing or historical bed bug activity.
 - 3.6. Any specimens found during an inspection or provided by a client should be positively identified by a trained individual to confirm that the pest is a bed bug, and not any of the closely related bugs in the family Cimicidae that primarily feed on bats and birds, or any other pest, which require different management tactics.
 - 3.7. Low levels of existing bed bug activity can be difficult to detect and may escape detection during an inspection.
 - 3.8. In the absence of physical evidence of bed bugs, the presence of skin reactions or assurances by residents that bed bugs are present cannot be used to confirm bed bug activity. Inspectors should avoid inspecting a person's body or offering an opinion on the cause of a skin reaction.
 - It is not possible to tell if an apparent bite was caused by a bed bug because skin reactions vary, and skin reactions from other insects may have a similar appearance to those of bed bugs.
 - Some skin infections and other conditions may resemble insect bites.
 - 3.9. Bed bug inspections are a critical component to successful management but are not uniform in scope and should be tailored to individual location needs. No technique is perfect; however, implementation of multiple techniques is generally more effective than any single method.
 - 3.10. When existing bed bug activity is suspected but cannot be confirmed during an inspection, an inspector should consider follow-up inspections using additional methods that have proven effective for bed bug detection. Inspection techniques may include **rapid visual inspections**, **comprehensive visual inspections**, and **canine scent detection**.

RAPID VISUAL INSPECTIONS

- 3.11. These inspections can typically determine the presence of an obvious bed bug infestation quickly. They are well-suited for detecting moderate to severe infestations and are less reliable for low-level activity. This method can be useful when large-scale inspections are needed in a short period of time.
- 3.12. Brief inspection of exposed, high probability areas (e.g. beds, couches, recliner chairs, other furniture where people rest) to find readily observable bed bug evidence, without disassembling or flipping over furniture, removal of headboards, etc.



COMPREHENSIVE VISUAL INSPECTIONS

- 3.13. This type of inspection is more labor-intensive, time-consuming, and physically demanding but increases the likelihood of detecting low-level activity or less well-established infestations.
- 3.14. A comprehensive visual inspection includes, at a minimum, all areas inspected in a rapid inspection but is a more thorough and may include flipping and moving furniture, lifting box springs and mattresses, removal of headboards, etc.

CANINE SCENT DETECTION

- 3.15. Canine scent detection is the use of specially trained bed bug scent detection canine teams to detect bed bug activity.
- 3.16. Canine scent detection may be useful for large-scale inspections, complex environments, detecting low-level activity, situations when bed bugs are hidden or not in predictable locations, and other scenarios that are not conducive to visual inspections and/or monitoring.
- 3.17. Unlike visual and monitoring, positive alert of bed bugs by canine scent detection team may not be sufficient to confirm the presence of bed bugs. Additional methods of inspection are recommended to confirm the infestation.
- 3.18. See [SECTION 4](#) for detailed information about canine scent detection.

MONITORING DEVICES

- 3.19. Monitoring devices are traps or other tools that can capture or detect the presence of bed bug activity without a person needing to be present.
- 3.20. Monitoring devices may be passive or active:
 - Active monitoring devices emit a substance that attracts bed bugs to the monitor or increase bed bug movement. Examples include but are not limited to heat, carbon dioxide, and chemical attractants.
 - Passive monitoring devices do not emit an attractive substance to lure or mobilize bed bugs. However, these devices and how they are deployed, may exploit bed bug movement and orientation behavior to improve detection rates.
- 3.21. Monitoring devices increase the likelihood of detecting activity that may be missed otherwise. They are useful to help determine low-level bed bug activity, the extent of known infestations, the validity of canine scent alerts, bed bug activity that is not present in predictable locations, and bed bug activity between service visits or after control efforts have been implemented. This method requires multiple visits (installation and follow up visit(s) to inspect and maintain the monitor).



3.22. The failure of a monitoring device to detect bed bug activity does not mean that bed bugs are not present. For example, sticky traps alone have a low level of effectiveness for detecting bed bugs but may catch bed bugs if placed in enough locations.



4. BED BUG SCENT DETECTION CANINE TEAMS

Bed bug infestations can be detected by specially trained bed bug scent detection canine teams that are able to detect live bed bugs and viable eggs.

