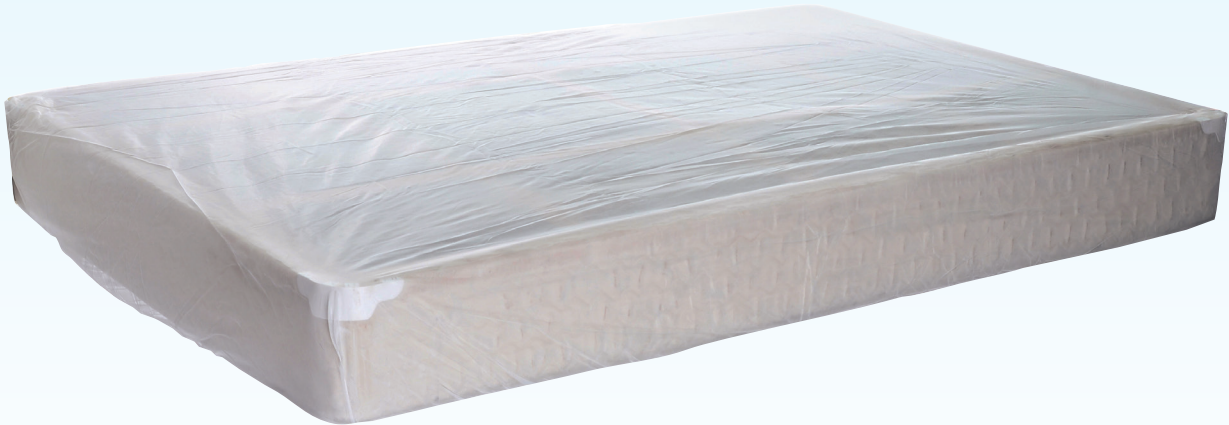


ActiveGuard® Mattress Liners for Bed Bug Control in a Large Metropolitan Hotel

Use of ActiveGuard® Mattress Liners as Part of a Comprehensive Pest Management Bed Bug Control Strategy Saves Large Metropolitan Hotel in Excess of \$500,000 per Annum.



An ActiveGuard® Mattress Liner installed on a box spring in the inverted position. Note the main panel of the liner covers the void on the underside of the box spring and will face the floor once placed into the frame.



The hospitality industry has been at the forefront of dealing with bed bugs ever since they made their comeback as an urban pest of major significance in the early 2000's. Hotels are perfect repositories for bed bugs: they welcome new travelers every night, each with the potential to bring bed bugs into the facility; provide ample food sources for bed bugs (the guests residing in their beds); and an abundance of harborage in the form of bedding where bed bugs can hide while remaining close to their food source. In turn, these same bed bugs can then hitchhike with departing guests to new housing locations, infest public transportation, and often be introduced into the homes of hotel staff. The complex nature of hotel environments — when combined with the cryptic behavior of these pests and a hotel staff that is often ill-prepared to handle bed bug incidents — provide ample opportunities for hotel guests to experience bed bugs during their stay. Frequently, these guests will turn to social media reporting agencies to make public their bed bug encounter to the detriment of a hotel's reputation, resulting in a significant negative impact on revenues.

It is no wonder that hotels are constantly seeking technology that

CASE STUDY

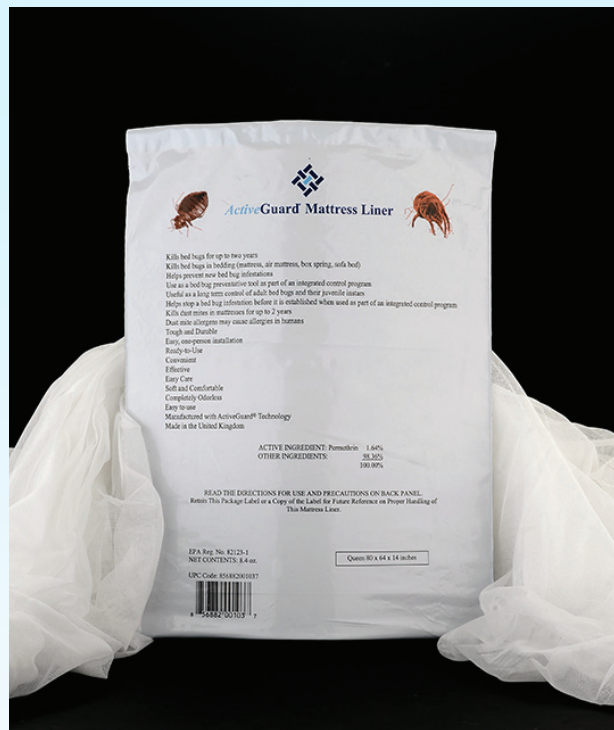
can assist them in their battle to control and optimally prevent this pest. One hotel, the subject of this article, became aware of *ActiveGuard*[®] Mattress Liners, and this is their story.

