



Chartered
Institute of
Environmental
Health



Pest Control Procedures Manual

Cockroaches

April 2013

Contents

INTRODUCTION	3
IDENTIFICATION AND BIOLOGY	4
Identification	4
Biology	5
Public health significance	6
INSPECTION AND ASSESSMENT	8
Preparation	8
Individual domestic property	8
Block or larger commercial property	8
Inspection	9
Evidence of cockroaches	9
Structure	10
Sanitation and hygiene	10
TREATMENT METHODS	11
Non-chemical methods	11
Chemical methods	12
Treatment considerations for the German cockroach	14
Treatment considerations for the Oriental cockroach	14
TREATMENT PROCESSES – DOMESTIC PROPERTIES	16
Infestation not present	16
Uncertain conclusion	16
Infestation confirmed	17
Method of treatment	17
Second or subsequent visits	18
Completion	18
TREATMENT PROCESSES - BLOCK OR LARGER COMMERCIAL PROPERTIES	19
Infestation not present	19
Uncertain conclusion	19
Infestation confirmed	19
Method of treatment	20
Second or subsequent visits	20
Completion	21
DISPOSAL OF INSECTICIDES	22
Legal background	22
Methodology: spent insecticide, waste packaging and contaminated PPE	22
Methodology: excess, out of date and obsolete unusable stock	22
STORAGE OF INSECTICIDES	23

1.0 Introduction

Cockroaches are primitive insects whose origin can be traced back through the fossil record for at least 200 million years. There are approximately 4,000 species of cockroaches worldwide – though only approximately 50 are regarded as pests. Those species which are classed as pests originated in tropical countries, but now thrive in countries with more temperate climates, having been distributed by international travel and trade. The German cockroach (*Blattella germanica*) and the Oriental cockroach (*Blatta orientalis*) are the most common species in the United Kingdom and Northern Europe.

Cockroaches are indiscriminate, omnivorous feeders and can gather together in large numbers in a suitable environment. This behaviour brings them in contact with numerous pathogens, such as those causing food poisoning and wound infections. They are common in commercial premises associated with the production or handling of food, as well as in public buildings and domestic premises, for example apartment blocks. Cockroaches are therefore an obvious public health concern and need to be effectively controlled.

Cockroaches are gregarious and nocturnal. They spend the daytime hours hiding in cracks and crevices around sources of food and water such as sinks, drains, cookers, the backs of cupboards and in refrigerator motor compartments. Some species favour complex pipe work systems and service ducts in larger buildings, which can make their control all the more problematical.

Poor sanitation and hygiene, structural disrepair and poor housekeeping contribute to large populations of cockroaches and therefore their successful control must be based on Integrated Pest Management. A thorough inspection of the entire premises to identify the species and define the extent and source of infestation is essential. This information will dictate the nature and extent of the treatment - which may include the use of insecticides, proofing and trapping, as well as improvements in structure, sanitation and hygiene.

This manual is therefore intentionally prescriptive, but it does not intend to dictate the methods by which Pest Control Technicians organise their work, if the same level of service and safety is achieved - for example, the use of computerised records or ISO accredited quality systems.

It is hoped that by clearly stating the minimum requirements that a Pest Control Technician should take into account when conducting any cockroach treatment, that consistent standards can be achieved throughout the industry, allowing it to develop and improve for the future.



2.0 Identification and biology



Blattella germanica



Blatta orientalis

It is a legal requirement under the Protection of Animals Act 1911 (as amended) that insects are suitably identified before a pesticide treatment can take place. Therefore, the initial risk assessment conducted as part of any pest control treatment must properly identify the insect pest species (using an appropriately qualified entomologist if necessary).

2.1 Identification

Cockroaches are medium to large sized insects in the order Dictyoptera. They are oval, flat-bodied, dark coloured, with chewing mouth parts, three pairs of legs and usually two pairs of wings. The cockroach is a dorso-ventrally flattened insect, meaning it looks flatter when viewed from the side compared to its shape when viewed from above. The head is orientated in a downward-facing position and from above is largely covered by a prominent pronotum (the dorsal surface of first thoracic segment just behind the head). Well developed compound eyes and long thread-like antennae are found on the head. The two pairs of wings are differentiated with the tegmina (forewings) being leathery and serving to protect the fan-shaped hindwings, which are the primary flight wings. The wings show mainly longitudinal venation, but are rarely used for flight.

The cockroach species commonly found in the United Kingdom are:

German cockroach (*Blattella germanica*)

Adults are 13-16mm long and light brown in colour with two dark almost parallel longitudinal stripes on the pronotum. The female is darker than the male with a broader abdomen.

Nymphs are smaller, wingless and have a pale stripe (on at least the second and third thoracic segments in first instar nymphs) running lengthwise down the middle of the darker brown body. Later instars have two dark longitudinal stripes on the pronotum.

Oriental cockroach (*Blatta orientalis*)

Males are approximately 25mm long and females are approximately 32mm long. Both sexes are shiny and very dark brown, nearly black in appearance. Early stage (instar) nymphs may be reddish brown and similar in appearance to the female, but smaller and wingless.

The wings have a distinctive shape. The male wings cover two thirds of the abdomen, whereas the wings of the female are vestigial (short).

American cockroach (*Periplaneta americana*)

Adults are 34-53mm long, reddish brown in colour and fully winged. Male wings extend beyond the tip of the abdomen, whereas female wings do not. There is a pale brown to yellowish band around the edges of the pronotum.

Australian cockroach (*Periplaneta australasiae*)

This species closely resembles *Periplaneta americana*. Adults are 25-35 mm in length, reddish brown in colour and fully winged, with a yellow to pale brown band around the pronotum and a yellow streak on the outer edge of the base of the front wings. Late instar nymphs have pale yellow markings on the lateral margins of the thorax and abdomen.

Brown-banded cockroach (*Supella longipalpa*)

The adult is small (11-15mm in length), light brown in colour and is often mistaken for *Blattella germanica*. Females are darker than the males and possess a broader, rounder abdomen. The male wings cover the whole abdomen, whereas female wings do not. In both sexes, the wings have pale markings across the upper third. Nymphs have pale brown bands across the body.