- 4.1. 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.
- 4.2. Canine handlers should inform the client of the canine team's certification status.
- 4.3. Canine handlers should be trained in bed bug biology, behavior, inspection methods and identification.
- 4.4. Distractors, commonly encountered within the type of environments that are to be inspected, should be included in the canine teams' ongoing training program.
- 4.5. Prior to making a treatment, the canine handler or a pest management professional should attempt to confirm the canine alert using one or more of the following methods:
 - Visually inspecting the area to confirm the presence of an active infestation.
 - Using monitoring devices.
 - Utilizing additional canine scent detection teams.
- 4.6. In the event live bed bug activity cannot be confirmed following a canine alert, the client may elect to have the room(s) treated without secondary confirmation but should be made aware that live bed bug activity could not be confirmed.



5. INTEGRATED PEST MANAGEMENT AND METHODS OF CONTROL

Integrated Pest Management (IPM) has been shown to be the most effective method for the control of bed bugs as it incorporates client education along with a variety of management techniques both chemical and nonchemical, for the control of bed bugs that may be resistant to pesticides.

5.1. IPM for the control of bed bugs includes the below strategies to achieve long term solutions.

- Educating and communicating with all affected parties on the biology and habits of bed bugs, their prevention, and control.
- Making requests of residents and/or property managers for specific types of cooperation directly related to the prevention and control of bed bugs.
- Inspecting using a variety of techniques highlighted in the SECTION 3 (Bed Bug Detection) of this document which often includes searching out other areas and objects associated with the known infestation to reduce the likelihood of reinfestation or further spread of bed bugs.
- Treating all infested areas and objects using a combination of nonchemical and/or chemical methods.
- Assessing the effectiveness of management efforts and to determine when control of bed bugs has been achieved.

5.2. The sections below detail treatment and post-treatment assessment processes including:

- Non-Chemical Control Treatment Methods
- Chemical Control Treatment Methods
- Treating Surrounding Areas
- Post-Treatment Assessments
- Health & Safety

NON-CHEMICAL TREATMENT METHODS

Many non-chemical control measures have shown to be highly effective for the control of bed bugs including populations resistant to insecticides and are also important in managing and in managing insecticide resistance. Additionally, non-chemical control methods can be effective in sensitive environments where chemical product use may be limited. However, non-chemical measures physical removal and thermal treatments do not provide any residual control.



DISPOSAL OF INFESTED ITEMS

- 5.3. Disposal of infested items can result in a reduction in the bed bug population. However, disposal of items can be expensive and unnecessary depending on conditions. Every effort should be made to preserve items if the client prefers to keep the infested item(s).
- 5.4. Disposal of items is often not a solution because bed bugs may be found infesting other items or areas of the structure.
- 5.5. Consideration should be taken to prevent reclamation of discarded items. Examples may include sealing items to prevent the escape of bedbugs, clearly marking infested items, and physically altered to prevent reuse of the items.

MATTRESS AND BOX SPRING ENCASEMENTS

- 5.6. Encasements create a barrier to bed bug movement in and out of the mattress and box spring.
- 5.7. Benefits can include population reduction, cost savings by salvaging infested mattresses and box springs, protecting replacement mattresses and box springs, and providing inspection and management efficiencies during follow-up services.
- 5.8. Encasements should be inspected for signs of damage that can compromise the effectiveness of the encasement and should be replaced as necessary.
- 5.9. Encasements are limited in scope and should be paired with other control techniques. Only mattress encasements specifically designed for bed bug management should be used.

VACUUMING

- 5.10. Vacuums are a very effective tool for physically removing large numbers of bed bugs and can quickly reduce populations. Vacuums should be equipped with a HEPA filter to reduce airborne allergens.
- 5.11. Other benefits can include physical removal of old evidence such as bed bug carcasses and shed skins to make it easier to identify new activity and prepares areas to be treated.
- 5.12. Vacuuming has limited effectiveness in removing bed bugs from within cracks and crevices and may not dislodge eggs.
- 5.13. Take measures to prevent the accidental spread of live bed bugs contained within the hose, bag, or housing of the vacuum.



THERMAL TREATMENTS

Steam Treatment

- 5.14. The use of a commercial-grade steamer can kill all stages of bed bugs and has the ability to kill bed bugs and eggs within cracks and crevices (~ 2 inches) and beneath the surface (~.75 inches) of most fabrics on upholstered furniture.
- 5.15. Steam can kill bed bugs that are resistant to insecticidal control and can be used on many surfaces that often are excluded from insecticide label language.
- 5.16. Steam can damage some objects. Care should be taken to avoid damage to items that may be sensitive to heat or moisture. First steam an inconspicuous area and then check for damage.

