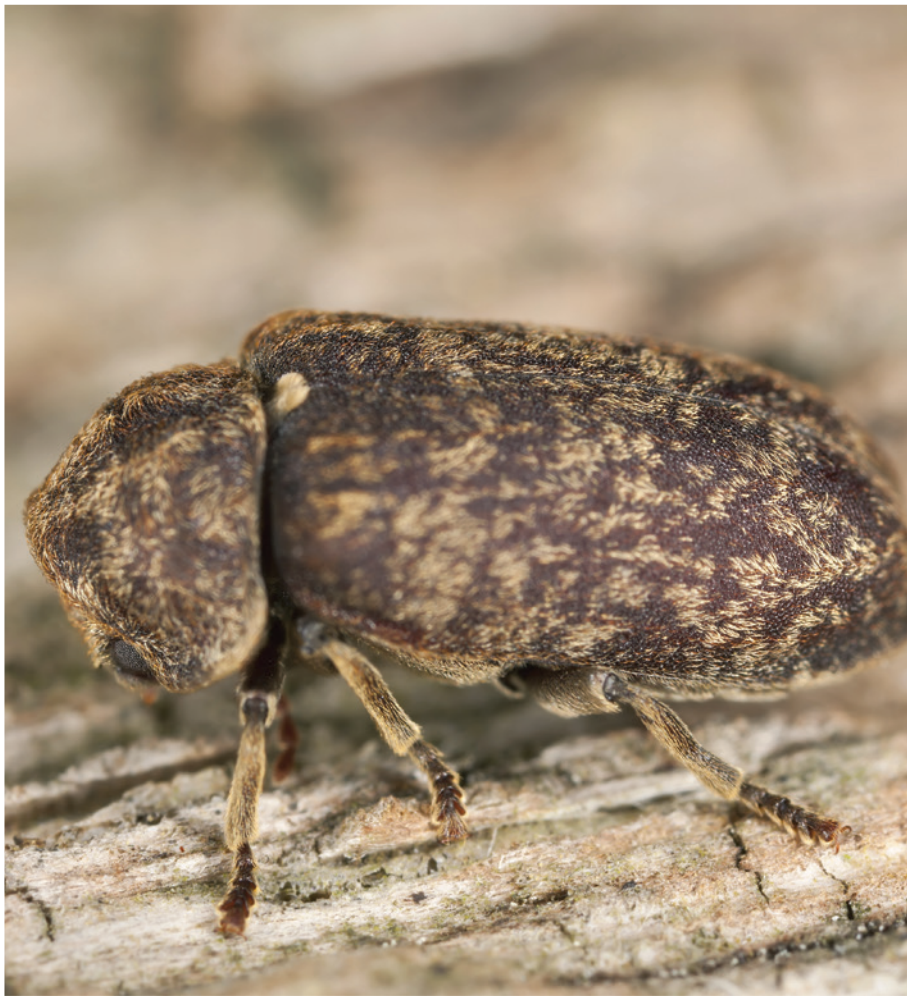
Wykamol GROUP LIMITED

FUNGAL DECAY AND WOODWORM IDENTIFICATION



USER TRAINING GUIDE

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FUNGAL DECAY IN BUILDING TIMBERS

Dry rot and wet rot can affect buildings of all ages and if decay is discovered it should be identified and remedial action taken without delay.

Fungal decay occurs in timber which becomes wet for some time and is the result of the attack by one of a number of wood-destroying fungi. The most well known are Serpula lacrymans – the true dry rot fungus -, Coniophora puteana the Cellar fungus and Poria vaillantii the Pore or Mine fungus. Many other fungi also occur and some have recently been particularly linked with decay in door and window frames.

Dry rot is only caused by Serpula lacrymans and is the most serious form of fungal decay in a building. It can spread onto and destroy much of the timber. Wet rot occurs more frequently, but is less serious; decay is typically confined to the area where timber has become and remains wet.

Fungal decay always arises because the wood has become wet, usually timbers will be in excess of 20 per cent moisture content. Finding the source of dampness and eliminating the ingress of moisture and promoting drying is always necessary.

Outbreaks of dry rot and wet rot start in similar ways. The mature fruiting bodies of wood-destroying fungi that develop during an attack produce millions of microscopic spores and these are widely dispersed by air currents. If they fall on untreated damp wood they will germinate by pushing out a hollow tube called a hypha which grows and branches to form a mass of hyphal threads called mycelium.

Mycelium develops inside the timber and breaks down the wood for food. The timber may darken in colour and develop a characteristic cracked appearance. Some wet rots may result in bleaching of the wood; these are more common in doors and window frames. Eventually, the wood loses its strength and in some situations may become dangerously unsafe.

The main differences between dry rot and wet rot are the degree of development of mycelium on the wood surface and the ability of the fungus to spread into other timbers via adjacent masonry. It is important that the two types of decay be distinguished since they require different treatment.

