Common Wood-Destroying Beetles

Introduction and Background

Those little holes in furniture or the grainy dust collecting around baseboards might be signs of unwelcome guests: wood-boring beetles. These insects, while small, can wreak havoc on wooden possessions and even the structural integrity of a home or business. They are known for their ability to infest and damage wood buildings, furniture, and other wooden items.

While the term "wood-destroying beetle" might seem like a single category, these destructive insects actually belong to several different families within the vast order Coleoptera, the insect group that includes all beetles.

Their lifecycle typically consists of four stages: egg, larva, pupa, and adult. The eggs are usually laid in crevices or pores of the wood. After hatching, larvae tunnel through the wood, feeding on its cellulose content. This feeding activity can cause structural damage over time. Once mature, the larvae pupate within the wood before emerging as adults.

Identifying wood-destroying beetles often requires a close examination of the insect's physical characteristics, such as body shape, size, coloration, antennae length, and the presence of distinctive markings. The type of damage they cause to wood can also help in their identification.

Wood-destroying beetles are typically attracted to wood with high moisture content. They may infest both hardwood and softwood species, depending on the species. Some beetles prefer freshly cut wood, while others target seasoned or partially decayed wood. Infestations often occur in areas where wood remains damp, such as basements, crawl spaces, attics, and areas with poor ventilation.

These insects can have significant economic impacts on industries such as forestry, construction, and furniture manufacturing. Infestations can result in costly damage to wooden structures and products. In natural ecosystems, wood-destroying beetles play a crucial role in the decomposition of dead wood, facilitating nutrient recycling and contributing to ecosystem health.

Powderpost Beetles

Powderpost beetles are so named because they can reduce wood to finely powdered frass (powder or dust). The small “shot hole” exit openings in wood surfaces are great indications of a powderpost beetle infestation.

Adult powder post beetles are rarely seen, and are usually found in a home by the presence of small exit holes noted in sills, joists, or the sub-floor. Their unusually long antennae best distinguish powder post beetles. Other characteristics that usually identify them are being white, yellow; soft bodied, hairy with five jointed legs. The life cycle of a beetle may be up to a year. They are considered to be the second most destructive wood - destroying insects.

Different Kinds of Woods

Some powder post beetles confine their activities to starch-rich, large-pored hardwoods, such as ash, hickory, oak, walnut, and cherry. Many

different kinds of wood commodities and structures have been damaged by powderpost beetle infestations. Timbers, planks and flooring in houses and barns, axe and hammer handles, musical instruments and museum woodcarvings are all good examples of items damaged or destroyed. They often are a serious problem for individuals remodeling or renovating old buildings and/or salvaging lumber from old wooden structures. Keep in mind that powderpost beetles can infest any item made of wood.

Powder post beetles belong to four Families: **Lyctidae,** the Lyctus and/or "True" Powder Post Beetles; **Bostrichidae**, the large and/or "False" PowderPost Beetles; **Anobiidae**, the Deathwatch, Furniture or Anobiid PowderPost Beetles; and **Ptinidae**, the Spider Beetles.

Identification of Powderpost Beetles

Lyctid or "True" Powderpost Beetles

In the United States, there are more than 35 kinds of lyctid beetles. These are considered the "true" powderpost beetles. The adults are very small; less than 1/4" in size and slender. They are flattened and range in color from reddish-brown to black. Larvae are white, cream colored, and shaped with dark brown heads and they create tunnels in the wood and

become pupae. The head is visible from above. The antennal club has two segments.

As adults they bore through the wood, pushing a fine powdery dust out, leaving pinholes about 1/32- 1/16 of an inch in size. Lyctid beetles infest hardwoods such as oak. They can live in wood with a wide moisture range, from a dry 8 percent to a very moist 32 percent. They attack hardwoods by depositing their eggs. Their average life cycle is about one year.

Female Powderpost Beetle

The female lays her eggs in the pores of the wood, so hardwoods (which have pores) are the most likely to be infested. Only the sapwood of hardwoods is eaten, because only it contains the starch required in the diet of these beetles. Once hatched, young larvae bore into the wood. Unlike termites, they are unable to digest cellulose. Consequently, most of the wood eaten passes through the larva. This is left behind as a powdery frass.

Diet

Their diet consists of starch, sugar and protein in the sapwood of hardwoods. Wood containing less than 6% moisture content is seldom attacked. This wood-boring beetle is the most widespread in the U.S. Many times, infestations are built into structures from infested lumber, and they can re-infest.

