Most of you have already noticed that bed bugs have been showing up all over the place. Homes, hotels, EMS stations, hospitals, schools, assisted living facilities, clothing stores, and the list goes on! With bed bugs on the rise, you need to be prepared if your company is going to offer bed bug control and have any success with it.

**Biology and habits.** First of all, you've got to know bed bug biology and behavior, not only so you can better manage them, but so you can also educate your customers about them. Bed bug adults are reddish-brown, oval, flattened insects about \(\frac{3}{16}\)" long and up \(\frac{1}{8}\)" wide. Engorged (blood-fed) adults are swollen and dull red in color. Though wingless, adult bed bugs do have small wing pads. The eyes are deeply pigmented and the sides of the collar-like pronotum curve slightly around the head (see picture at left). The nymphs (immatures) resemble the adult though they are smaller in size. Newly hatched nymphs are almost colorless whereas engorged nymphs are reddish and swollen. Bed bug eggs are white, oval, and about 1 mm long.

Bed bugs can feed and breed year round under favorable conditions. They typically hide during the day in mattresses, box springs, furniture, and/or cracks and crevices. Under favorable conditions, each female lays 200 to 500 eggs! Eggs and the eggshells are found, singly or in clusters, in or near the crevices bed bugs are hiding. At temperatures above 70°F, eggs hatch in about 10 days. At lower temperatures, hatching may take as long as 28 days. Newly hatched bugs feed at the first opportunity. They molt five times before reaching maturity and require at least one blood meal between each molt. Most nymphs usually develop into adults within 2 to 6 weeks.

Indoors, three or four annual generations may be produced and you will find all stages of bed bugs in established infestations. Immature stages can survive more than two months without feeding.
Bed bug adults can survive up to a year or more without feeding, which means that infestations may continue to survive even if a house is left vacant for several months.

Bed bugs cannot fly or jump and do not normally crawl long distances. Their primary means of dispersal is through human activity, i.e., people moving them from one place to another in or on luggage, laundry, furniture, etc.

So how do you go about eliminating bed bugs? First thing is to confirm that your customer actually has bed bugs. On occasion we have had bat bugs and swallow bugs which are difficult to distinguish without a microscope or high magnification lens. Bed bugs may also be confused with other insect pests, such as carpet beetle larvae or cockroach nymphs. If you need help identifying a pest, please visit [http://www.cals.ncsu.edu/plantpath/extension/clinic/Submit/submit.htm](http://www.cals.ncsu.edu/plantpath/extension/clinic/Submit/submit.htm).

Inspecting for bed bugs. Next, locate all bed bug hiding places:

- **Furniture, particularly bedroom furniture, must be inspected carefully.** When possible, dismantle the bed for easier inspection and possible treatment. Inspect the mattress and box spring thoroughly. Be sure to check the holes or slots where head and foot boards attach.
- **Check under and behind other pieces of furniture, such as chairs, couches, dressers, night stands, etc.**
- **Pull out dressers drawers, inspect them carefully and check the interior of the dresser before reinserting the drawers.**
- **Check the undersides of lamps, clocks, radio, phones, and other objects that might be on night stands.**
- **Pull back the dust covers on the undersides of chairs and couches and check particularly around the legs and frame.**
- **Remove and inspect objects such as pictures, mirrors, curtains, etc., that are hung or mounted on walls.**
- **Check obvious cracks and crevices along baseboards.**
- **Remove the covers on electrical outlets and switch plates and inspect the boxes for signs of bed bugs.**
- **Inspect torn or loose wallpaper and decorative borders.**

After locating all bed bug hiding places, the next step is to treat all known and suspected bed bug hiding places. Before treating for bed bugs, you need to communicate with your customer about preparing their home for the treatment. It’s a good idea to have a checklist customers can follow to ensure their home is prepared. A sample checklist can be at [http://insects.ncsu.edu/bedbugs](http://insects.ncsu.edu/bedbugs).
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Prajotring yourself during an inspection. You should take great care to ensure you don’t spread bed bugs during or after your inspection. Follow these precautions when inspecting for bed bugs:

• Avoid laying across, leaning against, or sitting on potentially infested beds or furniture.

• Inspect mattresses and box springs slowly and carefully to avoid sudden motions. Bed bugs are more likely to be dispersed if an infested mattress or box spring is abruptly “flung” around.

• If possible, have equipment (spray equipment, steamers, vacuums) dedicated for use only with bed bugs. Store this equipment in tight storage containers within service vehicle.

• When inspecting and/or treating for bed bugs, keep equipment in an open area away from walls and furniture.

• Remove vacuum bags and double bag tightly before disposal.

• Check your equipment carefully and destroy any bed bugs before leaving.

• Take off your clothes as soon as you get home. Remove your clothing over an uncarpeted area so that you can see any bugs that may have been on your clothes.

• If you think bed bugs may be in your clothing, you can place it in the dryer on the highest setting for 45 minutes.

Chemical control options. In most cases residual insecticides are needed. Such applications are best done as a "crack and crevice" treatments to gaps around baseboards and other such items.

Insecticidal dust formulations such as diatomaceous earth, silica gel, and more conventional dust insecticides provide long residual and are safe to use around electrical circuits. Dusts are best used inside voids such as those in walls, furniture legs, behind electrical receptacles and switch plates, and under carpet edges.