For over 80 years the Wykamol Group has been the market leader in the field of property renovation and repair. Starting way back with our founder devising a chemical treatment for the eradication of insect attack in timber, our product range has evolved and grown to become the broadest range of property repair and renovation solutions under one umbrella anywhere in the UK.

DEALING WITH DRY ROT

Insights from fungal biology

The dry rot fungus Serpula (formerly Merulius) lacrymans is well known for destroying timbers in buildings and spreading from floor to floor through hidden spaces. Its mysterious appearances throughout an affected building have led to a sometimes almost mystical fear of its destructive abilities, as though it is something like a biblical plague. However, S.lacrymans is only a woodland fungus that happens to have developed a capacity to grow in buildings. Its ancestral habitat is cool pine forests, where it feeds on fallen dead wood on the moist forest floor.

A building containing softwood embedded in damp masonry provides all the conditions to which the fungus has become adapted by natural selection in its original forest home: damp softwood to feed on, a moist surface from which it can scavenge mineral nutrients, and damp enclosed spaces to grow in. By understanding the fungus's biological requirements, evolved in its natural habitat, we can alter the conditions within the building to make them unsuitable for its growth.

S.lacrymans occurs in genetically distinct races in different parts of the world. Each race probably originated when a strain of S.lacrymans growing in dead wood on a pine forest floor made the jump to conifer wood in buildings. Populations of the fungus are made up of individuals, with each individual growing network the mycelium made of microscopic filaments, the hyphae. Individuals that meet can fuse hyphae to join into a single network.

Identifying S.lacrymans in buildings

The sponge-like sporophores (fruiting bodies) of S.lacrymans are often produced in ceiling cornices or corners of walls, oriented so that the pores are vertical, allowing spores to drop out into the air. Sporophores produce millions of rusty red spores a day which collect as a red dust on horizontal surfaces in unventilated rooms.

When sporophores are absent S.lacrymans can be identified by visual inspection and if necessary analysis of decayed wood.

S.lacrymans affects softwood. Early tensile strength loss occurs in wood that may still appear intact because S.lacrymans enzymes can extract sugars from cellulose without at first disturbing the lignin framework of the wood cells.

Genomic analysis recently showed that S. lacrymans has a highly evolved and sophisticated system of scores of cellulose digesting enzymes which it synthesises whenever its hyphae meet a wood food source.

Eventually, as cellulose is progressively removed, the wood becomes brown, breaks up by transverse and horizontal cracks into cubes, and eventually collapses into a dry brown powdery lignin residue.

Painted surfaces of timber such as skirting boards are usually colonised by mycelium growing through damp underlying masonry. The paint skin is easily dented with a chisel where the timber beneath has been decayed.

Mycelial cords – aggregates of hyphae visible to the naked eye – are produced by both S. lacrymans, and its close relative Coniophora puteana. These Agaricomycete brown rotting species are the most common cause of timber decay in northern European buildings.

Mycelial cords are strands of fungus from one to several millimetres wide, white in colour changing to yellow and brown. Cords usually remain, dried and brown, after an outbreak has died down.

They are often revealed when water-impermeable coverings such as oil-based paint, vinyl flooring and rubber-backed carpet are removed.

DNA testing can identify traces of live or even dead fungal tissue. Where the expense is warranted, samples may be sent to specialist laboratories. Unique volatiles of active dry rot can be detected by trained dogs.

Coniophora puteana can be confused with S.lacrymans because it has cords and a similar type of rot, but it does not spread as far and is usually limited to damper areas, hence the name cellar fungus.

Spread through buildings by mycelial growth

S.lacrymans can spread through buildings because of its ability to extend for distances of several metres from a wood food base over non-nutrient surfaces. In nature, this allows it to capture scattered pieces of dead wood by growing across the forest floor.

In buildings, mycelium growing from infected wood grows outwards over walls and behind plaster and flooring materials. The microscopic hyphae and fine mycelial cords are invisible to the naked eye and grow through spaces as small as a few microns (hundredths of a mm) wide, until it finds a fresh food source – damp wood or other cellulosic material.

The fungus advances through a building as a leading edge of parallel separate branching hyphae. These are the feeding part of the fungus. They exude enzymes and also scavenge nutrients: carbohydrates from wood, and compounds of mineral nutrients nitrogen, phosphorus and potassium from underlying surfaces.

The microscopic hyphae that initially colonise wood can only grow in wood with a water content of over 20%. There is no evidence that dry wood, with moisture level below 20%, can be colonised through import of water through cords, although mycelium can exude drops, and enclosed spaces round growing mycelium can retain damp.