Damage

Lyctid damage is characterized by the extremely fine frass (which resembles flour or talc) that readily falls out of exit holes.
Frass left by other woodborers usually contain pellets, has a course texture and a tendency to stick together. When inspecting damage, be sure to distinguish old damage from active beetle infestations. Recently formed holes and frass (sawdust like) are light in color and clear in appearance, old holes and frass are dark in color.

Wood Damage

Fortunately, relatively few insects actually damage sound wood. Termites, both subterranean and drywood, carpenter ants and certain powderpost beetles are the primary wood destroying insects. The potential for damage from any of these insects varies by region and

climate with more potential damage in warm, wet climates and generally less in cool, dry climates. Damage potential in a particular region varies by insect group as well. Termites, for example, tend to be of more concern in warm climates whereas carpenter ants tend to be more important in cooler climates.

Climates

Wood-boring powderpost beetles damage structural wood mostly in damp/coastal climates. Powderpost beetles can, however, damage hardwoods, like flooring and furniture, in any climate. There are also a number of minor wood damaging insects that may do significant cosmetic damage but rarely impact wood's structural integrity. Below is a list of all these insects and their potential for damage.

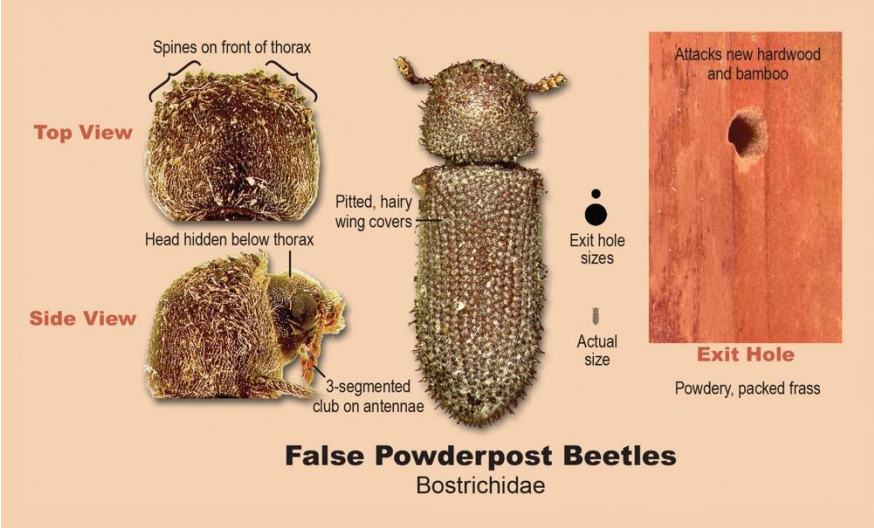
Bostrichid or “False” Powderpost Beetles

Adults are 1/8 to 1 inch long, cylindrical, and reddish brown to black. Adults bore into the wood to lay eggs, leaving a hole larger than 1/8 inch, usually in wood less than 10 years old. Larvae are curved and wrinkled.

These beetles are larger than other families of powder post beetles, leaving larger exit holes. Holes do not contain frass, though the galleries

do. Frass is tightly packed, tends to stick together and is extremely fine in texture. It contains no pellets.

Diet



Their diet is dependent on starch in the wood. They are most common found in softwood, but can attack hardwoods. They require 6-30% moisture content in the wood. Their average life cycle is one year. Most hardwoods attacked are not those commonly found used for interior floors, woodwork or trim. They are often found in oak, firewood and furniture. Most false powder post beetles do not reinfest wood after it is seasoned, so damage is limited to that inflicted by one generation. The speed of the damage can be considerable.

Anobiid Powderpost Beetle

Anobiid beetles are usually slightly less than 1/3 inch long, and red to brown/black in color. The head is not visible from above and there is no

antennal club. Females mate often during their lifetime. The total number of eggs laid per female is about 50. Their eggs are deposited in cracks and crevices of all types of seasoned wood, but these beetles seem to prefer the sapwood of softwood trees. However, females prefer to lay eggs on hardwoods, rather than softwoods, and prefer rough wood surfaces.

Deathwatch Beetle

The Deathwatch Beetle is found throughout the southeastern U.S. and attacks building timbers in poorly ventilated areas where moisture tends to collect. The name “Death watch” comes from a mating call which is a ticking sound that the adult makes inside infested wood. This sound is audible during a still night.

