European Code of Practice

Bed Bug Management

Oliver Madge

www.bedbugfoundation.org

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Bed Bugs are a growing problem across the globe. Infestations have been reported in hotels and peoples homes, but lately around the world, Bed Bugs have come to have a wider social impact occurring in hospitals, doctors' waiting rooms, cinemas and on public transport. Between 1999 and 2006, Australia saw an extraordinary 4,500 per cent increase in the number of new infestations. The United States has seen a huge rise in litigation linked to the problem and most cases are settled out of court as the accommodation provider rarely has a proper strategy to deal with Bed Bugs.

The development of this European Code of Practice (ECoP) is aimed at protection. Protection for those who provide Bed Bug control services. Protection for the customer who wants effective eradication and protection for businesses who want to defend their reputation and prevent negative media coverage.

Stephen Doggett - Department of Medical Entomology, Australia

Bed Bug control is becoming a specialist sector in the Pest Management Industry. The financial impact of getting it wrong has persuaded many commercial customers to reconsider how they deal with the problem. They are beginning to accept that a high level of expertise is needed to carry out eradication, while complying with restrictions involved in the use of insecticides.

Homeowners rarely make a plan to deal with Bed Bugs, so it can be very stressful when they suffer an infestation and have to find professional help at short notice. It can leave them feeling vulnerable and exposed as they have little idea of what they should be purchasing.

The European Code of Practice (ECoP) has been drawn up with both the pest industry and the customer in mind and provides an umbrella guide to managing Bed Bug infestation. It provides an overview for the management of Bed Bugs and will allow more bespoke documents to be created for residential and commercial customers, regarding the services they require according to their property and risks. It further provides a benchmark for professional service providers to help them deliver an effective Bed Bug Management Strategy.

Oliver Madge - Bed Bug Foundation

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Preface

The European Code of Practice (ECoP) is based on the 3rd edition of the Australian 'Code of Practice for the Control of Bed Bug Infestations in Australia' (www.bedbug.org.au). The trustees of the Bed Bug Foundation would like to express their sincere thanks and appreciation to Stephen Doggett and the Australian Environmental Pest Management Association for their vision and thoughtfulness in allowing their document to be shared. Bed Bugs are a global problem and we need to ensure that global standards are created, based upon shared and similar points of view towards eradication and best practice.

The ECoP will be reviewed periodically to ensure it incorporates the most recent advances in research and management technology in the control of Bed Bugs. Draft versions are made available for public comment and feedback is sought from various groups. This includes Pest Management Professionals (PMPs), national associations, pesticide manufacturers and distributors, the accommodation industry and their furniture suppliers, environmental health officers and other public health workers along with researchers in tertiary institutions.

Any version encompassing major changes are made available for consultation. Minor changes are undertaken at the discretion of the Senate Working Party. All subsequent changes to the ECoP will be documented and made available on the Bed Bug Foundation website:

www.bedbugfoundation.org/ecop

The Aims of the European Code of Practice (ECoP)

The ECoP aims to provide a best practice reference document for anyone directly impacted or at risk from a Bed Bug infestation and those involved with the control and management of Bed Bugs. This includes individuals, organisations, industries, government departments in the position of enforcing compliance, and those people who are in a position where they could inadvertently spread Bed Bugs.

Education is the key to long-term Bed Bug management and eradication. The Code will provide a structure and best practice for standards, education material and qualifications to be developed.

Among the many people and groups who will find this guide invaluable are pest service staff, the accommodation industry, housekeeping staff, linen contractors, tourism operators, environmental health officers, charter boat/cruise line operators, staff accommodation managers, housing organisations, landlords, property managers, transport operators, second-hand furniture sellers and government departments.

The ECoP will include the most effective measures currently known, as part of Integrated Pest Management (IPM), which may be employed to:

- Control active infestations,
- Minimise the risk of future infestations,
- Minimise the spread of active infestations,
- Protect vulnerable parties who provide or purchase Bed Bug services or use Bed Bug products,
- Provide a reference document on which other, more focused, documents can be based.

These measures will include the key components towards due diligence:

- Inspection and surveillance practices,
- Monitoring techniques,
- Management techniques & strategies,
- Hygiene practices,
- Recording-keeping and review policies.

Awareness

Fundamental Principles of Bed Bug Management

Bed Bugs are an international problem and infestations can only be reduced if similar best practice management options are undertaken globally. Bed Bugs have had a broad social impact, with infestations experienced by increasingly disparate groups. For example, infestations have been reported in hospitals, airport waiting lounges, public transport routes, cinemas, retail outlets and second-hand furniture shops, as well as the more traditional bedroom environment. This redefines this pest as not just a nuisance pest, but an exposure pest.

The highest-risk groups comprises those who frequent hotels regularly, either on business trips or on holiday, and those living in multi-occupancy residential developments.

In the United States, the growth in litigation has become of increasing concern. Most cases tend to be settled out of court as the accommodation facility usually does not have a strategy or policy to demonstrate due diligence towards Bed Bug management.

The impact on human health has been determined; however, the impact on the economy and indirect human health has yet to be established. Factors such as social stigma and sleep deprivation can all contribute to depression, anxiety and also increased stress – a recognised health problem by the World Health Organisation (WHO). The cost on business is difficult to calculate, where staff members do not attend work due to social stigma or even because of the physical bite marks from Bed Bugs, but these costs need to be included in the true economic impact of Bed Bugs.

For practical reasons it is not always possible to prevent Bed Bugs from entering premises. They are easy to transport: on humans, luggage, laundry or furniture. There may also be a period of time between introduction of the initial infestation and recognition of the signs.

The ultimate key to reducing the impact of Bed Bugs is to ‘detect early and act quickly’. No one method of prevention, monitoring or control should be relied on; there is no ‘silver bullet’ for Bed Bug control. Rather a multidisciplinary approach undertaken as part of an Integrated Pest Management (IPM) programme should be employed. Professional assistance should be obtained in advance before constructing a control policy in a commercial situation.

The Risks Associated with Bed Bugs

Brand protection

With recent media interest in Bed Bugs, brand damage is occurring to commercial organisations as a result of Bed Bug infestations. Smart phones now allow those bitten to take pictures and email them to the media or social networking websites, allowing disgruntled guests to 'share their experience', even if they don't know what a Bed Bug truly is. It is possible that person may not have to leave the infested room in order to post the notice, potentially even posting it, before raising the matter with management.

However this information reaches the public domain, it is the brand of the accommodation provider that will suffer as a result. The need to proactively prevent and monitor Bed Bug infestations has never been more commercially important for tourism and its associated revenue.

It has been found that many in the hospitality industry will often contract the cheapest pest control services, even if they have little or no experience in Bed Bugs control. Often the responsibility for managing these situations is also delegate to someone with little experience in contract or service management and, very often, without any direct pest management experience. Poor pest control, by untrained operators often leads to the spreading of the infestation and poor management is now seen as one of the main contributing factors to the resurgence of Bed Bugs.

This is a very risky situation as brand damage through the media, using customers to detect if Bed Bugs are active, and lost revenue due to room (or possibly multiple rooms) closure, far outweigh the real cost of employing a pest management professional.

Due diligence

To assist in reducing the damage against negative media impact and to provide a defence against any potential litigation, due diligence is a very important part of any pest management programme.

Due diligence is the ability to justify, beyond reasonable doubt, that all options, within reasonable time and financial boundaries, were considered and assessed to minimise the risk of Bed Bug infestations occurring or ensuring its eradication.

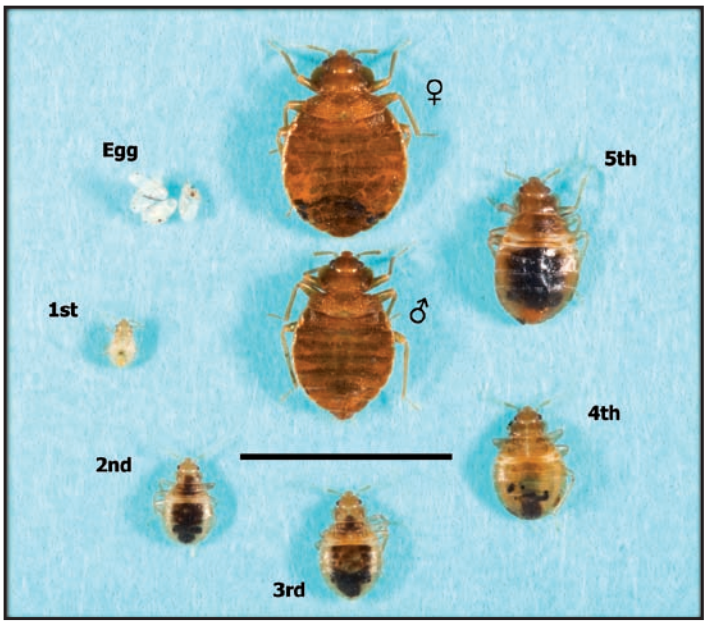
Customer cooperation

If a customer does not consider that Bed Bug control is a cooperative venture between themselves and the PMP, then the possibility of failure increases. The PMP must communicate with the customer and inform them of their activities, this should be both verbally and via the Bed Bug Management Strategy.

Appearance

Bed Bugs (*Cimex sp.*) are insects that are wingless and flat-backed. Adult Bed Bugs are a reddish brown, 5–6 mm when unfed to almost 10 mm when fully blood engorged. An unfed adult is approximately the same shape and size as an apple seed, with legs.

They cannot fly, but they can walk extremely quickly. They are able to cling tightly to surfaces, often upside down, but have difficulty walking over very smooth surfaces.



The various life cycles of the common Bed Bug. The number represents the different instar stage Bar = 5mm.
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The development time (in days) to hatching at various temperatures for Bed Bug eggs is:

Temperature (°C)					
Species	18	22	27	30	33
Common Bed Bug *(Cimex lectularius)*	20.9	12.1	5.3	4.4	4.1
Tropical Bed Bug *(Cimex hemipterus)*	25	13.2	5.9	4.6	4

Bites

There can be a delay in a physical reaction to a Bed Bug bite, even up to 9–14 days, and this can cause confusion as to the origin of the bite. For more information on the clinical consequences of a Bed Bug bite, see Doggett and Russell (2009).

If the traveller has stayed in many places during this period, it may be difficult to determine where the bite took place.

A Bed Bug feeding - notice the swelling body.
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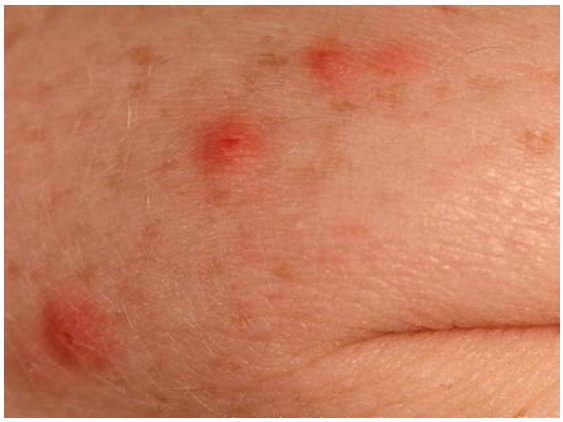
Is it a Bed Bug?

It is important to realise that if someone is bitten by an unknown pest, without identification, it may not necessarily be from a Bed Bug. Other common biting insects include ticks, mites, mosquitoes, midges, head lice and fleas.



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Bite-like reactions can also be caused by other factors that have nothing to do with insects, including environmental factors (fibres, dust or low humidity producing 'cable bug', which is caused by static electricity), medical conditions (skin and other infectious diseases; hormone changes, adverse reactions to medications or side effects of medications and/or addictive drugs), and power of suggestion (if one person starts itching in a workplace, then others often follow).

With the recent focus on Bed Bugs in the media, many people mistake other insects, such as juvenile cockroaches, for them.

It is important that the insect is properly identified by an appropriately competent person, before any treatments are carried out.

Signs that Bed Bugs are, or have been present

Indications of a Bed Bug infestation include:

- Live or dead Bed Bugs and cast-off Bed Bug skins. Live Bed Bugs will confirm that the infestation is currently active.
- Faecal traces.
  This is digested blood defecated by the Bed Bugs. It may be seen first on the sheets, but will often be spotted along the mattress seams and other places where Bed Bugs hide. (Note that the faeces of cockroaches appear similar; however, Bed Bug blood spotting tends to occur in groups.) It is most obviously noticed as small black spots.