2.2 Biology

Cockroaches are scavengers and indiscriminate, omnivorous feeders. A cockroach will survive on almost any organic matter ranging from faeces and soiled septic dressings to food intended for human consumption. They can also feed on non-food items including glue, leather, book bindings and soap, as well as other cockroaches.

They are nocturnal and therefore activity peaks during hours of darkness as they search for food and water. During the day they remain concealed in narrow, tight cracks and spaces where surfaces touch them on both sides - unless they are over crowded where all developmental stages are located together. Cockroaches tend to congregate in corners and generally travel along the edges of walls or other surfaces.

Cockroaches also produce an aggregation pheromone, which is a chemical messenger to other cockroaches of the same species, who respond by being attracted to the source of the pheromone. As this pheromone is present in cockroach faeces, cockroaches will also be attracted to areas previously contaminated by other cockroaches.

The development of the cockroach is affected by food quality, humidity, temperature and day length. The females of those cockroaches classed as pests all produce purse shaped egg cases or oothecae, which contain eggs that hatch inside the case from which nymphal cockroaches emerge. Egg cases are deposited or glued onto a surface prior to the eggs hatching.

Cockroaches exhibit incomplete metamorphosis i.e. the nymph resembles the adult. Nymphs emerge from the egg case and over a period of up to one year go through 5-12 moults, each time producing a larger nymph, which eventually moults into the adult stage. Once they achieve adulthood they are capable of breeding 2-3 weeks later.

Cockroaches are prolific breeders; for example, the German cockroach is capable of producing 20,000 offspring within a 12 month period. Some female cockroach species can also produce young without mating (parthenogenesis).

German cockroach (*Blattella germanica*)

Mated females produce an egg case that is attached to the end of the abdomen (unlike the Oriental cockroach) for up to a month before being dropped approximately 1 to 2 days before the egg hatches. The female will attempt to conceal the cases near a food source, which can be some distance from other cockroaches. Egg cases are thick-walled and approximately 8mm long, brown in colour and contain 30 to 40 eggs. First instar nymphs hatching from eggs are less than 3mm long and wingless, and easily infest tiny cracks and crevices in the immediate area.

Nymphs develop through 5 to 7 instars before becoming adults. Development is greatly affected by temperature, for example at a temperature of 25°C, maturity is reached in 3.5 months, however this can vary from 74 to 85 days. Adults live approximately 8.5 months at 25°C. There may be four generations per year and eggs are laid more frequently during warm weather. A female may produce 4 to 8 egg cases at approximately 1 month intervals.

Oriental cockroach (*Blatta orientalis*)

The female deposits an average of eight egg cases during its lifetime. The thick-walled egg cases are dark red-brown in colour and approximately 9mm long. Each case contains 16 nymphs which hatch in approximately six weeks, but this period may be extended to as long as 300 to 800 days in cool conditions. In this situation, the egg case represents a biological time bomb waiting to hatch and continue an infestation.

The female carries the egg case for about 30 hours and then drops or attaches it to a protected surface near a food source. They may then be covered over with debris. Nymphs progress through 7 to 10 instars before reaching maturity, a process which takes 10 months to 2 years depending upon temperature and food supply. With each successive moult the wings, antennae and cerci develop and the nymph becomes progressively more like the adult. Adults live approximately 4.5 months at 25°C. Each female and her offspring can produce nearly 200 cockroaches in one year. However, the slow proliferation of this species will limit its success where reasonable standards of hygiene exist.



Periplaneta americana



Supella longipalpa



Periplaneta australasiae

American cockroach (*Periplaneta americana*)

This species is not well established in United Kingdom, as it is not as cold tolerant as *Blatta orientalis* and *Blattella germanica*, therefore typical infestations are found in ports, where it is introduced via ships. It will inhabit food preparation and storage areas, and can also be found around steam/heating pipes and in areas of high temperature/humidity i.e. greenhouses, zoos, large centrally heated humid environments etc.

The female deposits oothecae a few hours or up to 4 days before the first instars emerge. The ootheca, containing 10 to 15 eggs, is dropped or glued to a suitable surface, usually in a pocket of high humidity near to a food source.

Australian cockroach (*Periplaneta australasiae*)

It is not yet widely established in the United Kingdom, as it requires hot, moist conditions to survive. Therefore it can be found in greenhouses, where potted plants may be a source of infestation, and pet shops - particularly those with large numbers of heated fish tanks.

The female deposits the egg case containing around 16 eggs which hatch after a period of approximately 80 days.

Brown-banded cockroach (*Supella longipalpa*)

The brown-banded cockroach needs hot conditions to survive, preferring temperatures in excess of 27°C. Whilst infrequently encountered, it is becoming more common as a pest in the United Kingdom and is typically found in light switches, electrical appliances, motor housings, etc.

2.3 Public health significance

The presence of cockroaches is a significant public health concern. Cockroaches foul their environment with faeces, regurgitated food and taint materials with their characteristic odour. Cockroaches contaminate food and food preparation surfaces directly as they move from contaminated material to food indiscriminately or by transmission in the insect's faeces. They are therefore implicated in the transmission of pathogenic viruses, bacteria, fungi and moulds - including food poisoning (i.e. *Salmonella* sp., *E. coli*, *Clostridium* sp.), dysentery, gastroenteritis, typhoid, poliomyelitis, hepatitis and tuberculosis.

Their role as mechanical vectors is significant because:

- The life cycle of the cockroach does not depend on the seasons and therefore is able to transmit disease throughout the year
- Their preference for warm, humid, temperature controlled environments, such as kitchens or hospitals, enhances their contact with pathogenic organisms
- Nymphs share the same habitat, behaviour and food requirements as the adult and are therefore equally efficient vectors
- Some species of cockroach (i.e. *Blattella germanica*) mainly inhabit indoor or enclosed environments, which increases the risk of contact with humans
- Being nocturnal, their presence can be difficult to identify
- As many cockroach pest species crawl rather than fly, the time spent in contact with contaminated material increases

The air within infested premises is likely to contain fragments of cockroach exoskeletons and excrement, which can cause allergic reactions, especially amongst sensitive individuals, who are exposed by inhalation or ingestion. Therefore, because residual allergens can remain as active contaminants for some time following a treatment, a thorough cleaning regime should be carried out afterwards.