Furniture Beetle

Furniture beetle is found primarily in the eastern half of the U.S. It infests structural timbers as well as furniture. Adults are 1/8 – 1/4 inch long. They are red to dark brown in color with an oval shape. Adults lay their eggs in the cracks and crevices of seasoned wood. As soon as they

hatch, larvae burrow into the wood where they live and tunnel for a year or more. Larvae form tunnels in both softwoods and hardwoods and require 13-30% moisture content. Larvae are slightly curved and wrinkled, with tiny hairs on the body. The larvae feed in the sapwood portion of the wood, and both new (less than 10 years) and old wood are attacked. Anobiid powder post beetles have a 1-5 year life cycle, depending on the quality of the wood infested, the fluctuations in temperature, and the moisture content of the wood. The adult beetles usually begin emerging from infested wood in early spring, and continue till mid-summer. The adults are nocturnal, and they become most active on the surface of the wood between dusk and midnight.

The susceptibility of various kinds of wood to attack by this species depends on the age, surface features, and the species of wood. A fine to coarse wood characterizes an infestation, powdery frass containing bun-shaped fecal pellets. Holes are round, 1/16-1/8 inch. The frass is loose in tunnels with small amounts at exit holes.

Infestations

Infestations can become so severe that loss of structural strength to sills, joists, and sub-flooring occurs. Anobiids commonly reinfest crawl space areas that are poorly ventilated and humidity is absorbed in the wood. Unlike the other powderpost beetles, anobiids have a digestive enzyme

that allows them to digest cellulose from the wood and are inclined to the softwoods; for this reason they are common in crawl spaces and basements, infesting the pine used for framing lumber.

Ptinidae Family - Brown Spider Beetle

Ptinidae Members of this family possess long, 11- segmented antennae, positioned between the eyes, plus a number of characteristics which give them a spider-like appearance; a stout body with hairy surface; a waist-like constriction at the base of the prothorax; 6 (not 8) long thin legs with 5-segmented tarsi.

Description

From the family Ptinidae, this beetle may occasionally damage pine boards in old buildings. The white-marked spider beetle is a small, brown, oval, long-legged beetle about 1/8 inch long, and resembles a spider.

Its forewings are hard and leathery, meeting along mid-line of dorsal surface; hindwings membranous, sometimes lacking; biting mouthparts;

well-developed thorax; complete metamorphosis with egg, larval, pupal and adult stages.

Spider beetles are often found in old buildings and warehouses. They generally feed on dried vegetables or animal matter, but they have been found in pine and oak woodwork.

Case Study: Identification of Powderpost Beetles

Accurately identifying the species of powderpost beetles infesting a property is essential for developing effective management strategies tailored to their specific behaviors and preferences. Through real-life case studies, we explore the methods used by pest control professionals, highlighting the importance of morphological examination, laboratory analysis, and environmental assessment in accurately diagnosing infestations.

Historic Home

A homeowner noticed small round exit holes and fine powdery frass on wooden beams and furniture in their historic home, indicating a powderpost beetle infestation. They sought assistance to accurately identify the species of beetles infesting their property and develop a management plan.

Upon conducting a thorough inspection of the affected areas, the certified entomologist and pest control professional employed various methods to accurately identify the infesting powderpost beetles. They collected specimens of the beetles and examined them under magnification to observe their morphological characteristics. Lyctid powderpost beetles (Lyctus spp.) were identified based on distinct features such as their elongated body shape, reddish-brown coloration, and relatively short antennae compared to other powderpost beetle species. The exit holes and frass associated with the infestation were also analyed. Lyctid powderpost beetles are known to produce fine, flour-like frass and leave small, round exit holes in the wood, which aligned with the observations in the historic home. Further confirmation of the beetle species was obtained by assessing the type of wood being infested as these beetles primarily infest hardwood species, and the presence of hardwood in the historic home corroborated the identification.

Wooden Furniture Workshop

A wooden furniture workshop experienced widespread damage to raw wood materials and finished products due to powderpost beetle infestations. The workshop owner sought assistance in identifying the

beetle species responsible for the damage and implementing effective control measures.