- Eggs (cream in colour with a slight bend, approx. 1 mm). These tend to be laid in crevices in dark areas. They are notoriously difficult to identify, but are key to recognising potential harbourage points, prior to a treatment process.
- Smell.
  A Bed Bug smell is sometimes described as 'sickly sweet'. This is usually only noticed in heavy infestations, if close to the Bed Bugs or during the treatment process.
- Blood spotting on sheets.
  In some cases problems can be detected by the presence of fresh human blood spots on sheets. This is not present in all cases but can be a valuable early indicator that there could be Bed Bugs present.

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Where Bed Bugs usually hide

- Beds (especially around the pillow end, where it's dark),
- Headboards,
- Mattresses
- Bedding,
- Carpet edges/skirting boards,
  Numerous eggs and blood spotting are evident.
- Objects close to the bed head including furniture, electrical appliances, plug sockets and pictures.

Also see Inspection of an Active Infestation section.

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Bed Bug Population Dynamics

The dynamics of a Bed Bug infestation can be classified into four broad phases:

I. **Introduction**
II. **Establishment**
III. **Growth**
IV. **Spread**

To reduce the risk of Bed Bug infestations and their spread, an accommodation facility must attempt to undertake prevention policies and monitoring processes for each of these infestation phases. It is recommended that homeowners follow a similar practice. It is important to remember that the example below is a general one and does not define the actual 'path' an infestation follows. For instance, an infestation could be picked up and transported to new premises before it had time to become established and grow in the original location.

I. Introduction: Bed Bugs are very difficult to prevent being transported into a property. Awareness of potentially infested sites can help to reduce their spread. For example, it is important to understand how transfer occurs between infested items of furniture or with luggage/travellers.

II. Establishment: Proactive Bed Bug management must revolve around making a specific environment (e.g. a bedroom) inhospitable to Bed Bugs, should they be introduced. This can include appropriate room construction, maintenance and the use of Bed Bug 'unfriendly' furniture.

III. Growth: An infestation can grow slowly until a point where it explodes and this may take up to six months. Being vigilant and frequently looking for signs of infestation is very important. In the commercial sector, this can include the training of staff in recognising Bed Bugs, proactive monitoring, informing tenants to encourage reporting and ensuring that linen handling and furniture supplier procedures are appropriate, along with proactive pest inspections.

IV. **Spread**: Infested items should be quarantined, with access to infested rooms limited. Control measures should be implemented promptly. Any belongings should be inspected/treated before being relocated and equipment or furniture within an infested room should be bagged before removal.

Bed Bug Management Strategy

A Bed Bug Management Strategy is a bespoke operational understanding between the customer, internal staff and the pest management company. Procedures should contain sets of instructions, policies, reports and responsibilities.

If an infestation is identified, the aim of the strategy is to achieve complete eradication of the infestation, as quickly and as cost-effectively as possible. The strategy will also contribute to reducing the risks associated with Bed Bugs, including possible litigation.

Following an initial site assessment, and ideally before an infestation occurs, the Bed Bug Management Strategy should include:

Risk Management:

- History of Bed Bug activity,
- Findings from the initial assessment,
- Bed Bug 'hiding' places,
- Previous pesticide applications,
- Location/environment of property,
- Risk category,
- A floor plan - this can help identify which adjoining rooms need inspection / monitoring if a Bed Bug infestation occurs.

Operational Policy – (accommodation internal processes):

- On-site responsibilities for proactive and reactive monitoring,
- Selecting a service provider,
- Service specification
- Room inspection/closure process
- Pretreatment and post control
- Control options
- Occupational Health and Safety,
- Training and competencies,
- Room structure and furnishings,
- Financial impact.

Review Processes:

- Complaints,
- Monitoring outcome,
- Escalation framework,
- Records and record-keeping,
- Warranties, limitations and restrictions, and conditions of validity.

The documents need to be treated as a live and evolving set of directions. While conditions on-site may not frequently alter, in connection with this ECoP, technology and equipment within the pest industry is rapidly being developed and enhanced for Bed Bug management. As such, it is advisable to set review dates and periods to ensure that the strategy remains effective, both financially and operationally. Organisations already standards-certified (ISO 9000 or 14000) should consider including a management strategy within their operational processes.

The strategy should be made available to all persons included within the documents. As such, it may be appropriate to keep any financial detail within a separate service agreement, ensuring that financially sensitive data is not available to everyone.

Pest Management Professional (PMP)

Required Conduct

Despite the puzzling nature of Bed Bugs, the professional must realise that the general practice of 'acceptable', in terms of actual control achieved, is not an option and that the primary aim of any treatment must be eradication.

The inspection process should be extremely thorough and may take some time, as all hiding places will need to be identified and control options considered, prior to any treatment taking place. Inadequate preparation often leads to the spreading of the infestation with inevitable escalating control costs to the customer.

Non-chemical solutions should be considered first but integrated with chemical means of control, as well as physical barriers depending on the location of an infestation. All control options must be balanced against the level of and risk from an infestation. A follow-up should be completed to determine the success of the previous treatment.

Continuing Work Based Professional Development Portfolio (CPD): PMPs are encouraged to review developments in industry products and processes to continually remain aware of best practice and effective control methods in an effort to minimise disruption and cost to the customer. Updates and the latest version of the European Code will be available at www.bedbugfoundation.org

Bed Bug control can only be achieved if the customer fully cooperates with the PMP, as and when infestations require a specialist. Cooperation may range from preparing the room for treatment, to possible room closure/vacation and implementing recommendations. If the customer is unwilling to cooperate with the PMP, then successful eradication may not be achieved.

In this case, the customer must accept responsibility for this decision and this fact needs to be explained, possibly documented and preferably signed by the customer.

Education

PMPs who undertake Bed Bug control programmes should be specifically educated and certificated in Bed Bug identification, biology, control options and pesticide management. For example, completion of the Bed Bug Foundation SleepTight programme will ensure that an individual has completed a comprehensive education process in Bed Bug management, including control options.

Due to the difficulty of Bed Bug eradication, under no circumstances should an unqualified person undertake a Bed Bug treatment, without the direct supervision of a certificated PMP who is experienced in Bed Bug management.

This ECoP forms the basis for the PMP regarding Bed Bugs and the ongoing Continuing Professional Development (CPD) criteria for active service providers.

www.bedbugfoundation.org/pmp

The Customer

Required Conduct

The customer cannot solely rely on the PMP for the prevention and control of Bed Bug infestations and must realise that the true cost of Bed Bug control can be expensive, especially in heavy infestations when rooms may be unusable for long periods.

The accommodation provider has a duty of care to undertake risk management, educate staff in Bed Bug management, guarantee that appropriate hygiene measures are implemented and maintained, confirm that rooms are not Bed Bug 'friendly' and ensure that other strategies are implemented to reduce the risk of potential infestations.

Unqualified individuals should not attempt to control an infestation prior to a site assessment by the PMP. Such attempts can potentially spread the infestation, increase the downtime of the premises, present a health and safety risk and lead to an increase in control costs. If any pesticides are applied by incompetent individuals, this may also contravene the product label instructions.

It is not the intention of the ECoP to compromise any control activity on the basis of financial impact. Rather the objective is to provide current 'best practice' for the prevention of infestations, the control of active infestations and their spread, and the management of future potential infestations.

Accommodation Providers

Education

On-site staff are a very valuable commodity when monitoring and inspecting for Bed Bug infestations and should be an integral part of the Bed Bug Management Strategy. Not only are they on site more frequently than the specialist PMP, they interact with guests or tenants and will probably have a better knowledge of the building and operations.

Education policies should cover basic awareness and identification for all staff levels, through to how to manage risk for senior staff/managers. For example, understanding how Bed Bugs can be transferred around a property, by moving either laundry or furniture, can assist in preventing the inadvertent spread of an infestation.

Fact sheets, visual awareness posters and best practice notices should be posted in communal staff areas to serve as a constant reminder to all to be proactive, vigilant and report any possible signs of an infestation.

Groups of staff could include:

- Housekeeping,
- Maintenance,
- Front of House/Site representatives,
- Regional Managers,
- General Managers.

It is important to maintain records of staff training for due diligence purposes.

www.bedbugfoundation.org/accommodation

The Traveller

Bed Bugs are traditionally, and often inadvertently, brought into properties or transferred between accommodation facilities by travellers.

Luggage is the prime means by which Bed Bugs are transferred from one location to the next and consideration should always be given to means of reducing the risk of Bed Bugs infesting the luggage.

Durable luggage without external pockets may be more resilient to Bed Bug invasion than soft bags. However, soft material bags may be laundered in hot water, killing Bed Bugs or their eggs. Check the product label.

To minimise the risk of taking Bed Bugs home or transferring them elsewhere, it is important for the traveller to check their hotel room on arrival for evidence of Bed Bugs. It is strongly recommended that a room is inspected before the owner's luggage is brought in. Alternatively, luggage could be placed in a Bed Bug low risk zone, for example the bath or shower tray.

The edges, seams and beading of the mattress as well as any furniture drawers built into it should be checked for signs of Bed Bugs, particularly in the darker areas, where the bed meets the wall for example.

If there is evidence of Bed Bugs, a new room should be requested.

If the traveller experiences any bite-like reaction or has suspicions of Bed Bugs being present (such as blood spotting on the sheets), it would be best to assume that luggage and clothing is infested and requires decontamination.

On returning home, luggage should be kept isolated from the bedroom (such as in a garage) or sealed in clear plastic bags immediately. All clothing should be hot washed and/or dried on the hot cycle of a clothes dryer. Check the product label.

Luggage can be cleared of Bed Bugs by heating and/or freezing. If there is any possibility an infestation may have been acquired while travelling, a PMP should be consulted.

Clothing should not be unpacked and put into bedroom draws, but kept in the luggage. To reduce the possibility of Bed Bugs entering luggage, these should be kept sealed in large plastic bags, which are disposed off when leaving the premises.

www.bedbugfoundation.org/residential

Publications

All industry publications (be they in pest management, accommodation or housekeeping journals) that make recommendations on Bed Bug control should ideally be produced by recognised Bed Bug professionals.

Any document not acknowledged should be ignored and not incorporated into any management policy. Registration with the Foundation will provide automatic notifications when new publications are available: www.bedbugfoundation.org/publications

International Pest Control (IPC) is a publication partner of the Bed Bug Foundation: www.international-pest-control.com

Selecting a Bed Bug Pest Management Professional (PMP)

Identifying and instructing a pest management (service) company to undertake Bed Bug eradication can be a daunting prospect, especially if an infestation is already active. Bed Bugs are considered by many as the most difficult of all pests to control and, as such, it is advised that control should not be attempted by service providers who have a 'generalist' approach to pest control.

Unfortunately, despite their claims, some pest control operators are not successful in treating these pests. Not only can this cause the infestation to spread, it can also increase the risk of chemical resistance, dramatically increase overall eradication costs and risk brand reputation.

www.bedbugfoundation.org/sleeptight provides a list of suitably competent, CPD-registered PMPs.

Alternative pest controllers are available and the following suggestions can assist in selecting a reliable company:

- No silver bullets for control exist; if the company makes promises of miracles, then caution should be exercised.
- The technician should abide by this European Code of Practice and use this doctrine as their principal guide in inspecting, monitoring and controlling infestations. This should be stated in the Bed Bug Management Strategy.
- Individuals should have a bespoke qualification for Bed Bug Management, obtained from an independent, recognised source.
- Individuals should ideally be registered on a CPD scheme related to Bed Bug Management.
- The service provider should operate in accordance with a Bed Bug Management Strategy. If they fail to recommend a thorough inspection prior to treatment or want to close multiple rooms, destroy furniture without a proper inspection or just spray chemicals to control active infestations, then shop elsewhere.
- The pricing of the job is usually a good indication of likely success. Bed Bug control can be expensive and if the price is too good to be true, then it probably is. Likewise professionals should not recommend one treatment or suggest the comment 'see how you go after that'. Obtaining a fixed quotation for eradication is recommended.
- Bed Bug management is a process of logical steps and needs to be comprehensively delivered. Ask for copies of other treatment process reports (confidential details should be removed). This will provide further reassurance that the service provider has previously completed suitable treatments and has some level of understanding. This can be reviewed by the Bed Bug Foundation if further reassurance is required.
  Email copies to **help@bedbugfoundation.org**
- Enquire as to the warranty terms the company is willing to offer. This can vary, even between pest management companies. However, if a Bed Bug Management Strategy is agreed between the PMP and the customer, warranties should be possible.
- Confirm that the company has current insurance cover and is a member of the representative Trade Association. While these are not part of the treatment process, it does provide an indication of the company's standing.