The psychological impact of a cockroach infestation should also not be overlooked. Those affected by cockroaches could potentially suffer high levels of anxiety and stress resulting from health concerns, feelings of vulnerability and/or embarrassment. The latter should also be considered by the Technician as this may result in underreporting of cockroach activity – particularly in residential properties.



3.0 Inspection and assessment



3.1 Preparation

An established cockroach infestation is often difficult to control because it is likely that the infestation will be widely distributed in difficult to reach harbourages. Successful control of cockroaches is therefore complex and depends on tailoring control measures to the species concerned. The ability of the cockroach to breed quickly only serves to compound this problem, as any treatment must eliminate a high proportion of the population to avoid a further increase in numbers. Integrated Pest Management is essential, as spot treatments will be ineffective for all but small and localised infestations.

Accordingly, an inspection to ascertain the presence, species and dispersion of a cockroach infestation is essential and must be conducted methodically. The Technician will need unobstructed access to all areas of the infested room(s) / areas. In domestic properties, it is particularly important to ensure the occupier is completely aware of the level of intrusion into their home.

The Technician will also require suitable personal protective equipment, the type and nature of which will depend upon whether the Technician is assessing a potential cockroach infestation or conducting an insecticide treatment. Any personal protective equipment must therefore be provided in accordance with the insecticide manufacturer's instructions and following a suitable and sufficient risk assessment. As a minimum, coveralls, nitrile gloves and (dependant upon the insecticide formulation used) a suitable respirator should be provided.

One of the most common reasons for ineffective treatments is the failure to identify all areas of cockroach activity. Technicians must therefore be given adequate time to conduct the inspection. Not only will this increase the chance of a successful treatment, it will also provide an indication as to the potential time required to undertake the treatment itself.

3.2 Individual domestic property

The Technician should ascertain where cockroaches have been seen and/or any evidence of activity. The Technician should also attempt to determine how the cockroaches gained access to the home as other areas/services may need to be treated. Areas that are unsanitary and/or are cluttered should be examined and the occupier questioned about any previous control attempts, levels of activity and the reasons for the conditions found at the property – if known.

3.3 Block or larger commercial property

Once cockroaches gain access to high density housing or multi occupation properties (i.e. hotels) they can quickly become established and spread throughout the building. If only one area is left untreated, this can act as a reservoir for the re-infestation – particularly any remaining oothecae. Similar initial questions about the distribution of complaints and sightings should be asked. However, if possible, it is important that housekeeping / maintenance staff are contacted as they may have more detailed knowledge about an infestation than management.

In all cases, it is useful to obtain a plan of the building so that the Technician is familiar with the layout of the building. Rooms/ areas adjoining those to the infested area should be inspected. Sufficient details must be taken to ensure accurate records can be made, noting the areas where evidence of activity has been found.

Based on the evidence from the survey confirm the existence and extent of any activity and record the details. Details of contributory factors should also be recorded.

The Technician must consider the property as a whole, and not individual dwellings, when making any assessment. Dependant upon the size and nature of the property and the extent of any activity, consideration should be given to obtaining Supervisor/ Manager involvement as a number of agencies may need to be involved in the treatment to secure control from the outset. Such agencies may include environmental health officers, housing officers or representatives of any other client organisation who manages the property and representatives of the occupants of the property.

When treating larger properties and/or larger infestations, it is advisable that a Supervisor/Manager compiles a detailed management plan, which can be provided to all parties to assist in the coordination of resources and assessment of the treatment. Plans should be based on the criteria previously stated.

3.4 Inspection

The aim of the inspection is to provide sufficient information for the Technician to assess the dispersion and severity of the infestation so the treatment can be planned accordingly. Known harbourage sites should be inspected including those highlighted in the next section. Sufficient details must be taken to ensure accurate records can be made, noting the areas where evidence of an infestation has been found. A room/site plan should be drawn showing the location and degree of any activity. Adjoining rooms and spaces (either side, above and below) should also be similarly inspected.

Night inspections may be required and red light torches used - in rare occasions. The inspection may require the use of crawling insect traps (see next section) and/or the use of pyrethroid-based aerosols sprayed around and into potential hiding places will flush out cockroaches, although this can have limited effect on the Oriental cockroach.

3.5 Evidence of cockroaches

The number of cockroaches observed is usually a small percentage of a much larger population. Infestation can occur when cockroaches are carried into premises on raw materials or packaging, or gain entry to the premises through structural defects, damaged drains/drain covers, ventilation openings and under doors. Evidence of cockroach activity includes:

(i) Marks

Large infestations of cockroaches may be completely hidden during the day but the marks left by cockroaches are evident on surfaces. These brown, irregular streaks are liquid excreta produced by cockroaches when water is readily available. They are usually most noticeable near cockroach harbourages.

(ii) Odour

Large populations of cockroaches exhibit a characteristic foul odour, which is produced by faeces and salivary/abdominal gland secretions, or by dead insects. The odour can be easily detected in heavily infested areas.

(iii) Harbourages

German cockroaches especially favour the following locations:

- In kitchens, behind and under ovens, sinks and kitchen units
- Around water pipes and radiators, particularly where pipes pass through walls
- Inside cupboards, under tables, behind wall tiles
- In kitchens and catering areas, where they can be found inside plugs and the sockets into which 3-pin plugs fit
- Ventilation and service ducts

(iv) Oriental cockroaches especially favour the following locations:

- Cellars, pipe/heating ducts, store rooms, boiler houses, oven footings and floor cavities
- Brickwork and cracks in concrete
- Outbuildings, drains, rough ground, refuse areas and rubbish tips

(v) Live cockroaches

- Live cockroaches can be detected using a torch shone into harbourages or flushed using an aerosol pyrethroid spray. (Care must be taken to avoid contact with the propellant and any naked flames)
- A night inspection may identify areas where cockroaches are foraging
- Crawling insect traps placed overnight may produce better results than a visual night inspection





3.6 Structure

Improvements of the structure of a building to prevent cockroach ingress will help prevent infestation as well as assist an existing treatment. The inspection should therefore aim to find evidence of any defects or damage to the structure and fabric of the building that would provide harbourage for a cockroach population. For example, cracks and crevices around kitchen cabinets, baths, water and plumbing pipes; cracks on floors, walls and exterior windows and doors can eliminate most hiding places and help reduce the cockroach population. Dependant upon the species of cockroach involved an inspection of the drainage system may also be required to ascertain any areas of harbourage and/or defects that would impact upon the distribution of the infestation or the effectiveness of the treatment.