Following a comprehensive inspection of the wooden furniture workshop, the pest control technician utilized various techniques to accurately identify the infesting powderpost beetles. Specimens of the beetles, exit holes, and frass were collected and sent to a laboratory for detailed analysis. Microscopic examination and taxonomic keys were employed to identify the beetles as Anobiid powderpost beetles (Anobiidae family). Anobiid beetles are characterized by their cylindrical body shape, dark brown coloration, and elongated antennae. Additionally, the exit holes left by Anobiid powderpost beetles are typically oval-shaped or D-shaped, differing from the round exit holes associated with other powderpost beetle species. They also considered the environmental conditions within the workshop, including the type of wood being infested and the humidity levels, which further supported the identification of Anobiid powderpost beetles. Through a combination of morphological examination, laboratory analysis, and environmental assessment, the specific beetle species infesting the workshop was accurately identified, facilitating the development of targeted control measures.

By employing these meticulous identification techniques, the pest control professionals ensured that the management strategies implemented were tailored to the specific characteristics and behaviors of the powderpost beetle species infesting each respective location.

Other Common Wood Destroying Beetles

Old House Borer

This European insect is now well established in the U.S. and is becoming more abundant and destructive each year. This is one of the most common beetles from the Cerambycidae family. This beetle places its eggs in the season cracks and crevices of wood, and can infest seasoned wood years after it has been used for construction. Larvae are thin-skinned, the head is wider than it is long, the tips of the mandibles are rounded, and there are three ocelli (simple eyes) on each side of the head. Adults are brownish-black to black, slightly flattened and about 3/4-1 inch long. The thorax is rounded, with several small tubercles at the sides and a black polished line and spots on the upper surface. The wing covers have whitish spots, which form irregular bands across their middle.

Average life cycle is usually five to seven years in the north and three to five in the south. It can take up to twelve years if nutritional and

environmental conditions are unfavorable. Because of the long-life cycle, reinfesting the wood, it may take years before you see any structural damage.

Adult Old House Borer

Old House Borers are commonly found in older buildings, but is more frequent in newer buildings (in houses less than 10 years old). A larva hollows out galleries in seasoned softwood (pine). Exit holes are about 1/4-3/8 inch in diameter, but damage may have occurred several years before spotting such holes. They are able to digest cellulose.
When wood has been infested with fungi, the larval development is faster. Their powder (frass) in the tunnels is like sawdust, tightly packed.

Flat Oak Borer

This is a small, elongate, dorso-ventrally flattened, shiny beetle with a dull yellow color. It is 1/3 to 2/5 inch long and occurs throughout the eastern U.S. Larvae excavate long meandering galleries in the dry heartwood of oak and hickory,

packing them tightly with fine granular frass.

Stored lumber is frequently infested and larval feed in it until wood is thoroughly riddled. The life cycle may be completed in one year in green logs and under forest conditions but lumber drying activities may extend larvae development to several years.

Ivory Marked Beetle

This beetle is elongate, one-half to one inch long, pale yellow in color. It has two pairs of ivory white spots on each wing cover, the first pair longitudinal and near the base, the second just behind the middle of the wing. Larvae are robust and wedge-shaped, tapering posteriorly, with a tough, shining integument (outer covering) sparsely covered with golden hairs.
The legs are distinct, long and four jointed. Adults may attack lumber undergoing seasoning.

Oak, hickory, ash, chestnut, maple, and cypress are susceptible to infestation. In buildings, beetles may emerge from flooring or furniture years after the infested wood is used.

Controlling Wood-Destroying Beetles

Prevention

Inspect periodically all exposed wood surfaces and probe them for evidence of internal damage. Evidence of attack is more common in attics, crawl spaces, unfinished basements and storage areas. To be certain that the infestation is active (not old damage or old frass), there should be fresh frass the color of newly sawed wood, or live larvae or adults in the wood.

Many powder post beetle problems are related to high moisture in the wood, particularly in crawlspaces. Reduce the moisture content to proper ventilation to less than 20%. Central heat, vapor barriers and good ventilation can help control moisture.

Spot Treatments

Spot treatments include controlling wood moisture, using surface covers, mechanical removal freezing, and insecticide treatments. *Plastic sheets*

covering 70% of the crawl space will keep the lumber from getting too moist. Surface cover, including paint, polyurethane and water sealants will protect wood from moisture problems and help prevent wood-boring beetles from penetrating the wood. Replacing the wood may be the best control strategy. As a preventive measure, inspect the floor or moldings beneath interior wood walls.

In many cases, the damage from wood boring beetles is very minor and old, meaning that all the beetles have died. If action is taken, the first thing to do is to *reduce the moisture content*, to proper ventilation to less than 20%. Moisture meters can be used to determine the moisture level in the wood.