- The subject hotel is located in the southern United States and is heavily dependent on convention business.
- The facility has 1,600 rooms and approximately 3,000 beds.
- The hotel had a persistent bed bug problem. The typical reported incident rate¹ was two per week, spread consistently over a typical year.
- In year one (2013), the hotel used an in-house certified pest management professional to chemically treat rooms when an infestation occurred; in year two (2014), an outside commercial firm was employed.
- In accordance with good pest management practices, for each infestation the hotel would treat the infested room, the two adjacent rooms and each of the rooms above and below the infested room.
- Initial limited installation of *ActiveGuard*[®] on box springs in 45 rooms demonstrated prevention against bed bug infestations for two years (2010-2012).
- Subsequent hotel-wide installation of *ActiveGuard*[®] continues to prevent bed bugs from becoming established in over 1,600 rooms.
- \$500,000+ cost savings per annum resulting from the installation of *ActiveGuard*[®] Mattress Liners in the form of reduced pest control costs and maintenance of hotel rental revenue.

In September 2010, the hotel installed *ActiveGuard*[®] Mattress Liners on box springs to confirm their bed bug protective activity in 45 rooms on a single floor. This limited installation was designed to test the effectiveness of *ActiveGuard*[®] as a standalone preventive tool. The floor chosen was one that traditionally had a high frequency of reported incidents transitioning into infestations (5-6 per year). An infestation is defined as simultaneous detection of multiple bed bug life forms (e.g., eggs, juvenile instars and adults).

In the two-year period following the initial installation,

¹ Reported incident rate is defined as the number of bed bug occurrences (live or dead) reported by guests, housekeeping or other staff.



ActiveGuard[®] Mattress Liner product package labeling without any cautionary or hazardous warning statements, consistent with a Category IV product.

there were no reported bed bug incidents on either mattresses or box springs of these *ActiveGuard*[®]-protected rooms. Furthermore, no infestations were reported in any protected room whatsoever. Based on the average historical rate of infestations at the hotel, the number of expected infestations in these rooms over a two-year period would have been nine. As these were rooms with a history of infestations, the actual expected rate was probably higher. There were no changes to the pest management practices other than the installation of *ActiveGuard*[®].

In December 2012, encouraged by the success of the initial program, the hotel installed *ActiveGuard*[®] Mattress Liners hotel-wide; an installation in excess of 3,000 liners on box springs (except for rollaway and Murphy beds). Furthermore, the hotel has discontinued the use of mattress encasements due to their ineffectiveness in preventing infestations and propensity for ripping on box springs.

Through December 2013, there were six (6) reported bed bug incidents, none of which presented as an infestation. Of the six incidents, four (4) involved bed bugs

found dead on/underneath the *ActiveGuard*® liner or on the floor just alongside the bed. In one instance, 2-3 bed bugs were found on the headboard; the other instance involved 2-3 bed bugs found within the dust ruffle surrounding the box spring. These rooms were placed on increased vigilance status but in no instance was treatment required. This represents approximately a 94% reduction in reported incident frequency with a surprising 100% decrease in bed bug infestations requiring treatment.

From January 2014 through December 2014, inclusive, there were nine (9) additional bed bug incidents reported. Of these nine incidents, six (6) found bed bugs on the box spring and or the dust ruffle, in proximity and/or in contact with the installed *ActiveGuard*® liner. The number of bed bugs found ranged from 1-8, none of which presented as an infestation. The remaining three (3) incidents involved bed bugs directly on the liner installed on the box spring, once again, none being classified as an infestation. Given the engagement of an outside pest control firm 2014, and their zero tolerance policy for treatment when a single live bed bug is detected, all incidents, regardless of number were treated. For 2014, based against historical frequency of incidents, *ActiveGuard*® reduced the reported incident frequency by 91% throughout the second year since installation.

A two-year composite of data indicates that *ActiveGuard*® Mattress Liners installed as the centerpiece of a preventive program resulted in:

- 100% reduction in infestations
- 92.5% reduction in reported incident frequency
- Reduction in over 180+ treatments over two years (based on a zero tolerance treatment strategy enacted for year two)
- Immeasurable savings by preservation of brand reputation

Cost analysis

The financial return on the use of *ActiveGuard*® Mattress Liners as an integral part of a bed bug control program will vary by facility based on historic levels of infestation, occupancy levels, room rates, use of mattress encasements and the cost of pest management services. The following simplified analysis is based on discussion with the subject hotel and industry knowledge as to the typical costs associated with pest control services:

Assumptions

Room revenue per diem	\$200
Number of rooms in facility	1,600
Average number of beds per room	2
Number of infestations per year	100
Number of rooms removed from service per infestation	5
Number of days of lost revenue per infestation	7
Cost for pest management services per infestation	\$1,000
Cost of <i>ActiveGuard</i> ® per room (2 liners at an annual cost pro-rated over two-year life of product)	\$80