Liquid sprays using a fan spray may be applied to flat surfaces, such as carpet edges, wall/floor intersections, and baseboards. Liquid sprays can be extremely useful when applied with a crack and crevice tool into openings bed bugs hide. Pressurized aerosols with extension nozzles may also be used to treat cracks and crevices.

Some products are designed specifically to kill bed bugs on contact. Most of these contact sprays contain alcohol and a short-lived pyrethroid. Just remember that while these products will kill any bed bugs it contacts, they have little to no residual activity.

Pesticide applications to furniture, particularly mattresses, should be limited. Avoid spraying entire surfaces of mattresses and furniture and limit treatment to seams, tufts, and folds. If possible, place treated mattresses and box springs inside mattress encasements that prevent bed bugs from escaping the treatment and also keep other bed bugs from re-infesting the items. When treating mattresses, box springs, and furniture for bed bugs make sure you use only products that are labeled for application to these items.
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DDVP strips are used by some pest control companies to kill bed bugs in televisions, stereos, telephones, clocks, appliances, and other items that are difficult or otherwise impossible to treat. The items are sealed inside one or more heavy gauge plastic bag along with a DDVP strip and then placed in a garage, attic or basement for a period of days or weeks. DDVP strips are highly volatile and most labeling restricts their use to unoccupied areas such as garages, attics, crawlspace, and sheds that are occupied for less than 4 hours a day, and inside closed areas such as garbage bins and closets. Always check the label before use.

The EPA has developed a website that can help you choose an EPA-registered bed bug product that meets your needs. The site can be found at http://cfpub.epa.gov/oppref/bedbug/.

**Nonchemical control methods.** When treating for bed bugs, you will most likely need to use some sort of nonchemical control method along with pesticide applications.

**Mattress Encasements:** Mattress and box spring encasements can be used to create a bed bug barrier. Properly designed encasements completely cover and seal the mattress and box spring, trapping the bugs inside. In addition, once covered, other bed bugs cannot get into the mattress or box spring. If you’re going to sell encasements to your customers, choose one specifically designed to protect against bed bugs. This will ensure that the encasement is both bed bug “bite proof” and “escape proof.”

**Steam Treatment:** Steam treatment combined with insecticide treatment may provide better control than insecticides alone. Applied properly, steam will kill all stages of bed bugs. If you choose to use steam as part of your bed bug treatment plan, make sure you use a steam machine suitable for bed bug control. Use a machine that has a large tank, variable steam output, and a selection of attachments and brushes.
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You'll also want a machine that can produce low vapor rates. These machines, sometimes called dry-steam units, reduce the risk of water damage and mold growth as a result of the steam. Just remember that steam provides no residual activity.

Steam treatment will kill bed bugs any site that the steam can reach. The two limitations are (1) potential heat or moisture damage to treated items, and (2) the labor and time it takes to apply steam effectively.

**Dry Heat Treatment:** Dry heat can be used to treat an entire structure, a portion of the structure, or a commodity, such as a bed or other piece of furniture.

Heat is generated using a propane heater, natural gas, or electricity to force hot air into the structure through flexible ducts. Fans are used to ensure uniform temperatures. The entire area to be treated must be sealed and heated for several hours to >120°F. Heat treatments are not simply a matter of raising the temperature. The heated air must permeate all areas of the room/house in order to kill bed bugs that are hiding.

One potential problem with heat treatments is that pockets of bed bugs or eggs may survive in thermally protected areas. Such areas might include piles of clothing or bedding, or other areas that heat does not reach the necessary temperature. Even if heat treatments are not 100% effective, they will most certainly be effective enough to reduce bed bug populations to very low levels that can be more readily addressed with other methods.

**Canine Scent Detection:** A well-trained bed bug detection dog should be able to identify very small numbers of live bed bugs.

You may consider contracting for canine scent detection services in situations that would require a lot of time for a technician to inspect, such as the rooms in hotels, college dorms, group homes, and shelters.
Since the efficiency of dogs is much greater than humans, a typical inspection of a hotel room may only take a dog 2-3 minutes compared to 15 minutes or more of an equivalent inspection by a skilled technician. A visual inspection is still necessary in any areas the dog alerted.

Before contracting with a canine scent detection service, be sure to evaluate the training of the dog and the reputation of the trainer. Canine scent detection dogs must be trained daily. The dog’s handler must also be trained so they understand how to interpret the dog. Are reliability claims backed by evidence? Accuracy claims should be based on field results from actual inspections.

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**BED BUG RESOURCES:**

- NCSU Bed Bug Fact Sheets: [http://insects.ncsu.edu/bedbugs](http://insects.ncsu.edu/bedbugs)
- EPA's Bed Bug Information: [www.epa.gov/pesticides/bedbugs](http://www.epa.gov/pesticides/bedbugs)
- Centers for Disease Control and Prevention - Bed Bug Information: [http://www.cdc.gov/nceh/ehs/Topics/bedbugs.htm](http://www.cdc.gov/nceh/ehs/Topics/bedbugs.htm)
- Cornell University IPM Website: [http://www.nysipm.cornell.edu/whats_bugging_you/bed_bugs/](http://www.nysipm.cornell.edu/whats_bugging_you/bed_bugs/)