Customer Confidentiality

In the past, Bed Bugs were largely associated with dirty environments and negative social stigma. While this is no longer the case, the mind-set means the customer may feel embarrassed if an infestation occurs.

Bed Bugs can potentially impact on an accommodation provider's public image and they may lose potential guests if in-house infestations become publicly known. Thus the confidentiality of any Bed Bug infestation must be ensured by all parties.

The infestation should not be discussed in a location where guests may overhear the conversation and preferably only the management or housekeeping staff should be consulted. Treatments in communal areas should be undertaken during times that would be least visible to guests.

Confidentiality of survey and treatment reports is also required within the service company administration systems. A companies duty of care must include confidentiality to all staff members.

Integrated Pest Management (IPM)

The true art of controlling and managing pests is the skill of a professional. The most important aspect is understanding the pests' ecology, their biology, life cycle, behaviour and their population dynamics (as discussed earlier). Second most important, is that it is not just about having an understanding of the various control techniques available, it is knowing when and how to use them in each situation. Having knowledge of when the process needs to move from monitoring to control and back again is equally important. Pest management, like the pest, is not static – it needs to adapt and try to stay one step ahead.

Management is primarily split into three areas – prevention, monitoring and control.

Prevention
The primary aim of pest management is to stop the pest gaining access into a building, food sources, hiding places, high-risk areas or storage. It's a simple point – if pests cannot be present, they cannot cause any concern.

However, it is virtually impossible to stop Bed Bugs getting into buildings.

Monitoring
If it is not possible to prevent an infestation, it is essential that proactive, constant and effective monitoring takes place.
If infestations are detected early, the required control options are reduced, as is the potential for people to be bitten and the associated risks.

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Eradication
There is no one best method of controlling Bed Bugs. It is not simply about using insecticides to eradicate the infestation. Each situation will be different and consideration of the range of options is key with initial treatments and follow-ups.

For example, immediate control should remove the Bed Bugs but the eggs may remain. Few insecticides will penetrate an egg case, so it may be necessary to follow up an initial treatment or use a different long-lasting treatment that eradicates further outbreaks when the eggs hatch.

Conversely, non-chemical techniques such as steam have a benefit in that they will control eggs but they do not have the long-lasting effect of eradicating further outbreaks when they occur. Non-chemical control options are increasingly being considered as attitudes towards the continued use of insecticides changes across Europe.

Occupational Health & Safety

All operating procedures within a management strategy must comply with their relevant country or local occupational health and safety legislation when considering control options, especially for the use of insecticides.

Insecticides (Biocides)

For any insecticide, the label should be read for directions of use, safety instructions and restrictions or requirements for use (for example, some insecticides cannot be applied to mattresses or even Bed Bugs!) The product label is law and the instructions (and dilution/application rates, etc.) need to be followed to the letter. Additional information is available on Material Safety Data Sheets (MSDS), which are available from the manufacturer/distributor websites.

Ideally a PMP should have a bespoke competency with handling pesticide, including identification/ selection, storage, application, PPE and waste disposal.

A Control of Substances Hazardous to Health (CoSHH) assessment will need to be completed during the inspection phase and certainly before the treatment process. This document will need to take into consideration many factors but should at least include:

- whether an insecticide is required at all,
- the property location/environment,
- formulation of proposed insecticide,
- quantities to be applied (in connection with the inspection/treatment area),
- control measures to prevent access by staff or residents into the treatment area,
- emergency contact details.

In the UK, the CoSHH regulation does not support the application of an insecticide to act as a 'just in case' barrier. Unless the risk is sufficiently high, a target pest must be identified in order to justify the application of a pesticide.

On-site Staff or Residents

Access to rooms that have been treated, with a biocide, for the control of Bed Bugs should be prevented for a predetermined period (with your PMP) of time.

Electricity

If power needs to be disconnected in a room (e.g. plugs removed for inspection and insecticide application), on-site/ contractor maintenance staff should perform electrical procedures.

Many insecticides are liquid-based and are unsafe around electricity. A review of the available formulations will allow the most suitable control options to be delivered.

Manual Handling

It is likely that, in the majority of Bed Bug jobs, the PMP will need to move beds and other heavy furnishings to gain access to Bed Bug harbourages. For this reason, it is suggested that maintenance or a second person who has Bed Bug awareness always assists in gaining access to hiding places, in preparation for inspection and treatment.

Prevention

The primary objective in prevention is to make the environment as inhospitable as can be so that, should Bed Bugs be introduced, there are as few opportunities as possible for them to become established. It is impossible to prevent Bed Bug infestations.

Room Construction and Ongoing Maintenance

Locations that provide hiding places are generally referred as 'cracks and crevices' and they are not restricted to the head of a bed.

Gaps in headboards, plug sockets, skirting boards, loose wallpaper, flaking paint, wiring and pipes that penetrate into the walls, bedside alarm clocks or remote controls and even picture frames have all been used as hiding places.

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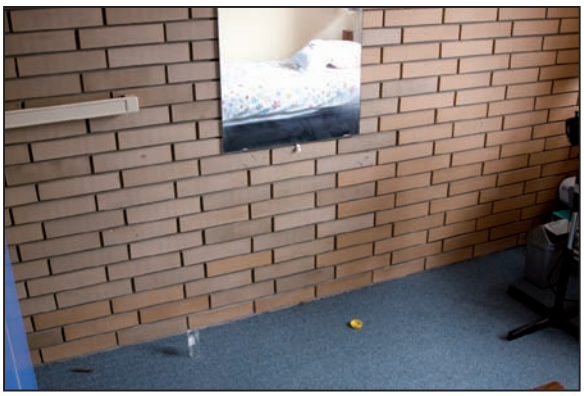
In some cases, access for inspection can be very difficult, such as in electrical ducting (hollow) skirting boards or where carpet has been fixed against the wall to replace skirting boards.

In exposed brick work. Bed Bugs often nest and lay eggs along the mortar, which requires time-consuming treatment of all mortar joints. In false walls, Bed Bugs often get behind the wall and it may be necessary to remove the wall or gain access behind it.



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The main aim of ongoing maintenance for preventing Bed Bugs is the reduction of potential hiding places. Even the smallest of gaps can be inhabited by Bed Bugs and, while it is not easy to 'secure' all of them, the aim must be to try. A simple run of silicon sealant around or over gaps and cracks can be very effective at removing potential hiding places. It is important that the silicon is applied smoothly and evenly so as not to provide potential harbourages.

Bed Design

To be most effective, the bed must be made like an island: isolated in the room. Keeping beds away from the wall (more than a few centimetres) will minimise the risk of Bed Bugs climbing up the wall and onto the bed.

Metal-framed beds can limit the impact of Bed Bugs as they provide fewer hiding places and the Bed Bugs are averse to climbing smooth hard surfaces (unless starved for some time). If the Bed Bugs fall off the bed, they are unlikely to climb back up and will eventually die without a blood meal. This may, however, also contribute to Bed Bugs relocating themselves as they search for alternative food sources.

To be totally effective, valances or bed linen must not touch the floor or walls and curtains must not touch the bed, as such contact will provide access for the Bed Bugs. Ideally the bed frame should be constructed so that the feet of the legs splay out, thereby making it impossible to push the bed against the wall.

Adversely, even if the bed is made completely of metal, fittings such as metal springs provide ample Bed Bug habitat. Metal springs are especially difficult to treat; using an aerosol or steam could result in Bed Bugs being blown out, possibly without being killed.

Extensive Bed Bug faecal spotting is evident.

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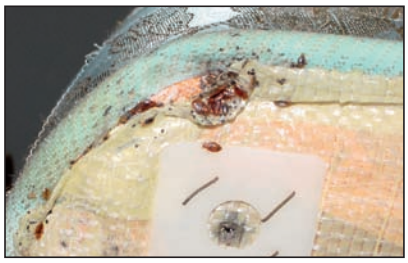
Wooden-framed beds offer numerous cracks and crevices for hiding places and provide many footholds for the Bed Bugs to climb up or down. Wooden bed slats and the underneath of the material strip that holds the slats in position are both favoured hiding places.

Divan beds contain many places for Bed Bugs to hide and lay their eggs. The base of this bed type is especially notorious as the areas around the staples are a favoured Bed Bug haunt and the material cover limits inspection. If the legs are plastic, they will most likely be hollow and provide further hiding places. The other problem with Divan bases is that they can be pushed hard against the wall, enabling the Bed Bugs to spread via the wall and move to other locations in the room.



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In hotels, the bed head is usually a separate component to the mattress and bed base and is often firmly fixed to the wall. This makes inspection and treatment almost impossible, unless either the bed head can be completely removed from the wall (but often they are nailed or even glued in place) or it is completely sealed with silicon to eliminate any hiding places.

If power or other service points such as light switches are attached to the bed head, this can make the inspection more time-consuming as the electrical fitting will need to be disconnected prior to inspection and any potential treatment. In addition, where such electrical wires penetrate the wall, this can be an access point by which the infestation can spread to adjoining units or rooms. All gaps around cables or switches need to be suitably sealed.

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Often bed heads are made of fabric-covered laminated chipboard which, unfortunately, also provides numerous hiding places. Such materials should be avoided in a room to limit infestations, as it is almost impossible to suitably proof against Bed Bugs.

Mattress Design and Cover

As Bed Bugs often hide on the beading of mattresses, those without beading may be less attractive to Bed Bugs, as fewer hiding places are available. If not prohibited to do so, all tags, labels, handles and corner protectors should be removed from the mattress.

The alternative is to use a white mattress cover, also known as an encasement, that can be easily removed for regular washing. These are predominantly beneficial before an infestation becomes established and, being white, makes Bed Bugs and their spotting easier to notice. Some mattress covers now have a specialised anti-Bed Bug inbuilt membrane that the Bed Bugs cannot bite through.

While covers cannot, by themselves, stop Bed Bugs, they can minimise the possibility of an infestation becoming established in new or uninfested mattresses and divan bases. The covers have few, if any, seams, meaning that there are less places where Bed Bugs can hide on the outer surface.

A good mattress cover should have zips with small teeth that stop Bed Bugs getting through, few seams and tightly stitched joins, an inbuilt bite-proof membrane, blocks at the end of zips that prevent Bed Bug escape or entry and anti-removal devices.

There are covers available that have been pretreated with insecticides and claim to resist Bed Bug infestations. Until the Senate Working Party has seen evidence that shows these treated mattresses work against modern insecticide-resistant Bed Bug strains, they are not recommended within this ECoP.

Vehicles that transport any beds or mattresses should be monitored and inspected on a frequent basis.

Second-Hand Furniture

There are numerous reports of Bed Bugs being transmitted via second-hand furniture. It is inadvisable to purchase or use any second-hand mattresses, furniture or furnishings unless the items can be confirmed Bed Bug-free. Accommodation facilities should also limit the transfer of mattresses and furniture from one location or room to another. If this becomes necessary, the items need to be thoroughly inspected for Bed Bugs.

For second-hand furniture retailers, all mattresses and bed frames should be examined for signs of Bed Bugs by an appropriately competent person, before being allowed into storage and certainly before being placed for sale. Infested furniture should be treated as outlined in the ECoP.

Disposal of second-hand furniture needs to be considered as much as purchasing or collecting second-hand furniture. Commercial establishments have a duty of care to dispose of equipment responsibly.

Vehicles that transport any second-hand furniture should be monitored and inspected on a frequent basis.

Members of the public should not simply put infested material ‘on the street’, assuming that these items will be collected by the local authority. In reality, it may be collected by other home owners and the infestation transferred to a new property. They should be suitably labelled as ‘containing Bed Bugs’ or alternatively destroyed beyond use, to limit the attraction to others who may consider taking them.