Improved structural design and/or modification can also help to reduce cockroach entry and establishment.

3.7 Sanitation and hygiene

Improved sanitation will not reduce an existing cockroach population, but it is an important factor in the prevention of an initial cockroach infestation and improved hygiene will greatly reduce the available resources to an existing population. The Technician should therefore aim to identify any areas that provide cockroach harbourage and resources, including:

- Food waste/particles on working surfaces, shelves, cupboards or floors
- Unwashed dishes
- Unclean areas under refrigerators, ovens, sinks and furniture
- Poor storage of foodstuffs (including pet food)
- Unclean pet litter trays
- Uncovered food items in refrigerators and/or cupboards
- Overflowing, unclean waste bins/containers
- Accumulations of refuse and/or soiled items
- Available sources of water e.g. leaking taps and pipes, toilet cisterns, wash basins, waste water traps, aquaria, dampness/condensation and water storage
- Defective / blocked toilets, sinks and baths
- Defective / blocked sewers and drains
- Unnecessary and/or unkempt storage of waste items i.e. corrugated cardboard boxes, piles of paper, newspapers, magazines and clothing

Based on the evidence from the inspection, confirm the existence of any infestation and record the details.

4.0 Treatment methods

Non-chemical options should be considered as management tools to reduce the overall cockroach population, as complete elimination of an infestation is unlikely unless insecticides are used. The following treatment methods should be employed as part of an Integrated Pest Management programme, and the reliance on a single product/application method avoided. A systematic approach is essential based on the evidence gathered during the inspection. Ideally, the treatment should start at the periphery of the infested area(s) and work towards the source of the infestation.

4.1 Non-chemical methods

Prevention is essential to successful cockroach control. Preventive measures will minimise cockroach invasion of buildings and eliminate or greatly reduce availability of food, water, and shelter.

Structure

Improvements in the structure of a building will help prevent initial cockroach ingress as well as assist an ongoing treatment. Filling cracks and crevices can eliminate most hiding places and help reduce the cockroach population. Improved structural design and/or modification can also help to reduce cockroach entry and establishment, as well as minimise the accumulation of refuse/debris and facilitate cleaning.

For example:

- If possible, seal any cracks of 1/8 inch or more in foundations and exterior walls
- Examine the seal around air conditioners, doors, windows, and other structural openings to ensure no gaps permit cockroach entry
- Refuse should be stored in durable, securely covered containers
- Repair cracks and holes in floors, walls, and ceilings and seal openings around plumbing fixtures, furnace flues, electrical outlets, between window sills and walls, and along kick boards or ceiling mouldings
- Repair any leaks to water and/or central heating systems
- Repair defective/blocked drainage

Sanitation and hygiene

Whilst cleaning alone will not reduce an existing cockroach population, it is an important factor to deny the infestation the resources it needs to sustain. A high standard of hygiene will help prevent re-infestation and is important to:

- Deny access to food and water, which will increase cockroach activity and directed movement improving the opportunity for the insects to encounter insecticides
- Deny access to harbourages in buildings or equipment which would otherwise provide hiding places and breeding sites
- Improve ventilation and reduce dampness, which will accelerate dehydration of the insects and interfere with the operation of antennal chemoreceptors

Improved sanitation and hygiene must form part of a comprehensive Integrated Pest Management programme to remove preferred cockroach harbourages and resources. In conjunction with structural repair and proofing, improved sanitation will also stress cockroaches, making the insect more susceptible to insecticides.

Practices and procedures

Infestations may be introduced inadvertently for example, egg cases or adults in incoming laundry, on raw materials, in crates and packaging, or arise as the insects enter buildings via such routes as drains or refuse chutes. Entry and establishment of cockroaches can be prevented by surveillance of incoming materials, such as food boxes, drink cartons, appliances, furniture and clothing.

Trapping

The use of crawling insect traps or monitoring devices will not eliminate an infestation alone and must also be used as part of an Integrated Pest Management programme. Several types of cockroach traps are commercially available, which rely on food attractants and/or pheromones to attract all types of cockroaches. The pheromones aim to attract males ready to reproduce as well as females in search of nest sights and nymphs which are looking for other cockroaches.





The effectiveness of traps depends on their design and placement. Traps should be placed where cockroaches have been seen, or believed to be active, and sited against a vertical surface, preferably a corner. Traps can be labelled with an arrow to indicate their orientation, which will help to demonstrate the direction the cockroaches are entering the trap – thereby giving further indication as to the characteristics of the infestation.

The advantage of traps is that they are not toxic; the pheromones are not detectable by humans and pose no hazard to food, people or pets.

The use of traps will allow the Technician to ascertain where cockroach activity is greatest, thereby reducing the risk of incorrect application of insecticide, which would limit the effectiveness of the treatment.

4.2 Chemical methods

Choice of formulation

The type of formulation selected for the treatment will be dependent on its usage patterns. For example, dusts can be used in areas occupied by electrical equipment and/or wall voids if cockroaches are penetrating such areas, whereas liquid formulations can be utilised in more obvious locations. However, as part of an Integrated Pest Management programme, reliance should not be placed on one product or formulation.

Application and use of insecticide

Only approved products must be used in accordance with manufacturer's instructions.

The insecticide must be directed to harbourage sites (if accessible) and areas of activity identified in the inspection. Suitable application methods should be used in accordance with the manufacturer's instructions. The use of extension nozzles allows the insecticide to be accurately applied to areas where cockroach activity is believed to exist, to ensure that the path of feeding and moving to and from harbourage crosses treated surfaces.

Surface residual sprays

Effective treatment depends upon the selection and thorough application of a suitable insecticide. Many insects and egg cases are well hidden; therefore, the insecticide must be placed at and around these harbourages and maintained over the developmental period of the particular species. To control an infestation the insecticide should ideally persist until all egg cases have hatched, but continued immigration may demand routine treatments.

