

Control Strategies for Bed Bugs

- Physical Removal
- Exclusion
- Physical Killing Techniques
- Pesticide Applications
- Follow-up

Physical Removal

Bed bugs can be vacuumed from exposed hiding spots such as box spring edges, mattress creases, furniture seams and carpet edges, but their eggs are stuck tightly to surfaces and are usually hard to remove. Using a crevice tool, or vacuum wand, to scrape the surface can help dislodge some of the eggs.

A high efficiency particulate air (HEPA) filtered vacuum, which removes >99% of all particles >0.3 micron diameter, will ensure that many allergens associated with bed bugs and their debris are also removed. Vacuuming, especially during inspections, will immediately remove a significant portion of the pest population and will usually kill some of the bugs. Bed bugs may also be removed from exposed resting sites by pressing down on them with the sticky side of a commercially available tape, hand-picking them, or brushing them into a container of rubbing alcohol or soapy water.

[Back to top](#)

Exclusion

Bed bugs have weak, flexible, piercing-sucking mouthparts, and weak, simple feet (tarsi), and claws. They are incapable of chewing or clawing through even a very thin coating of sealant or an unbroken layer of paper or cloth. Sealing almost any material, to completely cover a harborage opening, can halt bed bug movement. Once sealed inside, living bugs are effectively removed from the pest population and will die in place. Sealing most of the hiding spots can also restrict the bugs' movements, temporarily reducing the intensity of their feeding.

Mattress headboards and frames can be painted with several coats seal off these hiding spots. Any cracks or crevices on walls or along baseboards should be painted or caulked with an appropriate sealant. This can prevent bed bugs from getting inside wall voids, where they can migrate to other locations in the building. Storing clothes and other items in plastic bags or tightly sealed containers can greatly reduce potential hiding spots.

Commercially available plastic mattress covers, at least 0.08 mm thick, usually with a zippered edge, can completely enclose a mattress or box spring and prevent any bed bugs harboring in them from accessing hosts. Originally developed to reduce human

exposure to allergens in mattresses infested with house dust mites, such covers both seal in and exclude bed bugs.

They may also be homemade using plastic sheeting that is sealed shut with durable, flexible tape (e.g., nylon fiber tape, duct tape) (Cooper and Harlan 2004). Plastic covers will not work if they are ripped or torn, and must be completely sealed for maximum effectiveness.

More expensive options included fabric-based full mattress encasements. Good encasements consist of a tightly woven fabric that inhibits bed bug movement, and include a secured zipper system that prevents bed bugs from getting in or out. They are also more durable than plastic covers, and can be washed and reused.

Covers are best used after a mattress is treated for bed bugs. This will prevent outside populations from getting into the seams and folds, and will keep any newly hatched bed bugs on the mattress from getting out and feeding on occupants. Covers must be left on the mattress for a minimum of one year unless otherwise instructed by a pest control professional.

[Back to top](#)

Physical Killing Techniques (heat, cold, steam)

Heat

Since the early 1900s, bed bugs have been controlled by heating infested rooms or whole buildings to temperatures of at least 45 °C; the thermal death point for these pests. For heat treatment to be effective, it is critical that high temperature and low relative humidity be attained for a minimum length of time. Heat treatment works best with a combination of temperatures in the 49-52 °C (120-125 °F) range at 20-30% relative humidity for 20-30 minutes.

Heat treatment has an immediate and substantial effect, but does not provide long lasting control. Bed bugs can re-occupy any treated site as soon as temperatures return to normal. While there have been reports of physical distortion of structures and interior contents, whole room and building heat treatments are generally considered safe, and provide the added bonus of eliminating other insects that might be on the premises. Always consult with a knowledgeable pest control professional trained to use heat treatments and discuss their method in detail before contracting their service. Companies should be willing to offer service references, an important source of information when making contracting decisions for bed bug control.

One area where professional expertise is not required is laundering infested linens or clothes. Occupants can wash these items in hot water with detergent, followed by heat drying for at least 20 minutes in a clothes dryer on high heat, will kill all stages of bed bugs. This is an effective method, but will not prevent reinfestation of these

items. They must be stored in plastic bags or containers after laundering until the problem is under control.

Cold

Exposure to low temperatures can kill bed bugs if they are kept cold enough long enough. Bed bugs can tolerate 5 °F (-15°C) for short periods and, if acclimated, they can survive at or below 32 °F (0°C) continuously for several days. Cold treatments of rooms or buildings to control bed bugs have not been well studied, nor are they often employed. Freezing furniture or other items below 0 °F (-19°C) for at least four days should adequately provide control, although this option is not practical for most people.