Inspection and Detection

Bed Bugs have a very flat body shape and can hide in virtually any crack and crevice, preferring dark, isolated and protected areas. Bed Bugs prefer wood, paper and fabric surfaces and so these materials should be given special attention in the inspection process.

Identifying the extent of a Bed Bug infestation is key to any control options. Population numbers, hiding places (current and potential) and risk factors for potential fresh infestations all need to be considered and these will often differ between sites and locations.

Don't assume. Identify: If a specimen is collected but is not easily identifiable as a Bed Bug, send it away to a specialist to be 100 per cent sure. Treatments have been carried out against Bed Bugs when in fact the infestation is, for example, Carpet Beetle – a very different pest. Often photographs can be sufficient to allow identification and, if required, please email photos to **help@bedbugfoundation.org**

If identification is not possible via a photo, the actual specimen may need to be posted to a pest management company or the Foundation. If this is the case, ensure the specimen cannot be crushed; ideally it would be sent in a specimen jar, but an empty matchbox or the like would suffice, but it must be secure and not allowed to accidentally fall out as this may aid their spread.

Provide as much detail as possible, i.e. the physical location where the specimen was found in a room or location, time and date found, etc. The specialist may need to contact you with further questions so ensure that contact telephone details are also included.

Bed Bug infestations may be found in many varied situations and locations and attention to detail will always be required during the early stages of an inspection. The main aim of the initial assessment is to develop the Bed Bug Management Strategy and the aim of the inspection process is to detect every possible Bed Bug hiding place.

One of the most common reasons for control failure is that inspections often fail to reveal all the hiding places. This is usually due to insufficient time or effort spent looking or a non-competent person carrying out the inspection. A detailed assessment is also necessary to determine the time required to actually undertake the control programme and the equipment required, which is essential for accurate job costing.

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Inspection Equipment

The following may be useful for those carrying out a Bed Bug inspection:

- A powerful torch,
- A 10x magnifying lens (to inspect for live Bed Bugs and eggs),
- Collection bottles (for gathering Bed Bugs to confirm identity – sticky tape can also be used for gathering Bed Bugs),
- Fine-tipped tweezers (for picking up Bed Bugs),
- Screwdrivers and spanners or a multi-tool for dismantling items,
- An inspection mirror,
- Plastic bags (large and small) to hold bottles, tape, infested items, etc.,
- Notepad for recording details of the infestation,
- Digital camera for recording infested locations (the images can also be reproduced in a report and the Management Strategy),
- Checklists for a Bed Bug service.

Inspections

Ideally in a commercial situation, a Bed Bug Management Strategy will be in place prior to an infestation and this will detail the extent of the inspection process and the requirements from the customer.

However, it may also be possible that Bed Bugs have already become active and the inspection is made on a reactive basis, which is usually the case in domestic situations.

In situations where no strategy exists, it is extremely important that the PMP explains the inspection processes in detail and should include (but not limited) and preferably in writing:

- Instructions that it will be necessary to inspect bedrooms, including looking through cupboards and drawers,
- Instructions that it may be necessary to remove bed heads, lift carpets and dismantle other items to access all Bed Bug hiding places,
- Instructions on any activities the customer will be required to undertake prior to the inspection,
- Advice to the customer that follow-up inspections may be required.

Early detection and prompt action is the most cost- and time-effective option for Bed Bug management and, if a small infestation has been identified, non-chemical options are more preferable.

In higher turnover rooms or those with a history of infestation, these locations may need to be fully inspected at least on a weekly/fortnight basis. This frequency will need to be increased in rooms that have an active infestation.

Accommodation

The accommodation industry is at a higher risk of new infestations – literally every day – and so the need to proactively inspect and detect must reflect this level of risk. The consequences are expensive, both in terms of reactive control and loss of goodwill to a customer who has been bitten.

If there is less chance of guests being bitten by Bed Bugs through proactive inspections and control options, this reduces litigation risk, increases the customer's goodwill (and spending options) and room closure time will be reduced, increasing operating profits.

The most important aspect upon completion of the control programme is to upgrade the monitoring programme. Ineffective treatments can cause Bed Bugs to spread around a property and new infestations may appear as a result. Monitoring can observe if Bed Bugs relocate and allow early and effective control.

Housekeeping staff inspect rooms almost every day and, as such, have a better opportunity to identify an infestation, than the management or the pest management professional. They will certainly have a good understanding of guests and their habits. They are an important (and often overlooked) part of a Bed Bug Management Strategy and ideally should be incorporated to action the day-to-day elements of inspections and monitoring.

Time is always a factor when including on-site staff; however, a balance must be made by the accommodation provider as to whether to contract outside specialists for the day-to-day inspection or provide slightly more time for internal staff to look as part of their daily duties.

When an inspection is being undertaken in a hotel by a PMP, it is important that discussions with housekeeping and front of house staff take place to obtain information on which locations guests have complained of bites and where staff may have seen Bed Bugs. Ideally, records will be maintained.

Housekeeping trolleys, laundry areas/collection and delivery points, if outsourced, should also be inspected on a frequent basis. Depending on the level of diligence provided by the laundry services (internally or outsourced), Bed Bugs could be delivered or spread around a property on linen. Obviously, direct contact with used linen is a higher risk and this needs to be incorporated into any inspection strategy.

It may also be that other areas of the hotel are actually the source of the bites. It is not inconceivable that a lounge seating area, common rooms or even the upholstery of a bar area could be hiding places for Bed Bugs. As such, everyone who uses these areas could be at risk and this could also include people who use the hotel facilities for day events, not just residents.

All findings must be recorded and ideally contained within one central report folder or database, so that they are available for review by relevant parties (PMPs or Environmental Health Officers) or to provide a demonstration of due diligence.

If an infestation has been identified through proactive monitoring, then the control options (as already agreed in the Strategy and/or this ECoP) will need to be activated. Provided that the monitoring has been diligently completed, the control options should be minimal.

Multiple Occupancy Residential Complexes

Like hotels, if Bed Bugs are detected in one dwelling within a multiple occupancy residential complex (such as apartments, units, flats, townhouses or villas), the adjoining dwellings will also be at risk and should be inspected.

However, there are differences in management responsibilities between hotels and multiple occupancy residential complexes, which can pose many challenges for Bed Bug control. For example, a hotelier has complete control of the building, including housekeeping and maintenance, and can readily undertake inspections, prevention work and treatments in any room whenever necessary. This is not the case for multiple occupancy residential complexes and ensuring that an adjoining room is inspected can be very difficult.

Private Managed Complexes and Social Properties

It could be considered unprofessional and a breach of customer confidentiality for the PMP to contact neighbouring premises without the consent (preferably written) of the customer. The situation becomes difficult when the adjoining property is the source of the infestation as re-infestation in the treated premises is likely to occur.

All the PMP can do in these cases is to suggest that the occupant instigates communications with the other properties, and inform the site or district management or the property owners. It is important that all residents are made aware that Bed Bugs have been found in the complex and that anyone who experiences bite-type reactions should have their premises inspected by a competent PMP, preferably the same person for consistency.

Once Bed Bugs have been introduced into high-density housing, they can quickly become established and spread throughout the building, making ultimate control more difficult and potentially expensive. If only one room is left untreated, this can lead to the re-infestation of the whole building. Management should be proactive and aim to detect early, identify and suitably treat every infestation. Tenants must be encouraged to notify management of the suspicion of Bed Bugs and to not attempt to treat the infestation themselves and they should be restricted from introducing discarded furniture or other items off the street into properties.

Carers and other community workers should be notified of any Bed Bugs and encourage tenants in the management of the infestation. Carers should be informed how they can prtect themselves during a visit and not contract/spread Bed Bugs - especially to their homes.

Management should place notices of Bed Bugs with pictures of the insect and signs of an infestation on communal boards and include information in tenant meetings. If Bed Bugs should become active, the greater the level of awareness and communication between residents, the quicker the personal stigma barriers will be lowered as individuals will know they are not alone. As such, a comprehensive control programme can be delivered. Most importantly, management must respond rapidly to any reported Bed Bug incident.

Rental Accommodation

A disturbing trend for people with Bed Bugs in rental accommodation is for the tenants to move to another property, leaving an uncontrolled infestation behind. Increasingly, tenancy disputes over Bed Bugs have occurred between the landlord and tenant, predominantly over who pays the bill for getting rid of them.

In order for the landlord to provide due diligence and protection to the incoming tenant, steps can be implemented to reduce pest-related conflict:

- The tenancy agreement needs to reflect the responsibilities should an infestation occur. If this is agreed at the beginning, prior to any infestation, matters should be easier to resolve.
- Inspections between tenancies can provide the incoming residents with a ‘clean bill of health’. Ideally this will be certified by a PMP and the aim is to protect both parties within the agreement.

- Communication is key to improved and long-term relationships. Incoming tenants may be unaware of the risk of Bed Bugs and so any information made available to them will not only assist in preventing pests, but will further confirm the landlord's due diligence and duty of care responsibilities.
- Supply the incoming tenant with monitoring advice and share with them the Pest Management Strategy to make them an inclusive part of the detection process.

If Bed Bugs are reported by tenants, the following steps can be taken by the disputing parties:

- Confirm that the pest is identified by a competent PMP as a Bed Bug and that the property is actually infested (false reports have been made as an excuse not to pay rent!)
- Ensure that the (written) report lists the signs of Bed Bug activity and the extent of any spread. Ideally the inspection should also be able to identify the source of the infestation.
- Refer to the tenancy agreement for the prior agreed control options and responsibilities.

For more information, including download policies, visit: www.bedbugfoundation.org/accommodation

Residential

As with all active infestations, the PMP should attempt to determine how the Bed Bugs were brought into the property in order to treat the targeted source.

For example, if Bed Bugs were brought in via the occupant following a holiday, then the likelihood of a reinfestation after eradication is unlikely. However, if it is the result of either business trips or work activities, then the risk of a reinfestation is high, as that activity may need to be repeated. In this situation, it would be proactive (and possibly financially beneficial for the PMP) to try to establish the actual source of the Bed Bugs, to control the spread of infestations – a new customer may be at the end of the line.

The movements of the person/s affected by Bed Bugs need to be established. Have they have slept in various areas within the home or away from the home? Then, if practicable, all these locations need to be inspected and possibly treated.

Areas where luggage and used linen is stored should be examined and the occupant questioned about any previous control attempts.

Bed Bug control is often made more difficult due to the fact that there tends to be more furniture and items within residential properties than hotel accommodation. While the occupier will have a more intimate knowledge of the property, belongings and general maintenance of the location, it is not generally inspected or cleaned as often as accommodation properties. As a result, the need to be more diligent and proactive in monitoring for signs of Bed Bugs must increase.

If Bed Bugs do become established, this also means that more items will need to go through the control process and the cost of eradication often reflects the time taken for such activity.

Inspecting Adjoining Rooms

Sometimes it is necessary to inspect rooms above, below, to the left and right (Sometimes referred to as the Maltese Cross) of the infested room. These rooms should be manually inspected when an infestation has been reported, even if a proactive monitoring system is in operation. With a heavy infestation, possibly even the rooms diagonally adjoining may need to be included within the inspection.

If a recording system is in place, check against inspection records to determine whether any activity or treatment has been identified or carried out, as the infestation may have spread. It is possible that the treatment has failed and the PMP would need to be called to complete contracted services.

This demonstrates the need to maintain accurate records and track infestations or potential infestations. If it is not possible to complete such inspections, it is highly likely that a re-infestation may occur. A continual cycle of treatment and re-infestation often happens in multi-occupancy buildings as access into all adjoining rooms is not always possible.

Monitoring through the 'Maltese cross' approach does not mean automatic spraying of adjoining rooms. If there is no sign of Bed Bugs, the application of a 'preventative' biocide treatment is unnecessary. It may also contribute to the dispersal of the original infestation and increase the resistance of Bed Bugs if they infest the room at a later date. The Control of Pesticides Regulations and COSHH in the UK require identification of a pest species prior to the application of a pesticide, however a silicate based product may be permissible.