Heat Treatments

- 5.17. Heat treatment can be used to treat and control bed bugs in:
 - A whole structure.
 - An apartment unit, a room, or a portion of a room.
 - A compartment containing furniture and possessions.
- 5.18. Heat treatments typically provide more flexibility for use in cluttered environments than traditional pesticide applications.
- 5.19. Research and understand applicable fire codes, and local ordinances regarding the use of portable heaters, fire suppression systems and other heat treatment related concerns.
- 5.20. Only equipment designed and tested for use as an insect control device should be used for whole room bed bug heat treatments.
- 5.21. Heat equipment should be carefully inspected before use to ensure that it is in proper working order and no foreseeable fire hazards exist.
- 5.22. When conducting any 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. See [APPENDIX B](#).
- 5.23. 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.
- 5.24. 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.
- 5.25. Ambient air and/or surface temperature should be monitored to avoid damage to heat sensitive items.
- 5.26. The effectiveness of heat treatment can be limited by these factors:
 - Insulated areas where it is difficult to raise the temperature to levels sufficient to achieve complete kill.
 - Poor air flow in a room or container resulting in cool spots.



- Poorly insulated rooms or containers during cold weather.
 - Construction features that may contribute to heat loss or insulated cold spots.
 - The possible ability of bed bugs to move out of heated areas in whole-room/structure treatments.
- 5.27. Care should be taken to safeguard against potential heat damage to certain materials, including the risk of activating automatic fire suppression systems (sprinklers).
- 5.28. For whole-room/structure 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.
- 5.29. 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. Typical items to be heat treated include beds, furniture, personal possessions, clothing, shoes, appliances, and equipment.
- 5.30. Various enclosures can be used including trucks, trailers, shipping containers, storage pods, specially designed self-contained heating units, or tarps.
- 5.31. Exposure to elevated indoor air temperature may increase the potential for heat-related illness such as heat exhaustion, heat cramps, and heat stroke. Some individuals, (adults aged 65+, children and infants, people with chronic medical conditions, etc.) including workers and clients, may be particularly vulnerable to environments with elevated temperatures.
- 5.32. Consider developing a company policy for bed bug heat treatments which may include language advising clients of associated risks, including heat-related illness and recommendations to avoid re-occupancy until interior temperatures return to levels typical for the structure.

Cold “Freeze” Treatments

- 5.33. Freeze treatments use extreme low temperatures to kill bed bugs and eggs on contact and can be applied to many bed bug infested objects that are otherwise are difficult to treat including toys, plastics, books, and other items.
- 5.34. This treatment method is used for killing bed bugs and eggs on contact.
- 5.35. Infested items that are freeze-tolerant can be sealed and placed in a household or industrial freezer for one week to kill bed bugs and eggs.



CHEMICAL TREATMENT METHODS

- 5.36. This treatment method is used for killing bed bugs directly, for providing a residual that may kill any bed bugs who contact it, or both.
- 5.37. Insecticide options include, but are not limited to dusts, liquids, aerosols, impregnated fabrics, slow-release vapors, and/or fumigants. Many chemical control options provide residual control.
- 5.38. Insecticide resistance in bed bugs is widespread and variable from one population to the next. To help manage resistance, it is important to incorporate multiple classes and formulations of insecticides. Additionally, it is important to evaluate the effectiveness of products selected.



6. SURROUNDING AREAS

Bed bugs commonly spread to areas adjacent, above, below, or across from areas where the original infestation existed.

- 6.1. 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.
- 6.2. Surrounding units include adjacent units beside and directly above and below or across the hall, in buildings with whose units share a common hallway.
- 6.3. One or more of these surrounding units:
 - May have been infested by bed bugs that have traveled from the unit with a confirmed bed bug infestation.
 - May be the originating source of the bed bugs.
- 6.4. Inability to inspect surrounding units, and to service any surrounding units found to have bed bugs, increases the risk of:
 - Identification of primary source units.
 - Re-infestation of the original unit.
 - The bed bug infestation spreading further through the building.



7. POST-TREATMENT ASSESSMENT

The purpose of a post-treatment assessment is to assess the efficacy of treatment, to determine whether there is still bed bug activity (and if continued service is necessary), and if activity is present, what actions are required to resolve the ongoing activity.