A new commercial technology uses liquid carbon dioxide (CO₂), stored at very cold temperatures, to deposit a super-cooled "snow" on materials that kills bed bugs and other pests by rapid freezing. This snow evaporates into a gas, and does not leave behind any residue. As with heat treatment, freezing does not offer long lasting control as the effects are immediate, so re-infestation may become an issue.

Steam

Steam treatments have been used effectively by pest control professionals to quickly eliminate live bugs and their eggs from the seams of mattresses and furniture. However, this technique requires practice and care. Most retail steam cleaners do not generate enough heat to be effective. Commercial steam cleaners must typically be used to generate the temperatures necessary to quickly kill bed bugs. These devices often operate at temperatures well in excess of 180 °F, and can pose a scalding hazard to the operator if used improperly. Manufacturer's instructions must be followed concerning the steam generating devices' operation, maintenance and safety precautions.

When selecting a device, look for a vapor or dry steam cleaner. These products produce steam with less moisture than conventional steam cleaners, which reduce the risk of water damage and mold growth. Most professionals use multiple-jet or wide steam heads to cover more surface area with each pass of the steam head, and will usually wrap the head in a small towel to intensify the heat. Triangular and rectangular heads are very common. Smaller steam heads and those equipped with brushes should generally be avoided as the steam pressure and bristles may inadvertently dislodge bed bugs from the surface material onto the floor. However, these may be appropriate when the area is too small for a larger head to adequately clean.

Steam treatment speed will vary; however, general recommendations are to pass the steam head across the surface at the rate of 1 foot (30 cm) every 10 to 15 seconds. It is also important to test the steam cleaner's impact on small section of material to check for possible damage before steaming the entire surface.

[Back to top](#)

Pesticide Applications

Currently, most non-chemical products and techniques do not quickly or efficiently eliminate established bed bug populations. In many cases, the judicious application of a pesticide by a certified pest control professional is necessary. However, bed bugs have developed an extraordinary resistance to most classes of pesticides. This means that a chemical only approach is insufficient. The best programs combine targeted pesticide applications with nonchemical treatment options.

Any pesticide used should be labeled specifically for bed bug control and, where necessary for use on belongings such as mattresses and furniture. Many over-the-counter aerosol products are not labeled for bed bug control, and should not be used only on belongings or surfaces as specifically stated on the pesticide label. It is in everyone's best interest to apply pesticides according to the label. Misapplication is a violation of the law, and can lead to unnecessary exposure that can threaten the health and safety of occupants, or regulatory fines and lawsuits.

Residual applications (long lasting pesticides)

Precise placement of a suitably labeled, registered and formulated residual chemical insecticide is still a practical bed bug control. Effective insecticide treatments consist of applying interior sprays or dusts to surfaces that bed bugs contact, as well as and to cracks and crevices where they rest and hide. Before using any residual insecticides, care must be taken to select the least-toxic active ingredient and formulation.

Retreatment, when needed, should be carried out after the shortest interval permitted by the label until bed bugs are eliminated. The choice of chemical products and specific application techniques can depend on many factors, including the physical location, product label, the immediate environment, the presence of sensitive populations in the building (including children, elderly and health-compromised individuals) and local, state or national laws.

Crack-and-crevice applications

Because of their habit of hiding clustered together in cracks and narrow hiding spaces, precisely applied crack-and-crevice treatments are among the most effective control techniques against bed bugs.

Active ingredients change over time. There are several products, including those containing multiple ingredients labeled for use against bed bugs. Various formulations and devices are also available for applying insecticides to bed bug-infested areas. For example, dust formulations should be used in electrical outlet boxes and in other

places where it is desirable to employ lowrisk (low volatility and toxicity), long-lasting insecticides.

Insect Growth Regulators

Insect growth regulators (IGRs) have virtually no effect on vertebrate metabolism because of their mode of action and low application rates, when applied properly, but they are very effective against bed bugs, impeding their development and fertility.

Space sprays (ULV, aerosols, and foggers)

Insecticides currently labeled for ULV, aerosols and foggers have little or no residual effects on bed bugs. Most will seldom penetrate into bed bug hiding spaces, and seldom effective at killing bed bugs, even with prolonged or repeated exposure to such products.

Fumigation

While fumigation of furniture, clothing, or other personal items can kill all bed bug stages present, it will not prevent reinfestation immediately after the fumigant dissipate, and is seldom necessary, practical or affordable.

[Back to top](#)

Follow-up

At least one follow-up inspection of infested sites should be conducted at a suitable interval (e.g., 10-21 days) after each control effort or treatment in order to detect any of the typical signs of continued infestation, such as live bugs, cast skins (after those present earlier had been removed), fecal spots on bed linens or harborages, and unhatched eggs.