Freezing temperatures can kill wood-boring beetles, especially in small furniture. Access to a large freezer can be a considerable option. A sustained temperature of 0°F for at least 72 hours is required for this method to be effective. Eggs are very tolerant of cold, and this method may not be entirely effective as a result.

Heat treatments for entire buildings are available. They are also likely to be expensive. They may be the only way to eradicate a heavy and widespread infestation without causing considerable damage to the building.

Insecticides

Spraying the wood with an insecticide is the most common method of chemical control for powder post beetles. Recommended borate insecticides are *Timbor*, a powder that mixes with water, and Boracare, a liquid borate. Pesticides containing "borate" are particularly effective against powder post beetles because they penetrate the wood and kill beetles feeding within wood, as well as killing adults entering or exiting the wood surface. *Timbor* is considerably cheaper per gallon use.

Timbor is water soluble inorganic borage salt with insecticidal and fungicidal properties effective against wood-destroying organisms, including: subterranean termites, dry wood termites, damp wood termites, and carpenter ants, powderpost beetles (false powderpost beetles, furniture and deathwatch beetles, old house borers, longhorn beetles, and ambrosia beetles.) It’s best to use oil treatments since these penetrate better than emulsions and suspensions. Good penetration of insecticide is important.

Surface Treatment

Surface treatments usually do not prevent beetles already in wood from emerging. If the infestation appears to be localized (ex. only a few holes in a board or sheet of paneling), simply removing all infested wood and

replacing the board or sheet of paneling may solve the problem. If additional holes begin to appear in adjacent areas, additional action can be taken such as using residual borate insecticides: *Timbor* and *Boracare.*

Fumigation

If you are concerned that wood behind walls or in other inaccessible areas is infested, then it may be necessary to fumigate. Fumigation is effective but gives no residual protection. Fumigation is an expensive means of ridding a structure of powderpost beetles and should be considered a last resort. However, in the case of severe, widespread infestations, it may be the only option. Instances where structural fumigations are warranted are when infestations have spread into walls, between floors, and other areas where access/wood removal is impractical. The best way to avoid such problems is through early detection and implementation of one or more of the corrective actions mentioned previously.

Fumigation of infested furniture, antiques and other manufactured articles can be done at a substantially lower cost than fumigating an entire building by placing the items under tarps, in trailers, or in vaults that maintain gas concentrations at high levels. Some pest control companies offer this service.

Selection of Pesticides

Selecting the appropriate pesticides involves careful consideration of various factors, including the type of beetle species infesting the wood, the characteristics of the wood itself, environmental concerns, and safety considerations.

Different species of wood-destroying beetles may exhibit varying levels of susceptibility to specific pesticides. Therefore, accurate identification of the infesting beetle species is essential for selecting the most effective pesticide. For example, powderpost beetles (e.g., Lyctus spp., Anobiidae spp.) may require different treatment approaches than longhorn beetles (Cerambycidae spp.).

Some wood species may be more porous or absorbent, affecting the penetration and efficacy of certain pesticides. The presence of finishes,

coatings, or preservatives on the wood surface may interact with pesticides, influencing their effectiveness or causing adverse reactions.

Pesticides should be compatible with the type of wood being treated and any existing finishes or coatings. Some pesticides may cause discoloration, staining, or damage to certain wood species or finishes. Compatibility testing or consultation with manufacturers can help ensure that the selected pesticide is suitable for the specific wood and treatment conditions.

Different pesticides exhibit varying modes of action against wood-destroying beetles. Contact insecticides kill beetles upon direct contact with the treated surface, while residual insecticides provide long-lasting protection by remaining active on treated surfaces. Fumigants penetrate deep into the wood to reach hidden beetle larvae and eggs. Selecting the appropriate mode of action depends on factors such as the extent of infestation, treatment goals, and environmental considerations.

Consideration should be given to the potential environmental impact of pesticides, including their toxicity to non-target organisms, persistence in the environment, and potential for groundwater contamination. Environmentally friendly or low-toxicity pesticides may be preferred, especially in sensitive environments or areas with endangered species.

Ensure that selected pesticides comply with regulatory requirements and label instructions established by regulatory agencies such as the Environmental Protection Agency (EPA). Use of unregistered pesticides or misuse of registered pesticides may result in legal consequences and environmental harm.