Residual surface sprays are generally easy and fast to apply. The application should aim to wet or dampen the treated surface rather than to saturate it. When treating for cockroaches, pay particular attention to cracks and crevices and other unexposed areas.

Be careful when using oil-based insecticides; they may stain, dull or damage certain floor tiles, linoleum, painted surfaces, plaster, plastics, houseplants, carpets and carpet backing. Oil-based sprays can also create a fire hazard when used near an open flame (pilot lights, gas stoves, furnaces). Water emulsions may stain wallpaper, light-coloured carpets, draperies or other materials. They can short out electrical circuits, and are inferior to oil-based sprays on impervious surfaces such as glass or metal. Wettable powders must be frequently agitated in the spray tank, but they leave the most active residues, especially on porous surfaces such as unpainted wood, mortar or concrete block.

Consideration for the use of surface sprays must also include the possibility of the insecticide being washed away (i.e. on kitchens or swimming pools) thereby reducing the effectiveness of the treatment.

Whilst there may be an initial substantial kill of adults and nymphs, used on its own, space spraying techniques are unlikely to adequately control a cockroach infestation. However, the technique can be useful (using pyrethroid insecticides) to flush cockroaches from their harbourages and over surface deposits of insecticide. As previously stated, a flushing technique is generally less effective against *Blatta orientalis*.

Baits

Baits offer the opportunity for controlled placement of insecticides formulated in attractive food bases. When placed in infested areas, the insects feed on the baits picking up a lethal dose of insecticide in the process. They can be integrated with surface or space spray treatments, or used in areas that cannot be effectively, or safely, sprayed or dusted.

Baits also offer the opportunity for continuous control of cockroaches over extended periods, and give best results in buildings where there are few alternative food supplies. The Technician should follow the manufacturer's instructions to ensure a sufficient amount of bait is suitably placed, using a suitable bait station if necessary, to adequately treat an area where cockroaches are to be controlled. Bait stations should be examined frequently to ensure the bait remains fresh and has not depleted.

The application of numerous discrete droplets of bait is better than one large amount of bait. Similarly, using numerous bait stations will help reduce the aggregation among cockroaches and allow increased access to the bait. The location of bait stations is equally important as they must be located close to harbourage or on known routes where cockroaches are likely to come into contact with the insecticide. Moreover, if bait is located on treated surfaces, or if the bait is contaminated with a liquid insecticide, this can reduce the amount of bait consumed.

The advantage of these products is that the Technician is able to apply them with a minimum of preparation. However, baits take longer to work, so it may take several days before dead cockroaches are seen. Furthermore, the effectiveness of baits is reduced by rainfall or other contamination by water.

Dusts

Insecticide dust should be considered as a supplement to other treatment methods, as whilst they generally have longer residual action, they are ineffective once they become damp. Dusts are useful in cockroach control because they can be placed deep in cracks, crevices and wall voids, under refrigerators and furniture, around pipes, tunnels and conduits; on very smooth or very rough surfaces; and in other places not treatable with other formulations. The treatment of harbourage voids is particularly important to control an Oriental cockroach infestation. Enclosed voids can be treated with insecticidal dust, whereas small voids and crack and crevices can be treated by surface spraying.

Care should be taken when treating large surfaces because dust can leave unsightly deposits. Furthermore, cockroaches avoid heavy deposits and will not walk through thick layers of the insecticide.

Aerosols

Aerosol insecticides may or may not have residual activity. A non-residual spray alone may not provide a high degree of control, but when used with a residual surface spray or dust, a high degree of control can be achieved. Non-residual aerosols are useful for determining the location and extent of a cockroach infestation when used as a flushing agent or to force cockroaches to evacuate and move across previously treated surfaces. Residual aerosols should be used in the same manner as other types of residual sprays.

Inorganic insecticides

Boric acid, silica aero gel and diatomaceous earth are examples of inorganic insecticides that can be used effectively for cockroach control in domestic property. These chemicals are low in toxicity to humans and pets, and retain their effectiveness long after initial application. Usually, a longer period of time is required to achieve control, but reapplications are greatly reduced. The product should be applied in a light film to cracks and crevices and other cockroach harbourage. Avoid applications to moist or damp areas, especially when using silica aero gel or diatomaceous earth. Because of the limitations in the direct application of the product, inorganic insecticides should use as part of an Integrated Pest Management programme using other insecticides/formulations.





Insect Growth Regulators (IGRs)

Some synthetic compounds mimic natural hormones found in insects. When an IGR is applied to cockroaches during their early developmental stages, they cause nymphs to moult into sterile adults. IGRs have low human toxicity, but have long residual effectiveness. For best results they must be applied along with residual insecticides to eliminate existing adults or other non-susceptible stages. Overall population reduction with IGRs usually takes several months.

The cockroach population is controlled over time as the older individuals die and no further young are produced, therefore population reductions are usually apparent within three to six months after application. For faster and longer lasting results, IGRs should be used as part of an IPM programme using other insecticides/formulations. However, it must be noted that adult cockroaches exposed to IGRs are not adversely affected.

4.3 Treatment considerations for the German cockroach

An infestation of German cockroaches can establish itself very quickly throughout any building, but they show a preference for warm humid areas i.e. catering areas / kitchens, bathrooms and service areas. German cockroaches are rarely found outdoors, and in contrast to the Oriental cockroach, they are good climbers, being able to climb vertical glass or tiled surfaces. Severe infestations may spread to other parts of buildings and therefore they may also be seen in attics, wall voids, crawl spaces, foundation cracks and refuse areas.

Therefore treatments, and application methods, should focus upon the locations that German cockroaches especially favour, including:

- In kitchens, behind and under ovens, sinks and kitchen units
- Around water pipes and radiators, particularly where pipes pass through walls
- Inside cupboards, under tables, behind wall tiles
- In kitchens and catering areas, where they can be found inside plugs and the sockets into which 3-pin plugs fit
- Ventilation and service ducts

In addition to the traits exhibited by all cockroach pest species, the German cockroach is particularly successful because:

- The female lays a large number of eggs per case
- The female protects the egg case by carrying it until just before hatching
- There is a short development period to hatching and maturity
- The small size of the adult and nymph means the insect readily conceals itself

These specific traits must be considered carefully to ensure the treatment is tailored to ensure maximum impact upon the infestation.