- 7.1. Post-treatment assessment(s) should be conducted due to the complex biology and behavioral ecology of bed bugs. Scheduling follow-up services should be based on the biology of bed bugs, treatment methods used, level of client cooperation, and service agreement parameters. Reasons for post-treatment assessment may include, but are not limited to:
 - Bed bugs and eggs that were not accessible during the initial treatment.
 - Treatment failure due to insecticide resistance or poor treatment technique.
 - Lack of client cooperation that is necessary for control.
 - Reintroduction of bed bugs after treatment.
- 7.2. Success in bed bug service is generally declared when no evidence of new activity can be found. However, detection of bed bugs is difficult due to the cryptic nature of the pest and visual inspection alone may not determine when an infestation has been eliminated. It is best to use a combination of detection methods prior to terminating follow-up services.
- 7.3. Ensure all actions are adequately documented to determine that the bed bugs have been eliminated or service parameters have been met, and to document any ongoing problems encountered that impact the outcome of the service (lack of cooperation or conducive conditions that have not been corrected).



APPENDIX A – MINIMUM STANDARDS FOR CANINE BED BUG SCENT DETECTION TEAM CERTIFICATION

DEFINITIONS

Alert — A characteristic change in canine behavior in response to an odor, as interpreted by the handler.

Canine Team — A human and working canine that train and work together as an operational unit.

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.

Extract — odor extracted from an actual insect.

Handler — The trained person who works with the canine.

Hide — A container that allows free movement of air containing more than one live bed bug or viable eggs.

Pseudo-scent — Man-made compound that mimics the target odor.

PURPOSE OF CERTIFICATION

- To demonstrate the canine team’s ability to perform an accurate search for live bed bugs and viable eggs.
- To demonstrate the handler’s ability to accurately interpret the canine’s changes in behavior and final response associated with bed bug odor.

GENERAL GUIDELINES

- Only canine teams are certified under these guidelines, canines or handlers alone do not qualify for certification.
- Canine team certifications are valid for one year, at which time certification is required again.
- 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.
- Handler is responsible for describing to the evaluator the specific kind of passive or active alert that is expected from the canine.

- Pseudo-scents and extracts are prohibited for certification purposes.

TESTING GUIDELINES

- Certification tests should be designed to accurately evaluate the ability of a canine team to perform as trained.
- Testing must take place under field conditions where bed bugs may be found.
- Tests should consist of a minimum of four (4) areas designed to restrict odors from moving between areas.
- Each area described above should contain at least one distractor or hide.
 - Evaluator must place hides in the testing rooms at least thirty (30) minutes before testing begins.
 - Distractors should be representative of the typical odors encountered (under field conditions) by canine teams in the region(s) the team operates.
 - When dead bed bugs are used as a distractor, the bugs must have been dead for at least forty-eight (48) hours.

TIME LIMIT

- Time limit for completion of test (all rooms) is twenty (20) minutes of total search time.
- Time spent between rooms is not counted toward total time.

Table 1. Multiple combinations of outcomes that may result from the certification test.

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



EVALUATION

- Certification tests will result in a grade of pass or fail.
- Handler will interpret the canine's response by identifying the specific location of the hide.

TO ACHIEVE A PASSING GRADE FOR CERTIFICATION:

- Test outcome must result in pass (see [TABLE 1](#)) in all rooms.
- One false alert is allowed; however, it cannot be on a placed distractor.
- Mistreatment of canines during the testing process will result in failing score.

CERTIFICATION TEST PROCTORS

- A minimum of two (2) people must conduct each certification test (one evaluator and one witness). Evaluators should meet the credentials outlined below.
- 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:
 - Law enforcement
 - Government agency
 - Military
 - Other comparable and verifiable experience in canine scent detection training or evaluation.
- Certification test proctors may not be the canine's current or former trainer.
- Certification test proctors may not have any conflict of interest with regard to the canine, handler or handler's business.

CERTIFICATION ORGANIZATIONS

- Pest management firms should avoid conflict of interest when choosing a certification organization.
- 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

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

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

^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



The National Pest Management Association, a non-profit organization with more than 4,000 members, was established in 1933 to support the pest management industry's commitment to the protection of public health, food, and property from the diseases and dangers of pests.

For more information, visit [NPMAPestWorld.org](https://www.npmapestworld.org).

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