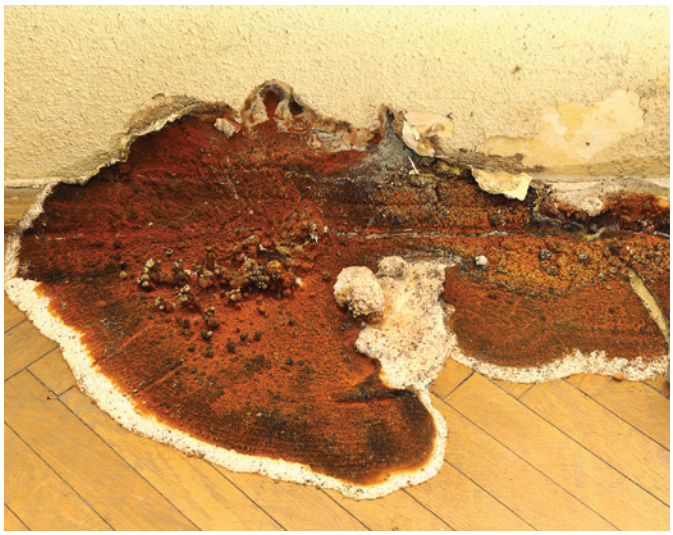
Nutrients accumulate inside the fungus as sugars and amino acids. They are translocated responsively in the network according to local supply and demand, through mycelial cords that develop around the hyphae connecting old and new colonised wood. Cords carry nutrients in either direction and can move different nutrients in opposite directions.

Starvation for nitrogen, provided the fungus is established in a wood food base that provides abundant carbohydrate, causes faster extension. Mycelium with plenty of nitrogen extends more slowly and branches more. This growth response can be exploited to limit spread of dry rot in buildings.

Extension stops when mycelium is fed with a local application of a non-metabolised amino acid, aminoisobutyric acid, AIB, which is translocated in place of food amino acids. AIB is like junk food. The fungus wrongly perceives a nitrogen glut, and switches its development from extension to localised branching. AIB inhibition acts systemically throughout a connected network. Arrest of extension persists indefinitely.

Spread between buildings by spores

An individual grows from a spore produced by a sporophore. Genetic analysis shows that spores produced in sporophores are the source of new outbreaks of dry rot in buildings. There is no support for the theory that dry rot infection can spread between buildings as tissue fragments in wood or on tools.



Survival of mycelium and vegetative spores within infected buildings

S.lacrymans can only grow in cool conditions. Growth is optimal at 20°c, scanty at 26-27°c and the fungus cannot grow above 28°c. Temperature affects the ability of mycelium to survive dormant in dry wood. It can remain viable for up to 8 years at 7.5°c but only 6 months at 27°c. Spores are more resistant to higher temperatures, but are killed by 32h at 60°c or 1h at 100°c.

Treatment

The first step is to locate both the wood and the source of water. Sporophores can develop at distances of 10m from the wood food source, connected to it by cords. A sporophore means that fungal growth is well established in a substantial wood structure. This may require exposure of underlying wall by removal of plaster and fittings. Established procedures used by accredited contractors are effective in modern buildings. Heritage buildings may require a more customised approach to detect and limit dry rot.

For example, a sporophore appearing between masonry joints in the entrance archway of an uninhabited Scottish castle was traced back to a wooden lintel nobody knew was there, embedded in a wall 15 metres away. The source of damp was condensation from the outer surface of a cold water tank in a tower percolating down through the wall into the lintel. The fungus had crossed a masonry wall in the form of cords connected to the sporophore which was emerging into the nearest available open air.

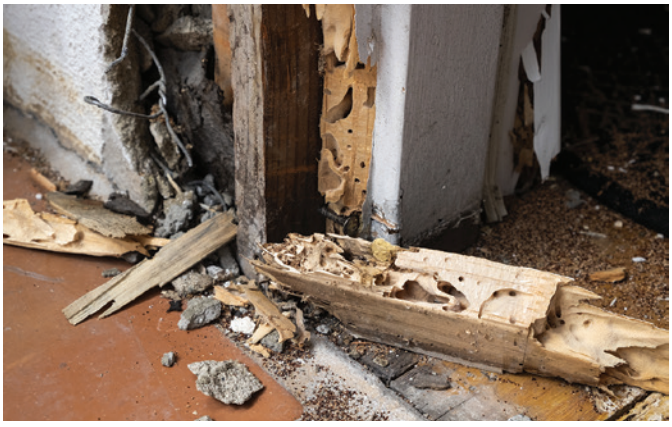
In a Victorian house in Oxford, massive mycelial growth was found colonising a wood fuel store in a cellar. The fungus originated from the floor above where rising damp caused by a blocked air brick and soil against an external wall. The unventilated space in the cellar stimulated mycelial growth.

A Victorian dining room was panelled with mahogany veneer curved round the inside of a circular turret, secured by softwood battens. Water seeping in through the exterior wall behind from a broken downpipe had allowed S.lacrymans to colonise the damp softwood battens and expand into the space behind the panelling.

In all these cases the treatment was to expose and ventilate the affected parts of the building, remove as much of the affected timber as feasible, and repair sources of water ingress.

When dealing with Dry Rot it is always advised to contact the team at Wykamol to seek suitable advise on the best products to use for dealing with Rot issues

We have an extensive range of products suited to individual instances and care must be taken in the recommendation in these specialist products



WET ROT

What is Wet Rot?