4.4 Treatment considerations for the Oriental cockroach

In contrast to the German cockroach, the Oriental cockroach prefers damp, cool and dark areas. Accordingly, populations of Oriental cockroaches can build to large numbers in buildings with service ducts and complex plumbing, as they migrate through buildings in search of food. Oriental cockroaches do not fly and are poor climbers on smooth surfaces, which can limit their distribution within a building. However, they can climb on rough surfaces, for example concrete ducting or lift shafts. Oriental cockroaches are also often found outside buildings, in drains, gardens, sewers, external brickwork etc. - a factor which should be remembered when controlling them.

Therefore treatments, and application methods, should focus upon the locations that Oriental cockroaches especially favour, including:

- Cellars, pipe/heating ducts, store rooms, boiler houses, oven footings and floor cavities
- Brickwork and cracks in concrete
- Outbuildings, drains, rough ground, refuse areas and rubbish tips

Dependant upon temperature and humidity, adult Oriental cockroaches will remain close to preferred harbourage, whereas nymphs are more likely to move to new harbourage, depending upon the distance. Consequently, identification of harbourage and aggregation sites is essential in their control.



5.0 Treatment process - domestic properties



As previously indicated, sufficient prior planning is essential to a successful treatment. In deciding the approach the Technician will take to control the infestation, it may be helpful to provide a plan to how the treatment will be undertaken. The treatment methods contained in the previous section, in addition to the information contained in the following sections, will be of assistance in this process.

5.1 Infestation not present

Explain to the occupier that there is no evidence of an infestation and reassure the occupier that a revisit can be arranged if any activity reoccurs.

- (i) As a minimum, the following details must be recorded:
- (ii) Details of the premises (including any specific job reference);
- (iii) Name of Technician who attended;
- (iv) The date of visit;
- (v) The areas surveyed;
- (vi) The result of the survey confirming that an infestation was not identified;
- (vii) Any other information that may be of relevance (for example, any previous history of infestation at the premises).

Close down the complaint making comments on the job sheet or electronic record.

5.2 Uncertain conclusion

If there is no evidence of any infestation and either the occupier will not accept the situation, or there are reasons that may give the Technician concern that an infestation may be present, then consideration must be given to either using monitoring devices and/or revisiting with Supervisor/Manager.

Provide information and advice to the occupier on improving standards of hygiene, housekeeping if necessary.

Inform the occupier that a revisit can be made within 2 to 3 weeks.

- (i) As a minimum, the following information must be recorded:
- (ii) Details of the premises (including any specific job reference);
- (iii) Name of officer who attended;
- (iv) The date of visit;
- (v) The areas surveyed;
- (vi) The evidence of potential infestation;
- (vii) The location, amount and type of monitoring devices;
- (viii) Any other information that may be of relevance (for example, any previous history of infestation at the premises).

Report circumstances to relevant Supervisor/Manager.

5.3 Infestation confirmed

The aim of the treatment is to achieve complete eradication of the infestation and therefore the plan should include:

- The findings of the inspection (including the species of cockroach involved, where they were evident, the degree of the infestation etc.)
- The treatment process itself including the integration of non-chemical means of control and the insecticides to be used
- Any instructions to be provided to the occupier for the treatment (including if and when they will need to vacate the premises) including covering of fish tanks, removing pets and ensuring children do not have access to treatment areas etc.
- Any requirement to inspect adjoining rooms (both vertically and horizontally)
- Any recommendations to the occupier, including housekeeping/hygiene improvements and structural proofing or improvements
- The requirements for follow up inspections and treatments

For Local Authorities, consideration of the need for enforcement action is required if conditions do not improve sufficiently to permit an effective treatment.

5.4 Method of treatment

Supplementing the plan, and before any treatment is applied, a full written on-site risk assessment must be carried out. As a minimum, the risk assessment should take into account the nature of the treatment as well as the presence of young children, pets and elderly infirmed people.

It is important to note that not all surfaces can be treated by all chemical and non-chemical means. The instructions on product labels should be carefully followed. Care should also be taken around electrical equipment and the use of water based insecticides and/or steam avoided.

The Technician should explain the nature of the treatment and any specific safety requirements to the occupier and provide an appropriately annotated (safety data sheet) advice sheet - highlighting the premises address, the date, what product has been used and what action to take in cases of an emergency.

Following the treatment, the occupier should be advised to undertake the following post treatment:

- Occupants should be encouraged not to re-enter the treated area until after the insecticide has dried completely. Manufacturer's instructions must be followed where any re-entry period is stipulated
- The occupier should be asked not to clean / vacuum treated floors for at least 10-14 days
- Ideally, the room should remain vacant until the Technician declares the area free of cockroaches in a follow up visit

As a minimum, the following information must be recorded:

- (i) Details of the premises (including any specific job reference);
- (ii) Name of Technician who attended;
- (iii) The date of visit;
- (iv) The areas surveyed;
- (v) The evidence of infestation, including any contributory factors;
- (vi) Relevant site information including the presence of young children, pets and elderly infirmed people;
- (vii) The location, amount and type of insecticide used (including suitable diagram);
- (viii) Any other information that may be of relevance (for example, any previous history of infestation at the premises);
- (ix) Proposed date of follow up visit.

Identify and survey any adjacent premises either immediately above or below or immediately to either side which may be 'at risk' of infestation. If this is not possible due to time or other constraints, record details of property numbers, street or block to identify them for future survey and treatment as necessary.

A revisit should be within a minimum of 7 days. In heavy infestations, several revisits will be required before complete control is achieved.





5.5 Second or subsequent visits

Carry out inspection of the affected area for evidence of cockroach activity. Inspection procedures should follow those stipulated earlier in this manual.

Confirm continued activity by visual verification of evidence of cockroaches as previously indicated.

Re-evaluate hygiene, housekeeping and structural standards within the premises.