Illustration based on 3,000 *ActiveGuard*® Mattress Liners installed

Lost revenue (at 80% occupancy)	
per annum due to infestations	\$560,000
Pest management costs	<u>\$100,000</u>
Total cost per annum	\$660,000
Cost of <i>ActiveGuard</i> ® per year	
amortized over two years	<u>\$128,000</u>
Savings per annum	\$532,000

This simplified financial analysis makes a compelling case for utilizing *ActiveGuard*® as part of any bed bug control program. There are numerous other factors that should be considered:

- *ActiveGuard*® Mattress Liners can be used in place of mattress or box spring encasements. *ActiveGuard*® Mattress Liners are far more effective in prevention and control of bed bug infestations, and easier to install and maintain. If a facility currently uses encasements, the switch to *ActiveGuard*® should have a very small incremental cost.
- There are significant reputational benefits (see Potter et. al, 2015; <http://www.sciencedaily.com/releases/2015/07/150714101145.htm>) to proactively deal with bed bug infestations, which are not reflected in this analysis.
- There are additional costs associated with compensating customers who complain about a bed bug-infested room, which are not reflected in this analysis.
- There are potential reductions in litigation expense and subsequent awards to plaintiffs complaining about bed bug incidents, which are not reflected in this analysis.
- Employees and customers benefit from a bed bug-free environment.

CASE STUDY

ActiveGuard® Mattress Liners are a revolutionary mattress and box spring product that kill bed bugs and dust mites generally within 72 hours. *ActiveGuard*'s® formulation represents a unique and proprietary delivery system that offers sustained bioavailability of permethrin for two years. New research supports that after a short exposure to *ActiveGuard*® of only 10 minutes, bed bugs — regardless of their level of resistance — begin to show significant reductions in feeding (biting) and a dramatic inability to lay eggs. Real-world consequences of this data include discontinuation of population growth, thereby halting progression of an incident to an infestation! Used as a complement to any present treatment program and as the centerpiece of a preventative program, *ActiveGuard*® is the only EPA-registered pro-active tool labeled to provide control and prevention for up to two years. These liners' ability to keep on killing bed bugs provides for continual protection against any adult bed bugs, nymphs or eggs missed during initial treatment or any bed bugs re-introduced after treatment has been concluded.

These liners also kill dust mites when installed on a mattress surface, providing a hypoallergenic environment for guests to sleep. Fashioned and installed simply and as quickly as a fitted sheet, *ActiveGuard*® has no cautionary signal words or use restrictions on its label. Only four sizes



Jim Ballard, Ph.D., BCE is the owner of Ballard Pest Management Consulting LLC, located in Medford, N.J. He has been providing technical assistance in the commercialization of ActiveGuard® Mattress Liners since 2008. He has no equity position in the sale of this product.

(Single/Twin, Double/Full, Queen and King) fit almost every available mattress or box spring, and accommodate up to XL in length and 17" in depth. *ActiveGuard*® will continue to work 24/7 even if ripped or torn; a decided advantage especially when installed on a box spring. *ActiveGuard*® is covered under U.S. Patents 5,916,580, 6,214,365, 6,440,438 and pending patents.

HOT OFF THE PRESS

Disturbed!; PCT Magazine, 24 Nov. 2015. J. Penn, W. Hu, and M.F. Potter. University of Kentucky

This article is centered upon a survey of leisure and business travelers, their attitudes toward bed bugs and the influence these bugs have on choice of hotel. Any sign of bed bugs in a hotel room resulted in the most extreme response with 60% of respondents indicating that they would switch hotels and request a refund. Business travelers indicated that they were likely (50%) to post their bed bug experiences online for public review and comment. A little more than half of all travelers would not select a hotel with an online history of bed bug reports. Given the frequent usage of online bed bug postings as a guide in

deciding which hotel to book a room, over 20% of all respondents believe that to avoid bed bugs, they would choose those hotels that implement protective services. While there was a mixed response as to whether a traveler 'wanted to know' that protective services were in place, overall, 70% of all respondents want to stay in those hotels practicing prevention. Eighty percent of all respondents agreed that disclosure of previous bed bug history for any given room was the 'duty' of the hotelier.

While this is an ongoing 'right-to-know' issue for apartment and other multi-occupant residents in many cities, implementation of this disclosure

requirement by hotels would be quite onerous in practice. Consider the lengthy negative impression a single bed bug online posting has on the decision-making process of potential guests, despite the hotel undergoing effective remediation, and the subsequent reduction in revenues for that hotel.

The hospitality industry is clearly in the middle of a difficult problem in dealing with bed bugs. While stopping the introduction of bed bugs is not possible, preventing its development into an infestation is achievable through implementation of proactive preventive measures and continued vigilance.

Allergy Technologies
124 S Maple St., Suite 100
Ambler, PA 19002
(215) 654-0880
allergytechnologies.com



ActiveGuard®
Mattress Liners for Use Against Bed Bugs & Dust Mites