Wet Rot is a fungus that affects very damp timber. It can also cause decay in plaster, wallpaper and carpets. Wet rot spores are attracted to materials with a high moisture content.

Compared to dry rot, wet rot is less destructive as wet rot remains confined to the wet area only but still needs to be treated as it can affect a building's structural integrity

Is wet rot a fungus?

Wet Rot is a fungus. The scientific name of the fungus is Coniophora puteana.

Types of Wet Rot

Wet Rot is a general term for several fungal species, the most common being Coniophora Puteana, also known as cellar fungus.

Why does wet rot occur?

Wet Rot occurs when excess moisture is present in timber over long periods of time. This type of decay affects wet timber by causing it to soften.

Wet rot is caused by moisture being absorbed into this timber. This moisture can originate from different sources.

Common causes of wet rot:

The common causes of wet rot include the following:

- Roof defects
- Plumbing leaks
- Leaky or blocked gutters
- Shower trays and around baths
- Penetrating damp through walls
- Condensation

Do I have wet rot?

Identifying wet rot is not always easy because some of the symptoms of wet rot are similar to those of dry rot. Wet rot should be identified by a professional who can tell it apart from other forms of rot by the differing colour of the decayed timber as well as the size and type of cracking it exhibits as the wet rot progresses.

The common signs of wet rot include:

- Darkened timber – darker than surrounding timber
- Soft and spongy timber
- Cracked appearance that may crumble to touch when dry
- Localised fungus growth
- Shrinkage
- A damp, musty smell

Damaged or flaky paint can sometimes be a sign of wet rot. However, with painted wood it can be harder to see evidence of wet rot. If you stick a screwdriver into the wood and it goes in easily this suggests you have an issue with rot.

Does wet rot have a smell?

Wet rot is more likely to smell than dry rot. It has a damp, musty smell that has been described as smelling earthy and like rotting soil.

Where is wet rot commonly found?

Wet rot is commonly found in cellars, roofs and in timbers around windows.

Effects of wet rot

The danger with wet rot is that left untreated, the timber starts to lose its strength and in some situations may become dangerously unsafe.

Pictures of Wet Rot

Many people want to know what wet rot looks like and how to tell it apart from dry rot. We have provided some photographs as examples of wet rot

Wet Rot Treatment

To solve issues with wet rot, it is important to first identify the source of moisture and stop the cause of the damp. Alternatively, you can isolate the timber from the damp source before treating the affected areas.

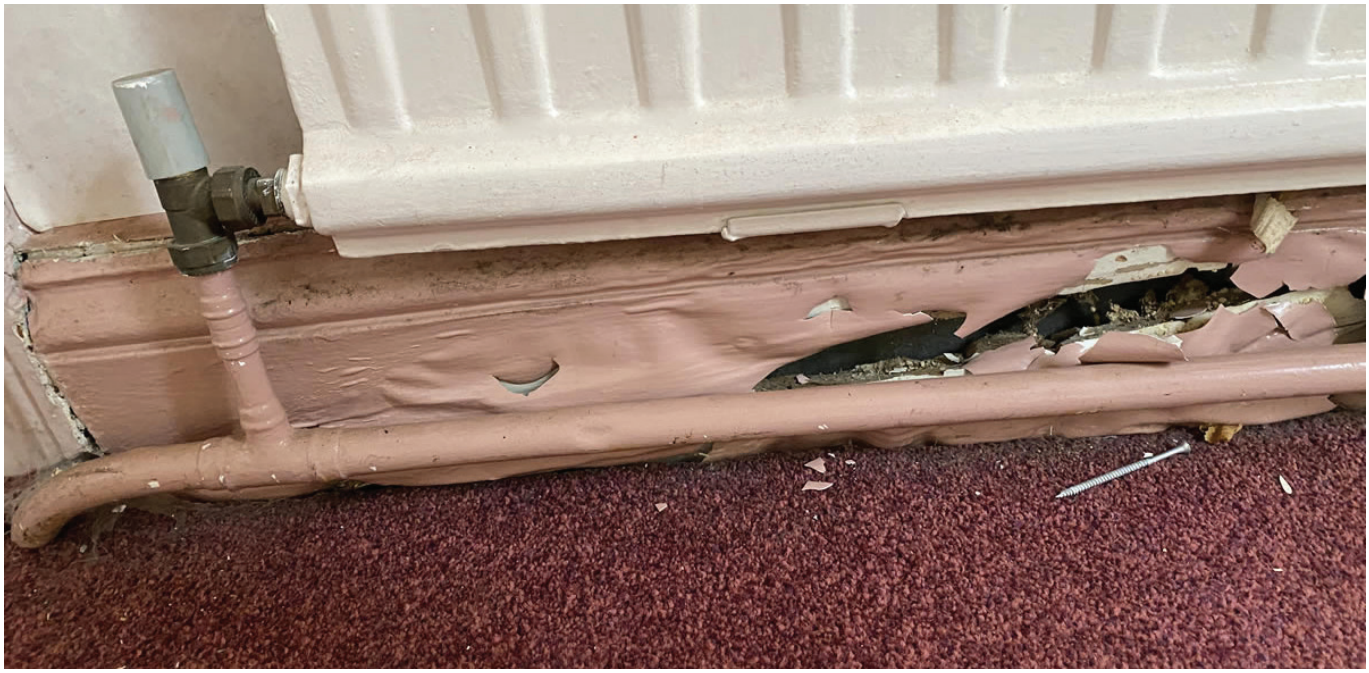
In some extreme cases you will need to replace the affected timbers. However, in most cases you can stop wet rot by treating the timber with a fungicide.