Pesticide selection should be integrated into a broader IPM approach, which combines multiple control methods to achieve effective and sustainable pest management. This may include preventive measures, habitat modification, monitoring, and non-chemical control methods, supplemented by targeted pesticide applications when necessary.

Case Study: Controlling Wood-Destroying Beetles

Wood-destroying beetles pose significant challenges for homeowners, businesses, and industries reliant on wooden structures and products. Through real-life case studies, we explore the application of various pest management strategies, highlighting their efficacy in controlling populations and mitigating the associated damage and economic losses.

Prevention

A historic building constructed primarily of wood was experiencing recurrent infestations of powderpost beetles, leading to structural damage and deterioration of valuable architectural elements.

A pest control professional conducted a comprehensive inspection of the building to identify potential entry points and areas prone to moisture buildup. They recommended several preventive measures, including sealing gaps and cracks in the building's exterior, improving ventilation to reduce humidity levels, and treating wooden surfaces with borate-based preservatives to deter beetle infestations. Regular monitoring and maintenance schedules were established to detect and address any signs of beetle activity promptly.

By implementing these measures, the frequency and severity of infestations were significantly reduced. The structural integrity and aesthetic value of the wooden elements were preserved, ensuring the long-term preservation of the architectural heritage.

Spot Treatments

A homeowner discovered signs of anobiid powderpost beetle infestation in several antique wooden furniture pieces, including exit holes, frass, and weakened wood structure.

A pest control professional conducted a thorough assessment of the affected furniture pieces to determine the extent of the infestation. They then applied spot treatments using a targeted insecticidal spray containing permethrin or bifenthrin directly to the infested areas. Careful attention was paid to ensure that surrounding surfaces were adequately protected from potential damage.

This eradicated the anobiid powderpost beetle larvae and prevented further damage to the wooden furniture pieces. The homeowner was advised to monitor the treated areas periodically for signs of reinfestation and to implement preventive measures, such as regular dusting and maintaining proper humidity levels, to minimize the risk of future infestations.

Insecticides

A timber yard experienced a significant infestation of longhorn beetles, resulting in widespread damage to stored lumber and economic losses.

Pest control professionals conducted a thorough inspection of the timber yard to assess the extent of the longhorn beetle infestation and identify key breeding and feeding sites. They then implemented insecticidal treatments using a broad-spectrum insecticide containing chlorpyrifos or cypermethrin, applied either as a spray or injected directly into infested wood.

The insecticidal treatments suppressed the longhorn beetle population, preventing further damage to stored lumber and minimizing economic losses. Regular monitoring and follow-up treatments were recommended to ensure long-term control and prevent reinfestation.

Surface Treatment

A homeowner installed new hardwood flooring in their home but was concerned about the risk of powderpost beetle infestation due to previous experiences with wood-destroying pests.

A pest control professional recommended applying a surface treatment of borate-based wood preservatives to the newly installed hardwood flooring. The surface treatment was applied evenly to all exposed surfaces of the flooring using a brush or sprayer, ensuring thorough coverage.

This approach protected the hardwood flooring from powderpost beetle infestation, providing long-lasting preservation and peace of mind for the homeowner. Periodic inspections and reapplications of the surface treatment were advised to maintain ongoing protection against wood-destroying pests.

Fumigation

A shipping company encountered wood-infested shipping containers harboring wood-boring beetles, posing a risk of spreading invasive pests to new locations and potentially causing damage to cargo.

Pest control professionals recommended fumigating the infested containers using a gas fumigant such as methyl bromide or phosphine. The containers were sealed tightly, and the fumigant was introduced at a concentration and duration sufficient to eradicate all stages of wood-boring beetle infestation.

The fumigation treatment successfully eliminated wood-boring beetles from the infested shipping containers, preventing the spread of invasive pests and safeguarding cargo from potential damage during transit. Compliance with international phytosanitary regulations and guidelines for fumigation of wood-infested containers was ensured, maintaining the integrity of global trade and biosecurity measures.

Safety Considerations for Pesticide Use

Safety considerations for pesticide use in controlling common wood-destroying beetles are paramount to protect both applicators and the environment.

Pesticide applicators must prioritize their safety by wearing appropriate personal protective equipment (PPE) to minimize exposure to potentially harmful chemicals. This includes several essential components:

Applicators should wear chemical-resistant gloves to protect their hands from direct contact with pesticides. These gloves act as a barrier, preventing the absorption of pesticides through the skin, which can lead to irritation, dermatitis, or systemic toxicity. Selecting gloves made from materials such as nitrile, neoprene, or butyl rubber ensures adequate protection against a wide range of pesticide formulations.