Tenant/Guest Complaints

Procedural guidelines within the Bed Bug Management Strategy must be followed if a guest or tenant lodges a complaint or if housekeeping staff find evidence of Bed Bugs:

- Any report of a possible Bed Bug infestation must be investigated and should be recorded in an incident report. This is the responsibility of the hotelier/site manager.
- Front of house staff should document when the supposed infestation was reported, the room number, if or where Bed Bugs were observed and the customer complaint (this may include evidence of bite marks and length of stay).
- If guests have a severe reaction to the bite, the hotelier should encourage and assist the guest to seek medical assistance. The hotelier and PMP must not provide any medical advice.
- Management should demonstrate empathy with the guest by explaining that Bed Bugs are becoming increasingly common throughout the entire industry and that the hotel has strict guidelines in handling an infestation. A prepared statement may support this situation and offer reassurance to the guest that proactive action is being taken.
- The room should be inspected for Bed Bugs as soon as possible in accordance with this ECoP by appropriately trained staff or a PMP. If the room cannot be inspected on the same day, then it should be vacated until an inspection is undertaken. For due diligence purposes, the inspection date and time should ideally be documented, along with the date when the PMP was contacted (ideally the same day), the dates the room was closed, when a comprehensive inspection took place, non-chemical and insecticide options/delivery and when the infestation was confirmed as eradicated.

Inspection of an Active Infestation

The primary objective of an inspection or survey is to find signs of an infestation. While bites are one sign of Bed Bugs, they do not confirm that an infestation is actually present. Bed Bugs are an exposure pest and, as such, infestations can occur in a number of locations.

If evidence of an infestation is found, its size and spread needs to be determined. It may just affect part of one room (small), be contained to one room (medium) or have spread to several rooms (large).

It is also important to try to establish where the infestation originated from; without this it is almost impossible to prevent the same spread occurring again.

The mattress should be the first site inspected. Bed Bugs are more likely to be present in the darker areas at the pillow end of the bed. Close attention should be given to and around:

- The seams, beading, under buttons, labels and corner protectors.
- The base, for a divan, which is more likely to harbour the Bed Bugs than the top mattress. The edge of the material, underneath the ensemble base is a favourite spot, as well as any hollow plastic castor legs. It will be necessary to carefully remove the material covering the base of the Divan.
- Wooden slats for metal-framed beds, if they are present. The slats contain many cracks for Bed Bugs to hide in and lay their eggs. If the wooden slats are bolted to the bed frame, the bolts should be undone and the drilled holes inspected. Bed Bugs can also hide in coils of bed springs and inside hollow bed posts.

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The areas around the bed should be investigated next, these include:

- The bed frame and bed head,
- Bedside furniture, tables, etc., which should be turned over and examined,
- The drawers in tables, cupboards and sideboards, which should be removed and examined,
- Bed heads that are attached to the wall, which should be removed after consulting maintenance staff or management.

Other furniture in the room should be inspected, especially:

- Locations where luggage is placed, such as luggage racks. Close attention should be paid to the seams and buttons (if upholstered) and any wooden join (especially if constructed from chipboard),
- Bedside items such as telephones and radios,
- Electric sockets/switch plates, rugs, underneath carpet edges and the straight edge that holds the carpet in place,
- Skirting boards, especially if they contain internal cable runs, joins in floorboards and under floor boards,
- Loose wall paper and paint, architraves, old nail and screw holes, ornaments, window casings and wall voids.

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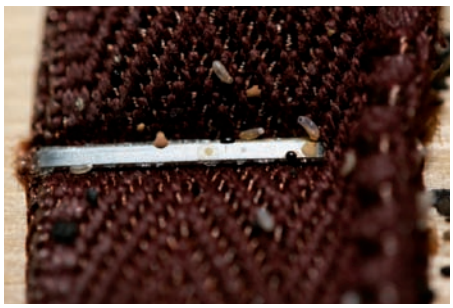
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To avoid the risk of transferring Bed Bugs, items brought into the room should be kept to a minimum. These items should be placed either on a previously inspected chair (with the customer's permission) or in an open area away from walls, preferably on a plastic sheet. Equipment should never be placed onto beds, furniture or next to walls. Likewise, the PMP should avoid prolonged contact with beds, curtains and other potentially infested materials.

The customer should not attempt to remove any item from the room before an inspection is undertaken by a PMP, for the following reasons:

- The PMP needs to gauge the true extent of the infestation,
- Disturbing the infestation may cause the Bed Bugs to disperse,
- Removal of items to another location may spread the infestation.

The extreme infestation site will often have Bed Bugs virtually everywhere within the dwelling. Not only will the bed be heavily infested, but the Bed Bugs could also be in books, CDs, pictures, wall hangings, clothing, cupboards and other furniture, white goods, appliances, telephones, under carpets, behind skirting boards and in wall cavities, etc.

Controlling such a large infestation can be very difficult as such properties tend to be very cluttered and Bed Bugs will be scattered throughout belongings. Control is impossible unless the clutter is removed and destroyed or taken off site for suitable treatment. For the tenant, this clutter may be their lifelong belongings and any suggestions of disposal must be undertaken with sensitivity and in conjunction with the manager of the facility, with the possible assistance of social workers.

In heavy infestations, the PMP will require considerable cooperation from a number of parties to achieve control. This may include the owner or manager of the facility (such as public housing), contract cleaners, community health nurses, and social and/or charitable workers to help relocate the tenant and provide assistance in removing and replacing clothing and belongings. Maintenance workers may also be required to assist the PMP in gaining access to areas for treatment and dismantling fixed items in the premises. The tenant will need to be relocated and none of their belongings (possibly including any clothing currently worn) should be permitted into the new premises, until a comprehensive inspection has occurred and items are free of Bed Bugs.

Bed Bug Monitors & Barriers

Monitors

Over the last year or two, there has been an increasing number of products coming onto the market that claim to monitor or capture Bed Bugs or prevent them crawling onto beds using physical barriers.

They are not a stand-alone 'silver-bullet' to preventing or eradicating Bed Bug infestations, but should be used as part of an IPM programme. A product must work in connection with the biology or behaviour of Bed Bugs. Monitoring traps may provide appropriate information on the presence of pests and the level of infestation which may improve the efficacy of our control techniques.

Monitors mainly work in two ways. Active devices attempt to catch Bed Bugs seeking a host, i.e. looking for a meal. They use a combination of heat, humidity or carbon dioxide to mimic a human and aim to lure the pest into a trap, usually a glue or pitfall trap.

A monitor that uses a 'smell' to attract Bed Bugs may actually disperse them. For example, if the Bed Bugs are far away from the smell, they may not be able to find it and may wander in the wrong direction. However, it can be argued that this probably happens when humans are present anyway. Most active monitors either have a short life (<24hrs) and are disposable or use consumables that only last overnight. These types of device require regular replacement or continuing maintenance to function.

Passive monitors are also becoming available which do not use a substance to attract Bed Bugs but are designed to act as a hiding place for them. These types of units can be hit and miss but aim to be a longer-term monitoring device.

A number of monitors are either too big or have perceived occupational health and safety issues. Regarding size, some units are over 10 cm tall – often higher than the space under a bed – which makes placing them difficult. The monitor cannot be placed in a visible location as the guest would not want to stay in a property where there may be Bed Bugs. The hotel also does not want to risk its reputation by announcing it has an infestation. However, both of these points may be overcome as the social stigma of Bed Bugs is reduced.

Regarding occupational health and safety, a number of Bed Bug monitors use mains power. Many in the accommodation industry may not want power leads under the bed for risk of fire or around the room for risk of customers tripping. Additionally, some units have a canister of compressed carbon dioxide and, again, it is probable that many hotels would not want a high-pressure gas cylinder within their rooms. Such devices may have additional insurance implications for the site.

Currently the limitations of Bed Bug monitors and how most effectively they can be employed are yet to be fully evaluated. Given this, the most probable use for monitors would include:

- Privately-owned properties where there are no reputation threats, although the occupational health and safety issues still exist. The monitors could be used to gauge the success of treatment or to allay the fears of a homeowner who thinks they have Bed Bugs.
- Long-term monitoring in commercial premises where passive monitors could be used. Currently this is part of a monitoring process, it should not solely be relied upon.
- A room closed during the treatment process where active monitors could be used to monitor the success of a treatment.

Proactive monitoring benefits from using staff or residents on site, to inspect all areas of a premises – not just the bedroom – and record on a frequent, routine basis.

Information is constantly being made available on the Bed Bug Foundation website:
www.bedbugfoundation.org/products

Barriers

Also referred to as 'intercepting devices', they are relatively simple units that aim to stop Bed Bugs climbing beyond the bed legs.

They may act as a first line of defence; however, if barriers are used in a room with an existing infestation, then Bed Bugs may relocate to other parts of a building in search of a food source.

Barriers are placed either at the top of the bed legs/castors or under the castors of divan bases. Additional safeguards such as pitfall, glue traps or insecticidal dusts may also help stop Bed Bugs reaching the bed.

Sticky barrier tape has recently emerged onto the market. This has the advantage of preventing Bed Bugs reaching lots of locations, not just bed legs. However, the sticky tape can catch dust and other debris and 'dry out' and stop trapping Bed Bugs.

Teflon discs have recently emerged and follow the same principle of providing a barrier between the ground and the host. Bed Bugs cannot pass the disc.

For any type of barrier to be effective the bed and pillows must be kept away from the wall and valances/sheets must not touch the ground or a bridge will be made available for Bed Bugs to bypass the barrier. Many of the barriers available also require routine inspection and maintenance ensure effectiveness. The bed must also be infestation-free.

Many barrier devices are clearly visible and, like monitors, are unlikely to be suitable in the commercial accommodation market. However, barriers can be a cost-effective option in low-income housing and homeless shelters but they will not control an infestation and should be used as part of an IPM programme.

Information is constantly being made available on the Bed Bug Foundation website:
www.bedbugfoundation.org/products

Bed Bug Detection Dogs

The use of dogs to detect Bed Bug infestations has become increasingly common in the last few years, following on from their use to detect termite infestations. Dogs have the ability to detect faint odours as their smell receptors are more numerous than humans and can reportedly detect smells at concentrations 100 million times lower than humans.

To be accurate and efficient in detecting infestations the scent detection dog and handler must work together in partnership and train on a regular basis and should only be rewarded on confirmed infestations detected.

Scent detection alone however cannot be considered to be confirmation of an infestation which can only be done by finding the signs of an infestation. If a service provider is prepared to treat the area on the recommendation / findings of a dog alone, then it is unlikely that a high standard of treatment is being delivered.

A scent detection team is only as good as the bond and understanding between handler and dog. So, the customer should request confirmation of the competence of the handler, continuity training programs for both the dogs and the handler, and how the handler maintains the dog during periods with zero activity (weekends and holiday periods for example). How often the handler returns with the dog, to its trainer for re-training and evaluation.

The use of field strain Bed Bugs, not 'lab-harvested' should form part of that competency program. The use of cross trained dogs must be avoided, the best bed bug dogs are single element point source trained, dogs that have been re-educated from other disciplines such as drug, explosive or search and rescue will always be inferior.

Dogs and handlers should also be trained and maintained in the specific environments that they work within and the scent detection methodology they employ. Experienced scent detection professionals will confirm that certain dogs work best in certain environments; as with humans, competency is knowing the environment in which one works. Methods statements for the dog and the handler, identifying standard operating processes should be available upon request.

The training of Bed Bug dogs is a specific skill and requires access to live Bed Bug material and appropriate training environments, it is not something that should be attempted by anyone without experience in training dogs for scent detection and to remain effective.

As the use of dog units for the detection of Bed Bugs has become more widespread it has also become apparent that there is a need for best practice and definition within the European market. There are some existing American industry generated codes, but we believe none (to date) have been written in conjunction with consumer groups. This is being address and will be available shortly through the Bed Bug Foundation.

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Control

Proactive Approach to Control

A true integrated programme will have the PMP and the customer working in a shared programme of inspection and monitoring, with the aim of minimising the risk of an infestation. It is very important that potentially infestable properties (accommodation or residential etc) have made provision for trying to prevent an infestation.

If an infestation is identified, then a balanced and considerate approach will be required as part of the control programme. The sole reliance on chemical treatments contravenes many pieces of European legislation and is actually becoming less effective, when matters of Bed Bug resistance are considered for example.