The treatment of wet rot involves applying a fungicide during the drying out period. Usually the fungicide comes as a concentrate and will need to be diluted. It can then be applied using a brush or a low pressure sprayer.

These treatments will eradicate the wet rot, as long as the source of the water ingress has been stopped.

Please speak to the technical team at Wykamol to determine which products and applications are best suited to treat Wet rot

Some products are better suited to different conditions on site and each project should be treated individually rather than a one treatment for all

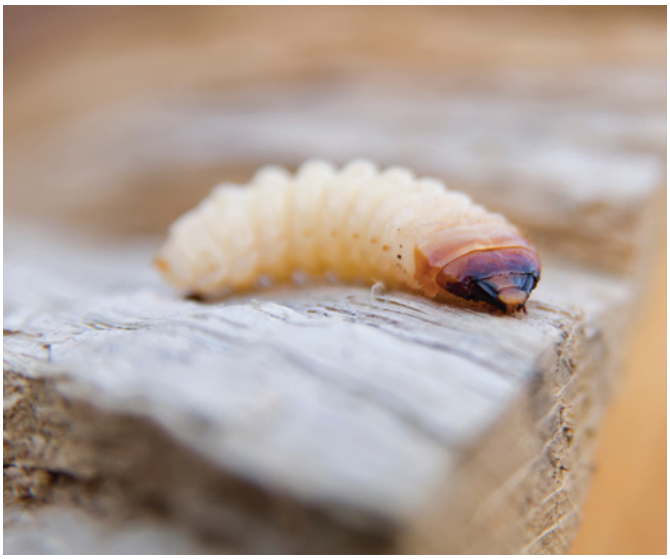


WOODWORM

What is Woodworm & how do you treat it?

Woodworm is a common issue in buildings that can eventually result in timber framework needing to be replaced as a result of infestation.

This is one of the most frequent causes of timber damage which can have a long-lasting effect on the framework of a building if woodworm is left untreated. Some forms of wood boring insects are more harmful to timber than others, but it is always best to consult a professional to identify the issue and recommend the best course of action for your home or business.



What is Woodworm?

Woodworm is the term given to the larval stage of wood-boring insects, which sees eggs laid into small cracks on the surface of the timber. The most common type of insect is the Anobium Punctatum, otherwise known as the Common Furniture Beetle, while others include the Death Watch Beetle, House Longhorn Beetle and Powderpost Beetle.

As the eggs hatch, the larvae bore into the wood searching for cellulose and create tunnels and chambers from which an adult insect will eventually emerge from. Depending on the wood-boring insect, the flight-holes, from which the adults emerge, and the frass (the visible waste of the larvae chewing the exit), will differ, although all damage that occurs to the surface of wood for woodworm can be hard to spot, considering how small the exit holes are in diameter.

Identifying Woodworm

Depending on the type of wood and the species of wood-boring insect, the visible signs of a woodworm infestation can differ. However, all types of wood-boring insect larvae leave a mass of tiny holes in the wood when the adults mature and fly away, which is the most obvious indication.

You might also notice flour-like or pellet-shaped wood "shavings" in and around the holes and underneath affected furniture or beams – this is the waste or "frass" produced by the larvae.

Here is a brief guide on what to keep an eye out for, regarding the most common types of wood-boring insects you might find in your property.

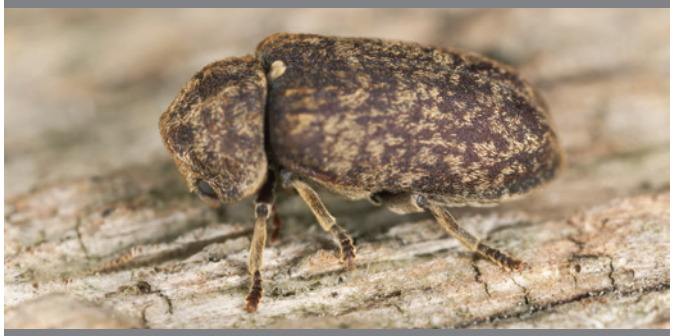
Common Furniture Beetle (Anobium Punctatum)

As the name suggests, the common furniture beetle is one of the most common wood-boring insects you will find in your home. It extensively bores into soft and hardwood with the grain, creating noticeably round tunnels that measure approximately 2mm in diameter.