If substantial changes have occurred that could affect the safety or success of the treatment, a new on site risk assessment should be completed. Similarly, if a different Technician attends the premises, than from the previous treatment, a record must be kept as to whether the Technician agrees with the on site risk assessment. Where the Technician disagrees with the assessment, a new on site risk assessment must be completed.

If cockroach activity remains

Extend inspection to other areas of the premises to verify that infestation is contained and extend treatment regime as required.

Retreat affected areas as appropriate following manufacturer's instructions. A record must be kept of all insecticide used when retreating any area.

As a minimum, the following information must be recorded:

- (i) Details of the premises (including any specific job reference)
- (ii) Name of Technician who attended
- (iii) The date of visit
- (iv) Any changes in the premises that could affect the safety or success of the treatment (completing a new on site risk assessment if necessary)
- (v) The evidence that the infestation still exists
- (vi) The degree of activity observed and the amount of new insecticide used
- (vii) The location, amount and type of insecticide used (including amendments to the site plan)
- (viii) The nature of any hygiene, housekeeping or structural works carried out or still outstanding
- (ix) Any other information that may be of relevance (for example, any previous history of infestation at the premises)
- (x) Proposed date of follow up visit

Explain nature of treatment, hygiene/ housekeeping/structural requirements and any safety requirements to occupier.

Estimate timing of next visit and inform occupier, this will generally be within 7 days.

If control has not been achieved after 3 visits, a revisit with Supervisor/Manager should be arranged and the control strategy examined and reassessed. Further discussions should also take place with the occupier to ensure that cockroach activity is not being inadvertently prolonged.

For Local Authorities, consideration of the need for enforcement action is required if conditions do not improve sufficiently to permit an effective treatment.

5.6 Completion

When no further signs of activity are observed or reported by the occupier explain the situation to the occupier and restate any outstanding preventative works or hygiene/ housekeeping issues that require attention.

Close down the complaint and maintain suitable permanent record of all notes, on site risk assessments, insecticide treatment records, copy letters and other relevant documents.

6.0 Treatment process - block or larger commercial properties

The methods of treatment discussed in the previous sections can be applied to block or larger commercial properties. Accordingly, this section highlights the processes to be applied when conducting treatments in these types of properties.

6.1 Infestation not present

Explain to the occupier(s) that there is no evidence of an infestation and reassure the occupier and/or owner that a revisit can be arranged if any activity reoccurs.

As a minimum, the following details must be recorded:

- (i) Details of the premises (including any specific job reference);
- (ii) Name of Technician who attended;
- (iii) The date of visit;
- (iv) The areas surveyed;
- (v) The result of the survey confirming that an infestation was not identified;
- (vi) Any other information that may be of relevance.

Close down the complaint making such comments on the job sheet or electronic record.

6.2 Uncertain conclusion

If there is no evidence of any infestation and either the occupier will not accept the situation, or there are reasons that may give the Technician concern that an infestation may be present then consideration must be given to either using monitoring devices and/or revisiting with Supervisor/Manager.

Provide information and advice to the occupier on improving standards of hygiene, housekeeping if necessary.

Inform the occupier that a revisit will be made within 2 to 3 weeks.

As a minimum, the following information must be recorded:

- (i) Details of the premises (including any specific job reference);
- (ii) Name of officer who attended;
- (iii) The date of visit;
- (iv) The areas surveyed;
- (v) The evidence of potential infestation;
- (vi) The location, amount and type of monitoring devices;
- (vii) Any other information that may be of relevance (for example, any previous history of infestation at the premises).

Report circumstances to relevant Supervisor/Manager.

6.3 Infestation confirmed

Notes will need to be comprehensive to manage the treatment. Consider the need for enforcement action if no cooperation is afforded to permit an effective treatment for the entire of the property. A coordinated approach of treatment and enforcement may be required to eliminate the infestation.

As a minimum, the following information must be recorded:

- (i) Details of each individual dwelling and/or common parts (including any specific job reference);
- (ii) Name of Technician who attended;
- (iii) The date of visit;
- (iv) Details of all areas surveyed;
- (v) The evidence of potential infestation, including any contributory factors;
- (vi) Relevant site information including the presence of young children, pets and elderly infirmed people;
- (vii) The location, amount and type insecticide used (including suitable diagram);
- (viii) Any other information that may be of relevance (for example, any previous history of infestation at the premises).

Report circumstances to relevant Supervisor/Manager. For Local Authorities, consideration of the need for enforcement action is required if conditions do not improve sufficiently to permit an effective treatment.





6.4 Method of treatment

Supplementing the plan, and before any treatment is applied, a full written on-site risk assessment must be carried out. As a minimum, the risk assessment should take into account the size and nature of the treatment as well as the presence of young children, pets and elderly infirmed people.

It is important to note that not all surfaces can be treated by all chemical and non-chemical means. All product labels should be carefully followed and care should be taken around electrical equipment and water based insecticides avoided.

Explain the nature of the treatment and any specific safety requirements to the occupier(s). Provide an appropriately annotated (safety data sheet) advice sheet to the occupier highlighting the premises address date what product has been used and what action to take in cases of an emergency.

Larger infestations represent a higher risk to the Technician and therefore PPE and decontamination procedures must be strictly adhered to avoid infestation of other parts of the property.

As a minimum, the following information must be recorded:

- (i) Details of the premises (including any specific job reference);
- (ii) Name of Technician who attended;
- (iii) The date of visit;
- (iv) The areas surveyed;
- (v) The evidence of infestation, including any contributory factors;
- (vi) Relevant site information including the presence of young children, pets and elderly infirmed people;
- (vii) The location, amount and type of insecticide used (including suitable diagram);
- (viii) Any other information that may be of relevance;
- (ix) Proposed date of follow up visit.

Identify and survey any adjacent premises either immediately above or below or immediately to either side which may be 'at risk' of infestation.

A revisit should be within a minimum of 7 days. In heavy infestations, several revisits will be required before complete control is achieved.

6.5 Second or subsequent visits

Carry out inspection of the affected area for evidence of cockroach activity. Inspection procedures should follow those stipulated earlier in this manual.

Confirm continued activity by visual verification of evidence of cockroaches as previously indicated.

Re-evaluate hygiene, housekeeping and structural standards within the premises.