Eye protection shields against splashes, spills, or airborne particles of pesticides. Safety goggles or a face shield should be worn to cover the eyes fully, providing a barrier against potential exposure. These protective eyewear devices are designed to withstand impact and provide a secure seal around the eyes, preventing entry of pesticide residues that could cause eye irritation, chemical burns, or more severe ocular injuries.

Respiratory protection is essential to prevent the inhalation of airborne pesticides. Depending on the type and concentration of pesticides being used, applicators may require respiratory protection in the form of a respirator or mask. Respirators equipped with appropriate filter cartridges or canisters designed for pesticide use can effectively remove airborne contaminants, providing respiratory protection during pesticide application.

Protective clothing should also be worn to minimize skin exposure. This includes wearing long sleeves, pants, and boots to cover as much skin surface area as possible. Clothing made from tightly woven fabrics provides an additional barrier against pesticide penetration. Wearing coveralls or chemical-resistant suits offers full-body protection, reducing the risk of pesticide contact with the skin. It's important to avoid clothing with tears, holes, or gaps that could compromise protection.

Proper ventilation is essential when applying pesticides to minimize inhalation exposure. Applicators should ensure adequate airflow in the treatment area to disperse pesticide vapors and reduce the risk of respiratory irritation or toxicity.

Proper application techniques are essential when using pesticides to control wood-destroying beetles, as they help minimize drift and off-target exposure. Utilizing low-pressure sprayers or equipment with nozzle adjustments allows for better control of droplet size, reducing the likelihood of drift. Adjusting the nozzle settings can further optimize droplet size and distribution, ensuring maximum coverage. Applying pesticides during calm weather conditions is crucial to prevent wind-induced drift. High winds can carry pesticide particles away from the target area, leading to unintended exposure to nearby vegetation, water bodies, or sensitive habitats. It's essential to avoid applying pesticides near water bodies, sensitive habitats, or areas with non-target organisms. Pesticides can have adverse effects on aquatic ecosystems, wildlife, and beneficial insects if they drift or runoff into nearby environments.

Applicators must adhere to proper mixing and handling procedures. They should use designated measuring equipment and follow accurate dilution rates specified on pesticide labels to ensure precise mixing. This helps maintain the desired concentration of the pesticide solution and

minimizes the risk of over-application or under-application. Promptly washing hands and exposed skin areas after handling pesticides further reduces the risk of skin absorption or irritation.

Pesticides should be stored securely in designated areas to prevent unauthorized access and minimize the risk of spills or contamination. They should be stored in locked cabinets or storage rooms that are inaccessible to children, pets, or food products. Keeping pesticides in their original containers with intact labels and safety information helps prevent misidentification and accidental exposure. Applicators should properly dispose of empty pesticide containers, excess pesticide solutions, or contaminated materials according to local regulations and guidelines.

Emergency preparedness is crucial to effectively respond to pesticide-related emergencies and ensure the safety of themselves and others. This involves several important measures. Having emergency response plans in place and ensuring that all personnel are trained in emergency procedures is essential. This ensures that everyone knows what to

do in the event of a spill, accident, or adverse reaction. Maintaining a spill kit stocked with absorbent materials, personal protective equipment, and emergency contact information is vital for quick and effective response to spills or accidents. Applicators should also be knowledgeable about how to recognize and respond to symptoms of pesticide exposure in themselves or others. Prompt action, including seeking medical attention if necessary, can help mitigate the effects of pesticide exposure and prevent further harm.

Hosts Habits and Diagnosis

Lyctidae: Lyctids infest hardwoods with large pores, such as oak, walnut, ash, and hickory. Hardwoods with smaller pores, such as birch or maple, are rarely infested. Softwoods like pine, spruce, and fir are not susceptible to powderpost beetles. Powderpost beetles can also infest some woods of tropical origin (e.g., mahogany and obeche) and can attack bamboo although it is not wood. Powderpost beetles usually infest relatively new lumber, which has a higher starch content than older wood. Therefore, recently seasoned lumber and semi manufactured wood products such as hardwood flooring, floor joists, and paneling are most vulnerable to attack. As wood ages, starch content decreases, making reinfestation less likely with time. Nonetheless, infestations have been observed in wood 40 years of age and older. Once starch levels

drop below 3 percent, the beetles will no longer infest the wood. These beetles are often "built-in" to structures because lumber is infested when it is installed (as flooring), but they can also be brought inside the structure within wooden items, such as furniture or knick-knacks. The frass of true powderpost beetles is diagnostic; it has the consistency of talcum powder and has no grittiness at all.