Common Furniture Beetle (Anobium Punctatum)

Death Watch Beetle (Xestobium Rufovillosum)

Often seen alongside white rot, the death watch beetle prefers to lay its eggs in the rotting wood of elm and oak. Once the larvae hatch, they create widespread tunnels throughout the wood which they fill with "frass" that is noticeable on closer inspection. Interestingly, the death watch beetle is one of the only beetles that you can hear, typically on a quiet summer night, as they emit a tapping sound in order to attract a mate. Tunnels with boreholes of approximately 2-3mm in diameter are an indication of a death watch beetle infestation.



Death Watch Beetle (Xestobium Rufovillosum)

Powder Post Beetle (Lyctus Brunneus)

The powder post beetle has a taste for young hardwood saplings that are below a decade in age and tunnels deep into the timber following the natural grain of the wood. They tunnel throughout the wood in a maze-like fashion, creating networks of small, rounded, conjoining and crossing tunnels that weaken the stability of the wood. Holes are very difficult to spot as they are only 1mm in diameter, although the waste produced has a flour-like appearance and consistency which can be easier to spot and identify. Commonly introduced to properties in new furniture.

Powder Post Beetle (Lyctus Brunneus)

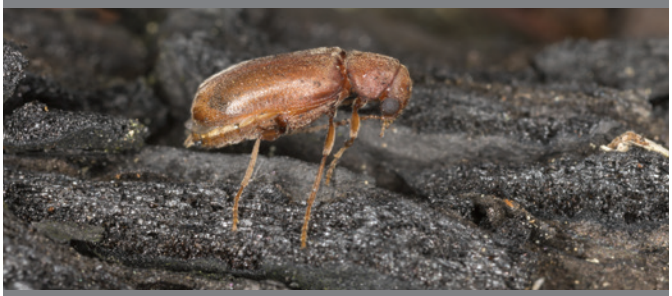
Ambrosia Beetle (Platypus Cylindrus)

The ambrosia beetle is of the weevil subfamily and splits into different species depending on the location. Most common to the UK usually inhabits freshly cut logs or recently fallen trees but has been seen in residential properties. They prefer timber with ambrosia fungi in order to cultivate their fungal gardens for nutrients which turns the surrounding timber fibres a black or blue colour.

Ambrosia Beetle (Platypus Cylindrus)

Bark Borer (Ernobius Mollis)

The bark borer favours bark-covered softwood and tends to create 2mm diameter tunnels close to the surface of the wood, leaving behind rounded waste that is coloured according to the wood they inhabit. Look out for small, rounded exit holes and the tell-tale sign of tunnels just below the surface of the wood.



Bark Borer (Ernobius Mollis)

TIMBER TREATMENTS

FUNGAL DECAY AND WOODWORM IN BUILDING TIMBERS

House Longhorn (Hylotrupes Bajulus)

One of the largest wood-boring insects, the house longhorn prefers younger softwoods and is one of the worst offenders for finding in your home. Their large, 10mm wide tunnel boreholes are easier to see without assistance and while creating their tunnels, they leave behind long, cylindrical-shaped "frass" pellets. The House Longhorn is a very destructive beetle.

House Longhorn (Hylotrupes Bajulus)

Wharf Borer (Nacerdes Melanura)

Another large wood-borer, the wharf borer insect most commonly stays in coastal buildings and structures, although it has been seen inland in buildings with serious damp problems. The wharf borer attacks the wood, leaving behind 8mm wide tunnels that are filled with a soil-consistency waste.

Wharf Borer (Nacerdes Melanura)

How Do You Get Woodworm?

Wood-boring insects are typically drawn to damp conditions and the presence of leaks or insufficient insulation in your home can lead to damp timber and timber decay that encourages wood-boring insects to lay their eggs.

Most woodworm tends to go for older, untreated wood over younger furniture and timber frames, however, this depends on the particular insect and should a wood-borer get introduced to your home that has a preference for young timber, they will happily help themselves.

When purchasing and bringing old furniture into your home, check it over for indications of a woodworm infestation and ensure that it has been treated to drive out any remaining larvae and make it harder for future infestations to take hold.

This is especially important for firewood, driftwood or kindling that advantageously, should be left outside rather than stored internally around other timber, whether this is furniture, open beams or wood intended for construction.

Make sure to regularly treat or apply a protective varnish to older or antique furniture pieces and ensure that any new wood coming into your home has been suitably treated with insecticide. If you own furniture that previously suffered from a woodworm infestation, it is susceptible to a returning attack and wood-boring beetles will happily lay their eggs in pre-existing boreholes so keep an eye out for wood-dust deposits.

Due to its preference for damp or moisture-holding wood, you are unlikely to suffer from woodworm infestations in a warm, dry home where your timber or wood has been sufficiently dried before the construction process.

The Effects of a Woodworm Infestation

As the affected timber remains untreated, more and more chambers and holes will form as the lifecycle of the inhabiting beetle continues, resulting in an increased number of insects. Over time, this can weaken the timber to the point that a repair or replacement is needed, creating structural stress and destroying the surface appearance of timber beams and furniture. In the direst of circumstances, when an infestation is not recognised or treated, affected wood and timber can give way or collapse, leaving an expensive repair bill.