If substantial changes have occurred that could affect the safety or success of the treatment, a new on site risk assessment should be completed. Similarly, if a different Technician attends the premises, than from the previous treatment, a record must be kept as to whether the Technician agrees with the on site risk assessment. Where the Technician disagrees with the assessment, a new on site risk assessment must be completed.

If cockroach activity remains

Extend inspection to other areas of the premises to verify that infestation is contained and extend treatment regime as required.

Retreat affected areas as appropriate following manufacturer's instructions. A record must be kept of all insecticide used when retreating any area.

As a minimum, the following information must be recorded:

- (i) Details of the premises (including any specific job reference);
- (ii) Name of Technician who attended;
- (iii) The date of visit;
- (iv) Any changes in the premises that could affect the safety or success of the treatment (completing a new on site risk assessment if necessary);
- (v) The evidence that the infestation still exists;
- (vi) The degree of activity observed and the amount of new insecticide used;
- (vii) The location, amount and type of insecticide used (including amendments to the treatment diagram);
- (viii) The nature of any hygiene housekeeping carried out or still outstanding;
- (ix) Any other information that may be of relevance;
- (x) Proposed date of follow up visit.

Explain nature of treatment, hygiene, housekeeping or structural requirements and any safety requirements to occupier(s).

Estimate timing of next visit and inform occupier(s), this will generally be within 7 days.

Larger properties may require several visits before treatment is successful. Revisits with a Supervisor/Manager may be required to ensure the ongoing success and coordination of the treatment. Further discussions should also take place with the owner and/or occupier(s) to ensure that cockroach activity is not being inadvertently prolonged.

For Local Authorities, consideration of the need for enforcement action is required if conditions do not improve sufficiently to permit an effective treatment.

6.6 Completion

It can often be difficult to determine when eradication has been achieved following a large infestation. Only through repeated treatments and follow up inspections, including one visit conducted at least 2-3 months after the initial course of treatments, can the treatment be considered completely effective.

Therefore, when no further signs of activity are observed or reported by the owner and/or occupier(s) explain the situation and restate any outstanding preventative works or hygiene/housekeeping issues that require attention.

Close down complaint and maintain suitable permanent record of all notes, on site risk assessments, insecticide treatment records, copy letters and other relevant documents.



7.0 Disposal of insecticides



7.1 Legal background

The safe disposal of insecticides and their containers is an important aspect of any Pest Control operation. The legislation covering this area is complex and all pest control operations are recommended to obtain suitable advice to ensure that their disposal routes are satisfactory.

Such disposal routes may exist within the resources of the Pest Control Technician or by the use of a third party. Whichever option is chosen, pest control operators are advised to satisfy themselves that all the necessary permissions, as required by the legislation, are in existence. For example, the disposal routes for spent insecticides are different from unused or obsolete products.

Under the Environmental Protection Act 1990 and the Pollution Prevention & Control Act 1999 local authorities must dispose of controlled and special waste in accordance with the Pollution prevention and Control (England and Wales) Regulations, the Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations 1991, the Environmental Protection (Duty of Care) Regulations 1991 and the Waste Framework Directive 75/442/EEC as enacted under the Waste Management Licensing Regulations 1994.

The Landfill (England and Wales) Regulations 2002 amended the Duty of Care Regulations to require transfer notes to identify waste by reference to the Consolidated European Waste Catalogue (EWC) 6 digit code, and also to restrict the types of waste accepted at certain sites.

Specific hazard classification and disposal advice is contained on each individual product safety data sheet. Pest Control Technicians must comply with this information when disposing any product. However, the following guidance provides an outline of the disposal method.

7.2 Methodology: spent insecticide, waste packaging and contaminated PPE

All interim waste should be stored in a suitable storage facility designed to the standard outlined in HSE Advice Sheet CS19 and handled in accordance with appropriate COSHH risk assessments.

All such waste arising from pest control activities should be consolidated in a systematic way, for example unused insecticide should be stored separately from other container wastes, and accumulated in such quantities as to allow economic and efficient disposal.

Such waste should be bagged for interim storage and transport in bags having the necessary strength to withhold the weight of the waste and provide resistance to puncture. 300 gauge clear polythene bags with plastic pull tags are recommended for this purpose.

It is a statutory requirement of the Control of Pesticides Regulations 1986 (as amended) to empty containers completely, which is important not only from a legal standpoint, but also from a waste reduction perspective. Therefore where containers have held hazardous classified formulations, and have not been completely emptied, then the container must also be treated as hazardous waste. Any waste residues should be disposed of legally. Similarly, it may be possible for the disposal operator to seek re-use, re-cycle or recovery options for products that are contained within a plastic bag within a bucket. These buckets should be emptied completely and stacked inside each other. The contaminated polythene bags should be packed into a separate sack.

Disposal operators cannot accept waste unless it is in accordance with the Regulations, and therefore consideration should be given whether a licensed carrier is required to transport the waste products; however such materials may be transported to the disposal operator in the pest control vehicle. Where Pest Control Technicians consider the use of a waste carrier, these must hold a valid waste carrier's licence.

The 'duty of care' obligation under Environmental Protection Act 1990 requires that all parties involved in any waste transfer must keep records (for example, transfer notes and waste descriptions) for at least 2 years.

7.3 Methodology: excess, out of date and obsolete unusable stock

The responsibilities and principles to be applied when disposing these products are the same as those described in the previous section, however the type and quantity of the waste product may require specific disposal. Pest Control Technicians are advised to seek suitable professional opinion from their nominated disposal operator as to the most viable disposal option for all such products.

8.0 Storage of insecticides

All pest control storage facilities should be designed to the standard outlined in HSE Advice Sheet CS19 and maintained in a clean and orderly condition.

All bulk pest control materials shall be stored in the pest control store immediately from the time they are delivered to the site, until they are needed by the operatives concerned. Materials may only be used by the operatives from original containers, or are in containers which are suitable and appropriately labelled. Waste materials may only be disposed of in the approved manner from the pest control store.

A detailed inventory must be maintained of all products and quantities, and the amount provided to each Technician. All insecticide received into the storage facility, and the quantities distributed to Technicians, must be recorded.





Chartered
Institute of
Environmental
Health