Survey/ Assessment of Infestation

The efficacy of Bed Bug control is largely dependent on a comprehensive survey prior to treatment. The aim consists in looking for and finding those places where bed bugs and their eggs may harbour. For detection and identification of Bed Bugs, a torch and a magnifying lens may come in handy during this work. It is also practical to make use of the information provided by the customer.

Survey and checking should include the following spots:

- beds, bed-frames, headboards and behind headboards,
- cushions, blankets,
- mattresses, hems of mattresses,
- bedside tables,
- near-bed furniture, tables, cupboards and its drawers,
- chairs, sofas, especially upholstery (joining points of soft furnishing and wood), tassels, seams,
- joints of furniture,
- cracks and crevices in walls and floor,
- wallpaper edges and defects,
- back side of picture-frames and wall-mirrors,
- curtains, strip-curtains and their plies,
- electric devices (TV, telephone, radio and their sockets),
- wall-sockets and switches, smoke detectors,
- suspended ceiling and joints,
- edges of wall-to-wall carpet,
- joints and edges of parquet.

Slash and Burn Approach

Unfortunately, the concept of simply destroying or replacing any infested items has increased as a 'necessary' option. Usually this is due to advice from incompetent operators, which is often negligent, as many items can be successfully treated and continue to be used after eradication.

The decision of whether to destroy or treat is usually based on the value of the item and the extent of the infestation. Higher value or sentimental items can be isolated, suitably treated (often without the use of chemicals) and then reintroduced following control of the infestation.

Difficulties also occur with simply replacing the infested items. Firstly, if the infestation level is high, then it is unlikely to be isolated to just that piece of furniture and exchanging like for like will see the new item quickly infested. A comprehensive treatment programme is still required for the room, so why not incorporate the infested piece of furniture?

Secondly, if the delivery company is not informed and also removes the infested old piece of furniture in the same vehicle as delivering the new one, the infestation may spread. Incoming pieces of furniture may also be introducing Bed Bugs into a property.

Future of Pesticides

New European regulations – known as the Biocide Products Directive (BPD) – are aiming to bring all pesticides in line with common standards and data packages across Europe. Commonly referred to as Annex 1, this is turning into a very expensive process and products will need to be reviewed on approximately a three- to five-year basis.

As a result, a number of insecticides will have a limited period in existence, primarily due to the considerable cost of registration and increasing time burdens or data requirements on the manufacturers.

There is a significant shift in the mindset of manufacturers of pesticides towards sustainable or environmentally friendly control solutions. In turn, there also needs to be a change in mindset from the PMP and, possibly more importantly, from the consumer, who will be purchasing the services.

There will always be a need for chemical solutions, as control needs to be quick, financially available and efficient and many non-chemical options do not continue to control Bed Bugs after the initial treatment. However, ideally, they need to be part of an integrated approach of chemical and non-chemical control options.

Treatment Procedures

Most household insecticides contain chemicals that are largely ineffectual and actually disperse an infestation. If the customer has attempted to control the infestation with such products, especially 'insecticide smoke bombs' or 'fogging', then usually the infestation will be far more diffused and spread throughout the property or into adjoining units within apartment complexes.

As a result, control becomes more challenging, as alternatives to these chemicals, of which there are a minimal number available, may need to be used.

The application of any control programme is usually the last, but possibly the hardest part of any strategy – provided that the ground work has been done in advance! The inspection should have identified hiding places, constructed a risk (UK-CoSHH) assessment and considered/eliminated the various control options. However, one of the most important steps is the preparation of the environment to be treated.

Preparation of an Infested Site

Customer preparation

In the process of, or immediately following, the inspection and only upon the recommendation of the PMP, items, which may include bed linen, curtains and clothing, must be removed from the infested areas. It is essential to handle all such items that may contain Bed Bugs. They must be bagged and sealed before removal from the room and labelled as being infested with Bed Bugs.

They should then be washed in the hottest water possible (⇢55°C) and/or dried in a hot air clothes drier for at least 30 minutes. Bags that dissolve in the washing machine are preferable for infested linen as they can be put straight into a machine without having to take the linen out. This reduces extra handling of infested linen and reduces potential cross contamination in laundry facilities.

If dissolvable bags are used, it essential that these are stored dry and away from sources of moisture; otherwise the bag will break down before laundering. If dissolvable bags are not available then plastic bags should be used for the transfer, but the bag must be destroyed immediately after the process. Delicate items that cannot be washed could be placed into a freezer after bagging.

Depending on the level of infestation, all wardrobes, drawers and cupboards must be emptied and the contents treated as above. After clothing and materials have received treatment, these should not be returned to wardrobes but kept sealed in plastic bags away from the room, until the infestation has been eliminated.

If a linen contractor is used then all potentially infested linen must be kept isolated, labelled infested and have instructions to wash separately. Dirty and clean linen should not be transported in the same vehicle and frequent, documented inspections should take place for all modes of transportation.

It is not uncommon for used linen to be placed either on the floor in the corridor outside a room or directly into linen baskets. This is a high-risk practice for spreading Bed Bugs and should be avoided. Inspection and monitoring of laundry baskets and storage areas should be included within the Bed Bug Management Strategy and documented.

Non-Chemical Control

Introduction

Non-chemical options are an essential, sustainable element within all control programmes and best results are guaranteed by integrating them with chemical control methods.

Leaving an infested room vacant for extended periods is not an option to control the Bed Bugs, as they can live for many months without a blood meal. Infested rooms must be treated as per this ECoP.

Cleaning

Removing any signs of an infestation, may positively contribute to reducing the level of activity and it will also help to detect if fresh activity occurs. Although cleaning is not seen as a part of control, it does assist with early detection which, in turn, reduces the likelihood of ongoing treatment. It is also beneficial for the treatment process to have clean surfaces.

Care needs to be taken if using stiff brushes as part of the cleaning process as the bristles can 'flick' Bed Bugs away from their hiding place. The entire cleaning process also needs to be controlled and detailed – simply applying soapy water or spraying a fresh air aerosol will not control Bed Bugs.

Vacuuming

Reducing the overall population size of a Bed Bug infestation needs to be the first activity for any control programme. While vacuuming will not remove all Bed Bugs or eggs, the population can be reduced by physically removing them through vacuuming along cracks and crevices.

The process of vacuuming must be slow and deliberate in order to collect as many Bed Bugs as possible. A crevice nozzle can be used along carpet edges, bed frames and mattress seams and in divan bases, furniture and other potential hiding places.

Vacuuming insects can cause a dispersion of insect allergens, which may be a problem for sensitised people and may trigger an asthmatic reaction. If customers report being sensitive to dust mite or insect allergens (discovered as part of the risk (UK-CoSHH) assessment), then using a vacuum machine with a HEPA filter is advisable. Alternatively, the individual should not be present either during or after treatment, to allow any particles to settle.

Vacuuming cracks and crevices prior to insecticide treatment will not only help to remove the Bed Bugs but dirt as well, which will allow the chemicals to penetrate further and improve their control and long-term effect.

It is important that the vacuum cleaner does not become the source of further infestations. Following any vacuuming, the machine must be isolated and thoroughly cleared of any insects or eggs. Vacuum cleaners that have the base and all hoses composed of solid plastic can be sterilised in hot water

This should be completed as soon as possible after use. When not in use the vacuum cleaner itself should be stored in a sealed bag.

The use of a vacuum cleaner that has a disposable dust bag is recommended so that, on completion of the cleaning process, the contents can be removed. If possible, the bag should be immediately destroyed by incineration, rather than just being placed into general rubbish. If incineration is not possible, the vacuum bag should be sealed within another plastic bag to contain any possible insects.

Depending on the risk faced from storing used vacuum bags, the light application of an insecticide dust to the contents may assist in reducing the possibility of spread. Under no circumstances should an insecticide aerosol or spray be applied to an operating vacuum cleaner as this may cause an explosion and/or fire.

The PMP and other competent staff, including maintenance, should be aware of the limitations of vacuuming. All previously vacuumed areas may need to be treated with insecticides as Bed Bugs within crevices can 'hold on' against the suction forces. The eggs themselves are glued in place when laid and may resist removal via vacuum cleaner, meaning that other control measures must be subsequently applied.

Steam

One practical method of non-chemical control is through the use of steam. The great advantage is that it will kill all Bed Bug stages, including the eggs. However, unless the level of infestation is low, control cannot reliably be achieved with steam alone and it should be used as part of an integrated approach.

As steam is composed only of heated water, some customers favour this treatment over chemicals, particularly for their mattress and bed area.

It is important to note that there are many different brands and types of steam machines on the market; however, not all are appropriate. The most effective unit must be able to produce steam of a low vapour flow and high temperature. It is best to use commercial units that employ 'dry steam', which allows for quicker drying times. Steam machines that have a continual flow feature can be filled and remain operational without the downtime of some of the cheaper units, which go through a cooling and reheating phase.

Note: 'dry steam' is a misnomer. Items treated will still be damp and a fan or ventilation should be used to dry the room afterwards; otherwise mould growth could occur over time.

As with all equipment, the steam machine must be properly maintained and the operating temperatures should be regularly checked with the aid of an infra-red thermometer. Immediately after steam treatment, the surface should be recording a temperature of at least 70–80°C.

Steam flow rates must be kept to a minimum to avoid 'blowing' Bed Bugs about and to reduce wetting of the surface material. Likewise, single jet steam nozzles can blow Bed Bugs away so, if these nozzles are used on mattresses, the nozzle should always be pointed towards the centre of the mattress where Bed Bugs can be seen and re-steamed/vacuumed if still alive.

If, as recommended, the machine is using a low vapour flow rate, it is necessary to place the nozzle in direct contact with the surface being treated. The temperature drops away rapidly from the nozzle and a separation of only a few centimetres will not be lethal to the Bed Bugs. The nozzle should be moved along the surface at a rate of only 3 cm per second.

Multiple jet steam heads produce a gentler flow rate, are thus less likely to blow Bed Bugs away and can treat larger areas over a shorter period.

With a single jet nozzle, it will be necessary to run the nozzle along both sides of the edge beading of a mattress, whereas a single pass with a multiple jet head will usually suffice.

By placing a cloth over the steam head as in,

Bed Bugs will not be blown about by the jets and the treated surface becomes much hotter, which increases the potential of killing all stages. Brush heads and brush fittings on steam machines should be avoided as the stiff bristles can 'flick off' eggs and Bed Bugs. It is important that the steam be applied directly to the Bed Bugs as even a thin layer of cloth may shield the insects and prevent effective control.

To reduce the risk of blowing Bed Bugs about, if a cloth is not used over the steam head, all areas should be vacuumed first.

Like any tool, steam machines are only as effective as the operator. To achieve control, an intimate knowledge of the pest and its ecology are essential, inspections must be diligent and the treatment process must be meticulous. The instructions of the steam machine must be read thoroughly, noting all safety instructions prior to use.

The steam treatment should start with the mattress and be applied to the seams, under labels and handles, and both inside and out of an divan base. It will be necessary to remove the material from the base. Cushions and joints of chairs and sofas should also be treated, paying particular attention to seams and buttons. Always check if the sofa is able to convert into a bed and, if so, treat the mattress as discussed.

Carpet edges can also be treated with steam, along with the straight edge both above and below. After the completion of the steam treatment, any dead Bed Bugs should be removed via vacuuming, which will aid in determining the success of the treatment. Some machines have a combined steam and vacuum process.

As with any technology, steam has its limitations:

- Being water based, electrocution is a potential issue and thus power points and other electrical fittings should not be steam treated.
- Steam may damage heat- and water-sensitive materials, thus the PMP should always test the item to be treated in a non-conspicuous area before the main treatment begins.
- Steam will raise the humidity in a room, which can lead to mould growth and other potential health issues.

Laundry

Bed Bugs and their eggs are very sensitive to heat and are quickly killed when exposed to temperatures over 45°C. Using these options is one of the most effective control processes; unfortunately it is not possible to apply this to all potentially infested materials, such as beds.

Care must be taken when transporting items between the infested location and the washing facilities and also to ensure that Bed Bugs are not spread to the washing facilities.