How Does Woodworm Spread?

Woodworm has a four-part life cycle:

Egg-Laying – the female woodworm beetle begins the process of laying her eggs in damp timber with cracks or holes in the surface.

Hatching – larvae hatch in the wood timbers and immediately begin tunnelling down

Growth – the embedded larvae eat the cellulose in the wood, sometimes staying for up to five years. This is when you might notice wood dust and also when the worst of the structural damage occurs

Maturation – the larvae, having gorged themselves on wood, form a pupa and metamorphose into the adult woodworm beetle which eats its way to the surface creating an exit hole. It then flies away to start the cycle again in fresh, damp timber

As the larvae stay buried for a considerable time (between 2-5 years) often the inhabited wood can dry out before the larvae mature into adults. This can prevent the spread of woodworm as females will only lay their eggs in timber that has a certain moisture level.

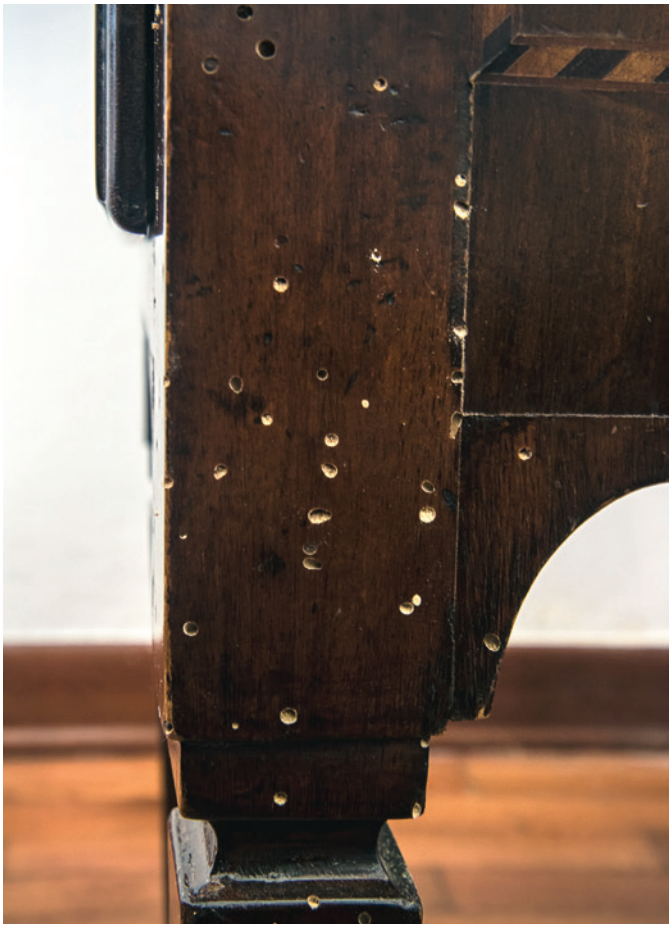
However, if the infestation goes unnoticed and the damp problem persists in your property, woodworm beetles will lay their eggs in the nearest suitable wood. This might be the same piece they have emerged from or unconnected wood in the surrounding area.

Can Woodworm Spread to Other Furniture?

Wood-boring insects will only lay their eggs in untreated wood or timbers that have a certain level of moisture – this includes wood commonly found in lumber or construction yards, antique or old wood stored in damp conditions and in recently felled or rotting trees. As the larvae can reside in the wood, feasting for up to five years, it can emerge from purchased furniture while in your home, especially if the furniture hasn't been closely inspected.

However, unless your home suffers from damp conditions, this includes in the walls and under counters and units, the female woodworm beetle will seek out ideal egg-laying conditions elsewhere. Another way to protect both old and new wood in your home is to regularly maintain furniture using a protective varnish as this will prevent wood-boring insects from laying their eggs. Wood-boring insects will not leave eggs on the surface of timbers, preferring to deposit them in cracks, holes or pre-existing woodworm boreholes.

In conclusion, the environment and circumstances play a huge part in the spread of woodworm in furniture. As long as your home is dry and well-maintained, any infestation should remain in the affected piece of furniture. Of course, if you have infested timber beams, the larvae can tunnel their way into connecting wood, so it is always best to seek treatment for woodworm as soon as possible.



How to get rid of woodworm

Before treating any kind of woodworm, it's extremely important to correctly identify the type of woodworm you're dealing with. If you are unsure, it's always best to consult a specialist.

If your woodworm problem only affects small items such as furniture, you can effectively treat it yourself using the right techniques and treatments.

You can easily treat Common Furniture beetles with a brush, dip or spray application of a Permethrin-based woodworm treatment on all timbers affected by woodworm. As a precaution you should also treat any close by timbers to protect against future outbreaks.

Don't forget to re-paint and re-varnish treated surfaces when they are dry.

Death Watch beetle infestations occur deep within a timber, so it is essential to treat by injection as well as a surface treatment. This can be done by injecting woodworm treatment spray into the exit holes left by the adult beetles.

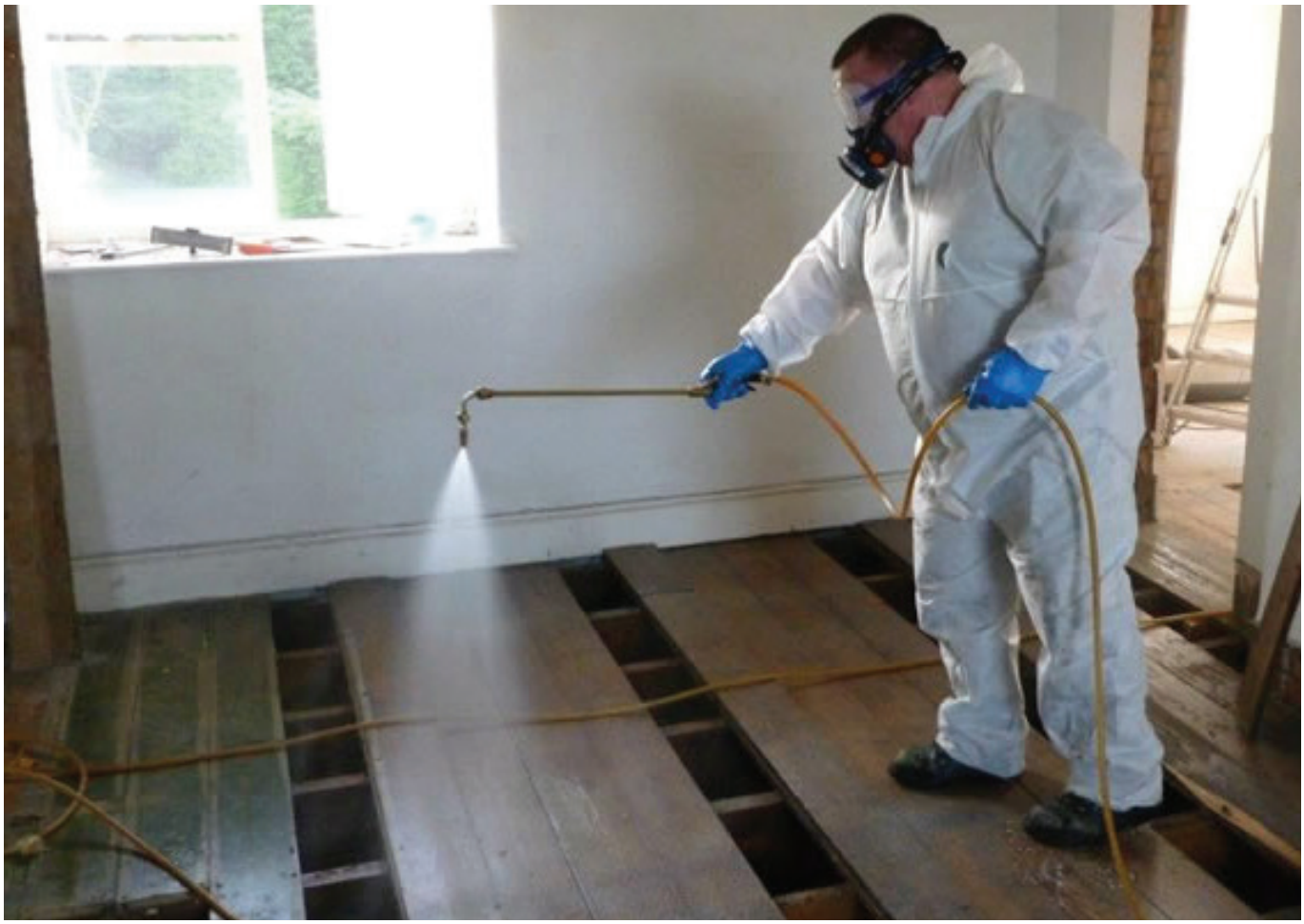
Or it can be done by drilling into the danger zone and filling the wood with a paste or gel woodworm treatment.

The larvae of the Death Watch beetle often causes more harm than the Common Furniture beetle, so it's good to check with a professional before going ahead with any treatment.

If you suspect you have a House Longhorn woodworm infestation it's always best to consult a specialist. All timber within the building will need to be treated and inspected for its structural integrity.

If your timber is free from severe structural damage and the infestation is minor, it may be safe to go ahead and tackle it with the same treatments and methods you would use to treat Death Watch beetles. ***But you must be very careful with this species of woodworm.*** A professional should treat any severe infestations that has caused extensive damage.

Wykamol offer a great range of products to treat woodworm including our water based range microtech dual and insecticide formulations as well as specialist gel formulation products.



It is always advised to seek advice from the technical team at wykamol to determine which treatment is best suited to each individual outbreak.

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