Hot water

Infested linen and clothing can be laundered in hot water followed by hot tumble drying to kill all Bed Bug stages. Studies from the United Kingdom have shown that, if the water is at 60°C, every Bed Bug stage will be killed in the wash. However, a temperature of 40°C will not be lethal to all the eggs. Note: many machines do not hold temperatures at these levels – this is often their peak.

As already discussed, ensure that all items due for laundering are placed in sealed bags within the infested room. If it is not possible to use dissolvable bags, ideally take the infested items in one bag and return them in another – preferably colour coded – to prevent re-infestation of the cleaned clothes.

Ensure that the material is washed on the hottest setting the fabric can stand, as instructed on the label.

Hot air

For tumble drying, the dryer must run on the 'hot' setting for at least 30 minutes for dry clothes to achieve a complete kill of all stages.

It is often claimed that Bed Bugs can be killed via heat by placing infested materials into black plastic bags and then into the sun. However, a scientific investigation has shown that this can be ineffective with large items such as mattresses. Since this method cannot be relied upon to de-infest items, it is not recommended within the ECoP.

Thermal heating

If heat is used for Bed Bug control, it is important that the high temperatures are applied suddenly; a gradual rise in temperature may cause the Bed Bugs to disperse, thereby potentially spreading an infestation.

Treatments such as fans and a heat source to heat a space create a gradual rise in temperature. It is difficult to reach the required temperature and maintain a constant heat in a room, especially under carpets and closed drawers.

Caution needs to be taken as commercial heat sources will draw a lot of electrical power and so might not be suitable for all premises. The PMP delivering a heat treatment should check the equipment manual or liaise with the equipment supplier for the consumption requirements and supply levels. A professional electrician may also be required as part of the pre-treatment planning exercise.

Bubble treatments, where infested items are treated in a fixed space, are becoming increasingly popular. Despite the increased cost, items such as beds can be suitably treated and this eliminates the need (and cost) to destroy and replace. However, this must be used as part of an IPM programme – it is not a stand-alone option.

Cold

The alternative to extreme heat is extreme cold, i.e. freezing the Bed Bugs. As with heat treatment, the most important element of freezing is that the temperature must be lowered quickly.

This has the advantage that heat-sensitive materials will not be damaged. While this method often cannot be directly used by the PMP for logistical purposes, it can be recommended for small items within a property. Large chest freezers can be used for off-site decontamination, whereby items are packed into plastic storage boxes before leaving the infestation and remain in the storage boxes for the duration of the treatment.

Any item for freezing should be placed loosely into a bag and, as always, this must be done in the infested room prior to removal. The amount of time in the freezer is dependent on the size of the item – the larger the item, the longer in the freezing process. If the freezer is operating at or around -17°C (typical for household freezers), then two hours at this temperature will kill all stages. In general terms, the longer the better.

Naylor and Boase (2010) have shown that 10 hours of freezing at -17°C is required to disinfest a 2.5kg bag of loosely packed dry laundry. Larger and / or denser items may therefore be expected to take several days for the centre to cool sufficiently to kill all Bed Bugs present.

Bags used for bagging items will also contain a certain amount of ambient air, (which also contains water) and this water may cause condensation upon freezing. Before freezing any items, care must be taken to try and expel any excess air and that condensation will not damage the enclosed item/s.

Dry ice

Also known as solid carbon dioxide, dry ice flash freezes the Bed Bugs and eggs. Research is still required as to the efficacy of both dry ice and the application equipment.

Direct contact is required with the Bed Bugs to have any chance of control. Dry ice cannot penetrate items. The flow rate may blow the Bed Bugs from the infested item. As with steaming, direct the dry ice towards the centre of the bed so that any propelled Bed Bugs collect in the middle.

Mattress covers

As discussed in the Prevention section, seamless mattress covers provide fewer potential hiding places than traditional mattresses.

A cover can be used to contain Bed Bugs within an infested mattress and divan base. If encased for an extended period of time, the Bed Bugs will die of starvation. Advantages of this system are that insecticide use is minimised and costs reduced as the infested mattress and base do not need to be discarded, even if damaged or heavily infested.

As Bed Bugs can live for up to six months without feeding at 22°C, or even longer in cooler climates, the covers must be left in place for much longer than this, as removal represents a reinfestation risk. Thus users need to be made aware that covers should not be removed if being used for Bed Bug containment.

When covers are used on the bed, the application of an insecticide is not required as a 'just in case' option.

Insecticides

It is a requirement of many European laws that only registered insecticides are permitted for use against Bed Bugs. The product label must be read before every application to ensure that it is currently registered for its intended use and must be adhered to at all times.

The Bed Bug Foundation is committed to the safe and effective application of pesticide where it is required. All SleepTight PMPs hold specific pesticide management qualifications. It is essential that anyone applying pesticides to control insects in sensitive areas such as beds and sleeping areas is suitably qualified and trained.

Legislation, such as COSHH in the UK, states that potentially hazardous products should only be used after all other treatment options have been considered and discounted. Where a pesticide is deemed necessary, care should be taken to ensure the safest and most suitable product/formulation is applied.

Legislation requires users to be more responsible for their own and their customer's health and better informed customers demand safer, environmentally friendly treatments carried out by professionally qualified, reputable PMPs.

Bed Bugs will generally be controlled by either contact insecticides that attack the nervous system, as a desiccant in drying out the waxy layer on their bodies, or by mimicking natural growth hormones that disrupt their bodily functions. The insecticide/s to be applied must be directed to all harbourage locations identified during the survey process and in accordance with label instructions.

The type of formulation selected for the treatment will be dependent on its usage patterns and limitations as instructed on the product label and any safety considerations such as CoSHH assessments.

Awareness should be made of the evidence of effectiveness of insecticides against specific Bed Bug control. Many data requirements vary between products and there remains a difference between Bed Bugs tested in a laboratory and those found in practice. The lowest cost does not necessarily represent the best option.

Formulations

The type of formulation (for example, liquid spray, aerosol or dust) selected for the treatment will be dependent on its usage patterns and the location of the hiding places. Each individual product will have advantages and disadvantages and these need to be understood in order to assess each product PRIOR to a treatment. The use of one formulation over another (and they may even contain the same active ingredient) needs to be considered during the COSHH assessment process and is predominantly based on risks that the product may pose against the location of the area that requires treatment. For example, water-based liquid sprays around an electrical point are not acceptable; however, the application of a dust may deliver effective control and minimise any other risks.

Dusts

Insecticidal dusts are free flowing, ready-to-use products that are usually white/grey in colour. The dust is mostly made of an inert carrier powder that contains a small amount of active ingredient with biocides, but for non-chemical dusts it may 100% of the product. The application of insecticidal dust requires careful consideration as dusts can be easily dispersed and will easily contaminate uninfected areas. They are also easily removed via vacuuming and cleaning if used in inappropriate areas.

Dusts will provide good control of Bed Bugs if used in appropriate areas. The insecticide in dust formulations will remain active for long periods of time and should be used in thin layers, as insects will not crawl through heavy deposits. Due to the contamination risk, dusts should be applied to horizontal surfaces and can be effectively used in electrical ducting and equipment areas if the Bed Bugs are suspected of penetrating such areas. Dusts can be applied to wall voids if the Bed Bugs are suspected of penetrating them. They can also be directed to the underneath of carpet edges and under straight edges.

There are a number of products available for the application of dusts. These vary from small handheld 'puffer-pack' applicators, to larger bellows and electrically-powered machines. All apply the dust under pressure into areas that may not be easily accessible.

One of the great advantages of dry (i.e. dust) formulations is the fact that they drift when applied accordingly – dusts are the only formulation that are capable of negotiating bends within hollow structures thus reaching areas no other formulation (except gas) can.

Residual Liquid Insecticides

Residual insecticides are extremely beneficial in the control of Bed Bugs. The 'residual life' of an insecticide is the period of time it will continue to kill insects after its application. Due to the cryptic and nocturnal nature of Bed Bugs, it is incredibly difficult to access every insect during a treatment, so an insecticide that continues to kill for a period of time after application can be beneficial. Residual life will vary between products and locations, but some products may remain active for several weeks.

Application will usually be via a compression sprayer, which traditionally holds five litres of insecticide when diluted with water. However, smaller one litre and larger sprayers are available, depending on the requirements/size of the treatment area. Fan sprays should be used along carpet edges and pin or jet streams for cracks and crevices. Avoid using hollow cone sprays.

Insecticides are often supplied in concentrated form and need to be diluted (usually with water) and applied as instructed on the label. Dilution and application rates have been scientifically designed to deliver the most effective quantity of the insecticide. These rates do not need to be altered for any reason, only double dose if the label says so. There is no need to add 'extra' concentrate unless the label states it. Mixing the wrong amount of concentrate can have serious consequences for the treatment programme, including spreading infestations and failing to achieve control as the insects can be repelled by 'overpowering' preparations.

It is recommended that residual insecticides are mixed immediately prior to the treatment, as this will ensure the correct amount of product can be mixed for the requirements of the treatment and will avoid wastage. Insecticides that have been mixed days or weeks before treatments may not be as effective as new preparation mixes; this may affect the residual aspect of the preparation.

While applying liquid formulations, the PMP has to take great care to avoid contamination (i.e. insecticide ending up where it was not intended). Usually contamination occurs when a liquid is overdosed – most labels state 'apply until run-off', which is difficult to achieve since there is no early warning, especially on fabric surfaces that are typical in bedroom environments.

Wettable powders

Wettable powders consist of a powder base that is generally diluted with water, as instructed on the product label. They are particularly useful for treating porous surfaces such as untreated wood, brick and concrete. This is due to the fact that, as the water dries through evaporation/absorption, it leaves behind a fine layer of the insecticide for the insects to pick up on contact.

Wettable powders may also be used on non-absorbent surfaces such as metal, plastic or painted wood. However, the PMP should be aware that in such locations the treatment can leave behind white deposits as the water evaporates, causing unsightly marks that can upset customers if it is not explained beforehand.

Water dispersible powders are generally presented in water soluble sachets that allow easy and exact mixing with the required amount of water, reducing operator exposure and ensuring the optimum performance from the product. However, sachets usually require five litres of water, which may be too much for small treatments.

Suspended concentrates

Suspension concentrates are generally milky-white liquids that are mixed with water (as instructed on the label) and they are particularly suited to surfaces where absorption is unlikely to occur, such as laminated or metal bed frames. However, they should always be applied in volumes to prevent run-off or in a manner to prevent easy access from third parties coming into contact with treated areas.

Suspended formulations combine ease of handling of a liquid formulation with the effectiveness of a powder-based formulation. They have a low toxic effect on people and animals but, as with all insecticidal treatments, the customer and all pets should be prevented from entering the treatment area until all insecticide has thoroughly dried. Suspended concentrates are usually presented in a plastic container that allows easy but accurate measuring of the insecticide concentrate. This allows smaller amounts of insecticide to be measured and mixed with water, if small infestations or smaller 'spot treatments' are being carried out.

Micro encapsulated

Micro encapsulated formulations are similar in appearance and packaging to the suspended concentrates. However, when diluted with water, the active ingredient is 'encapsulated' in a protective coating, creating microscopic 'bubbles' of the insecticide. These bubbles are ruptured by the insect, which, in turn, picks up the insecticide.

The micro encapsulated formulations available to PMPs offer long residual life (possibly up to three months) as the insecticide is sealed in its bubbles until ruptured. This is very beneficial to the pest controller as the insecticide may control hatching Bed Bugs. The products also have the capability to stick to the insects' legs and break down more slowly.

Aerosols

Aerosols are very beneficial as their flushing effect can help in the inspection process. Although this is true for crawling insects in general, PMPs should not rely too heavily on the same effect to happen when dealing with Bed Bugs. Bed Bugs will be aggravated by the insecticide and may be pushed out of their hiding places. When combined with a conscientious PMP carrying out a detailed inspection with a torch and inspection tools, aerosols can help to pinpoint hiding places that require treatment with a residual insecticide.

Products such as synergised synthetic pyrethroids can act very effectively to knock down and kill the Bed Bugs rapidly when applied directly to the insects (although it is always best to vacuum first). With extension nozzles, the chemical can be very accurately applied to areas such as beading on mattresses and cracks and crevices in furniture. For wall hangings and delicate or antique furniture, aerosols may be more appropriate than other formulations, again after vacuuming. However, due to the formulation being premixed and delivered via a sealed aerosol, large treatments can prove relatively expensive.

Aerosols should never be used as 'space sprays' for Bed Bug elimination. The fine droplets will not penetrate into the locations where the insects hide. As most contain pyrethroids, Bed Bugs may be repelled and dispersed by spraying into a space rather than a hiding place.

Caution should always be used when controlling Bed Bugs with aerosols. The pressure of the delivery can potentially blow the insects around, possibly spreading an infestation if the insects have not received a lethal dose of insecticide. If using an aerosol, as with steam, ensure that the treatment is applied to an area where the Bed Bugs cannot be dispersed or to an area where they can be collected. Often the extension nozzle will reduce the pressure of the application and so reduce the risk of blowing the Bed Bugs around.

Actives are often more efficacious in an aerosol form than in other formulations, and this is particularly true of the synthetic pyrethroids. The hydrocarbon propellants aid in producing a more efficient kill.

Smoke generators

Smoke generator treatments are often incorrectly referred to as fumigations. Smoke generators are known as 'pyrotechnics' and are ignited like a firework. They release insecticide in the form of a smoke. The generator size can vary depending on the cubic size of the area to be treated. As the smoke settles, the insecticide is deposited but only on horizontal surfaces.

They are designed for filling small, inaccessible areas with insecticide and have a quick knock-down effect, generally against flying insects. However, as they do not settle on vertical surfaces or on the underside of horizontal surfaces, they simply miss too many areas in which Bed Bugs are active.

Smoke generators are complicated treatments as they cannot be stopped once they are lit and can set off fire alarms or sprinkler systems if these devices are not switched off prior to application.

Smoke generators may be an attractive treatment for some pest controllers as they provide a quick way of treating an area. As the pesticide does not penetrate into enough hiding places, their use should be avoided in the control of Bed Bugs. In fact, they may even help disperse Bed Bugs that do not pick up a lethal dose of the insecticide.

The ineffectiveness of smoke generators means they are not a recommended control measure in this ECoP.

Fogging

This process is often incorrectly described as fumigation. Fogging consists of either Ultra Low Volume (ULV) or Thermal fogging.

This application involves the passing of an insecticide either through an electronic or thermal piece of equipment to create an airborne mist of fine insecticide. The small droplets of insecticide sit in the air for approximately one hour after treatment. Unfortunately for Bed Bug control, the small droplets provide minimal penetration and leave little residue, meaning that, when the mist is dispersed, no insecticide remains.

The small droplet size makes ULV a perfect treatment for flying insects that pick up the insecticide in flight. The lack of a residue does not lend itself to the treatment of Bed Bugs that spend much of their time in hiding places. Sub-lethal doses of insecticide will, in fact, repel Bed Bugs and effectively drive them to a new location.

Because of this, ULV treatments are not supported by this ECoP.

Diatomaceous earth 'DE'

This is a naturally occurring, soft sedimentary rock that is easily crumbled into a fine white to off-white powder. The control process works by drying out the skin of Bed Bugs and causing them to dehydrate.

It can be applied directly as a ready-to-use powder or a compression sprayer and has recently extended the range of formulations via aerosol.

Application

The insecticide/s to be applied must be directed to all hiding places identified in the inspection process, in accordance with label instructions.

It is important to note that not all surfaces can be treated by all insecticides and the location of the treatment will often dictate which formulation or product should be applied. For example, some products cannot be used on mattresses. Where mattresses can be treated, there are frequently rigorous instructions to be followed that will often not allow the treatment of cots and children's bedding. PMPs should always carry out their own assessment of the treatment area as, even if the product label allows the treatment, the PMP may deem another active or product formulation may be more suitable and safer for the customer.

Insecticides on a mattress should be kept to a minimum to reduce exposure to humans and it is best to use vacuuming and steam first to remove and eliminate Bed Bugs on beds.

In the past, 'fumigants' were widely used for Bed Bug control; however, this is a highly specialised area and an appropriate specialist should be consulted.

In most infestations, the carpet and underlay should be peeled back for at least 30 cm and the straight edge treated underneath.

Disposal

Any excess pesticide must be disposed of in accordance with the label and this may vary between products.

When mixing, consider the area to be treated and the approximate volume of spray required – this will minimise, if not eliminate any waste. However, if for any reason waste does occur, the best option is to decant it into a special watertight container, suitably marked with the contents and 'Poison' on the outside of the container. This should then be returned to a quarantine area for collection and disposal by a registered waste centre. Ideally the distributor of the product will provide this service.

Liquid insecticides are NOT to be poured down the sink or onto the ground in large quantities. Dry insecticides must NOT be placed in domestic or standard waste bins. They must be treated as hazardous waste.

Insecticide Reapplication

Most of the insecticides registered for Bed Bug control have little effect on Bed Bug eggs. With the exception of dust and encapsulated spray, these products also generally provide poor residual control and may fail to kill newly-hatched Bed Bugs.

It is possible that additional treatments may need to be undertaken after the initial application. This will be dependent on the ambient temperature but at least one follow-up visit may be required for an insecticidal application. If the infestation is heavy, further inspections and treatments will be needed, in accordance with the product label.

Insecticide Resistance Strategies

Recent research has found an increasing degree of insecticide resistance in Bed Bugs. These Bed Bugs will survive treatments and may go on to breed and produce future genetically resistant populations.

Resistance to both synthetic pyrethroid and carbamate insecticides has been recorded in the Common Bed Bug in the UK while the Tropical Bed Bug was found resistant to synthetic pyrethroids in Africa.

One study in the US found that field-collected Common Bed Bugs were several thousand times more resistant to synthetic pyrethroids than susceptible strains.

Currently, there are very few insecticides from different chemical groups registered for Bed Bug control, making it difficult to formulate an effective insecticide resistance strategy. Although new classes of active ingredient are becoming available in Europe, that are effective even against resistant strains.

The PMP should, however, assist in reducing the further development of insecticide resistance by integrating non-chemical with chemical means of control. If insecticide must still be used, the insecticide product previously in use should be changed to one from a different insecticide group (e.g. change from a carbamate to a pyrethroid) or alternative products, which have a different mode of control.

Accordingly, it is recommended to complement the insect neurotoxins (synthetic pyrethroids, carbamates) treatments with application of insect growth regulators (IGRs). The IGR active ingredients include the S-methoprene, the

pyriproxyfen and the chitin inhibitor lufenuron. The IGRs interfere with the hormonal balance of the insects thus inhibiting the development of eggs as well as the development of the nymphs.

Post Treatment Procedures

The customer should be advised to undertake the following after treatment:

- Occupants should be encouraged not to re-enter the treated area until after the chemical has completely dried. Refer to label instructions for re-entry period.
- The customer should be requested not to vacuum floors and upholstered furniture for at least 10–14 days after final treatment. However, following this time a comprehensive cleaning programme should be undertaken, with the contents of the vacuum cleaner removed and the unit cleaned.
- The time for eggs to hatch is dependent on temperature and this time should be a guide to the minimum period for any follow-up, using the average daily temperature. However, in heavy infestations, several follow-up visits will be required before elimination is achieved.
- All past signs of the infestation should be removed, such as dead Bed Bugs and blood spotting on walls and mattresses, to avoid future confusion.
- Preventative measures should be undertaken.

Measurement of Success

A successful treatment has been achieved when the infestation identified, at the initial inspection, has been eliminated.

Treatment success should also be based on assessing the level of customer cooperation, along with follow-up inspections. The PMP should ensure that the customer has followed all the recommendations prior to, during and post treatment. The final inspection should be as detailed as the initial inspection.

All previously identified locations of Bed Bugs must be re-examined, cracks and crevices receiving specific attention and the surrounding areas examined in case Bed Bugs have been flushed out by the insecticides. It is also necessary to inspect previously unoccupied locations as the Bed Bugs may have relocated.

If live Bed Bugs are observed, a further treatment and subsequent inspection should be undertaken.

All findings during this final inspection must be thoroughly documented (in writing/photos), compared against the initial inspection document, and success (or failure) checked and confirmed/signed by the customer.

Warranties

A customer accepting a recommended Bed Bug Management Strategy typically expects that elimination will be achieved. Accordingly, where practical, the PMP should offer a written service warranty. However, any contractual obligation should contain reference to customer and PMP responsibilities and limitations within the Bed Bug Management Strategy. These would include:

- The cooperation of the customer during treatment,
- Circumstances encountered during the implementation of the plan,
- The quality of ongoing housekeeping,
- The nature of the room itself, i.e. whether or not it is ‘Bed Bug friendly’,
- The level of ongoing maintenance,
- The potential risk of Bed Bug reintroduction (especially in apartment complexes if the adjoining units cannot be inspected).

Definitions

Bed Bug Foundation. European not-for-profit charity dedicated to the provision of awareness, communication and education for all matters related to Bed Bugs. www.bedbugfoundation.org

Bed Bug/s – Either the Common Bed Bug (*Cimex lectularius*) or the Tropical Bed Bug (*Cimex hemipterus*).

Bed Bug Elimination – Following the inspection and treatment undertaken according to the ECoP, no living Bed Bugs were detected in the final inspection.

Bed Bug Friendly – Any item, material (e.g. wood, chipboard, cane, unsealed brick work, etc.) or dwelling that contains numerous cracks and crevices and provides a multitude of Bed Bug hiding places.

Customer – An individual, business or organisation that employs a PMP to undertake a Bed Bug treatment.

Control – In the context of this ECoP, primarily implies the elimination of a Bed Bug infestation. In some contexts, control also includes Bed Bug management and prevention.

CoSHH – Control of Substances Hazardous to Health. A UK regulation applicable to applying pesticides, in accordance with the Health and Safety at Work Act 1974.

ECoP – Code of Practice, i.e. this document.

CPD – Continuing Professional Development

Fumigation – The process of using fumigants, which are gaseous insecticides. Due to the highly toxic nature of fumigants, they can only be used by PMPs with a fumigation licence. Fumigation is rarely undertaken for Bed Bug control at the site of the infestation.

Guest – In the context of this ECoP, the term is used for any individual staying within any form of accommodation, excluding those privately owned (i.e. homes, units).

Hotel – In the context of this ECoP, this is a generic term used for any level of accommodation, excluding those privately owned (i.e. homes, units).

Hotelier – In the context of this ECoP, any manager, administrator or owner of short- and medium-stay accommodation: for example, hotels, motels, guest houses, student lodgings, backpackers, caravans and cabins in caravan parks, B&Bs, landlords, etc., excluding those privately owned (i.e. homes, units).

Housekeepers – Includes staff responsible for hotel maintenance and cleaning.

IPM – Integrated Pest Management is a multidisciplinary approach to pest management with the main aim of maximising the control of insect infestations by the use of multiple methods. IPM is based on the proper identification of the pest, knowledge of the pest's ecology, non-chemical means of control and the judicious use of insecticides.

MSDS – Material Safety Data Sheet.

PMP – Pest Management Professional: A person qualified to undertake pest management services and who undertakes a professional Bed Bug treatment.

Residual Application – The process of applying insecticide to a surface such that an insect will come into contact with the insecticide when it walks on the treated surface.

SPs – Synthetic pyrethroid insecticides.

Topical Application – The process of applying insecticide directly at the insect (as opposed to 'residual application').

Further Reading

Gangloff-Kaufmann.
Pinto, Cooper, Kraft.
Naylor and Boase.
A CODE OF PRACTICE For the Control of Bed Bug Infestations in Australia
www.bedbug.org.au

The development of this code was made possible by the dedication and support of:

Bed Bug Foundation is a not-for-profit charity, dedicated to raising awareness of Bed Bug management through improved communication and education programmes.

The Foundation coordinates research fellows, together with the pest management industry, accommodation providers and home owners, to create, deliver and maintain professional standards.

Awareness

- Improve social understanding of this exposure pest
- Necessity to prevent and monitor potential activity
- Explain biology, life cycle and behaviour

Communication

- Deliver technical and service updates
- Provide industry and stakeholder interactive facilities
- Utilise technology to raise awareness and education standards

Education

- Defined and structured qualification process
- Integrated Pest Management for the 21st century
- Continuing Professional Development (CPD)
- Using technology to deliver and maintain service skills

www.bedbugfoundation.org

It's a bigger bug than you think...

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