Anobiidae: Anobiids infest the sapwood of both hardwoods and softwoods, although at times they will colonize heartwood as well. They are frequently found in older wood (10 or more years of age) and in high moisture areas. Some anobiids prefer to feed on wood infected with rot fungi. The frass produced by anobiids is often found in clumps or pellets and has a distinctively gritty or coarse feel. These beetles are infrequently reported in Minnesota, but cause extensive damage in the western and southeastern United States. In these areas, anobiids normally enter homes from outside, rather than being built in or brought in. In any region of the United States, anobiids may be brought into structures with

imported antique furniture. One species of note in Minnesota is *Ptilinus ruficornis*, which attacks logs of aspen (Populus spp.) in rustic cabins.

Bostrichidae: Bostrichids are often found in both hardwoods and softwoods, though hardwoods are preferred. Bostrichids frequently attack woods of tropical origin such as lauan and mahogany. The frass of these beetles is a combination of fine powder, pellets, and larger wood chips, and is frequently cemented into the feeding galleries made by the larvae. In Minnesota, most reports of bostrichids result from furniture imported from Asian countries.

Curculionidae: *Hexarthrum ulkei* is a weevil that prefers moisture-damaged softwoods (like pine). It is generally found in older structures near bathrooms and other areas that are consistently exposed to water. The frass produced by *H. ulkei* consists of small oval pellets and is slightly gritty. Infestations of these beetles often occur in hidden places, and consequently, damage can be extensive.

Description and Life History of Insects

Lyctidae: Adult lyctids are small (1/32"-1/4"), slender, and uniform reddish-brown to black in color, with a prominent head easily visible from above. They are similar in appearance to some beetles that infest

stored food (e.g., flour and grain beetles). Adult beetles lay tiny, cylindrical eggs in the pores of wood. Once the eggs hatch, larvae bore into the wood though larval entry holes are generally not visible to the naked eye. The larval galleries run with the grain of the wood and are generally short.

The creamy-white, c-shaped larvae feed for 3-12 months (several years in some cases) and are responsible for all the damage. Damage is generally first noticed 6-12 months after initial infestation when the adult beetles emerge from the wood. When conditions permit, powderpost beetles will reinfest the same wood from which they emerge. In most cases, other wood products are unsuitable for attack because they are too dry, too moist, or are covered with a sealant (e.g. paint, varnish, or wax) that prevents egg laying.

Anobiidae: Adult anobiids are also small, and vary in length from 1/16"-5/16". They are reddish- brown to black and are covered with fine hairs. Unlike lyctids, the head is not visible when viewed from above. They lay their round eggs in cracks and furrows in the wood, and bore both with and across the grain of the wood. The whitish, grub-like larvae feed for a long period of time and complete their life cycle in 1 to 5 years. Like lyctids, reinfestation occurs when conditions permit.

Bostrichidae: Bostrichids are large, normally between 1/8"-1/4" in length, though some can be much larger. They are reddish-brown to black in color. Like anobiids, the head of the bostrichid is not visible from above (with the exception of the black polycaon, Polycaon stoutii). Their eggs are slender and are deposited in pores exposed in "egg tunnels" that are constructed in the wood by the adult female. Beetle larvae typically feed for less than one year, though this time is lengthened as the wood dries out.

Curculionidae: *Hexarthrum ulkei* is a small weevil (snout beetle), between 1/8"-1/4" in length. The weevils are reddish-brown to dark brown in color with long rows of deep pits on their wing covers. Little is known about the basic biology of these weevils. They can easily reinfest moisture prone areas.

Significance

Powderpost, deathwatch, false-powderpost, and *H. ulkei* beetles are important because they feed on wood, damaging it and detracting from its appearance. Adults emerging from the wood leave small, circular exit holes (2-3 mm diameter), while larvae tunnel beneath the wood surface, converting solid wood into powder. In many cases, the holes can become so numerous that the damage looks like it was created by a shotgun

blast. Most powderpost and related beetles do not normally cause structural damage in a short period of time, but they can quickly destroy smaller items like picture frames and tool handles.

Management

The first step in managing powderpost beetles is to determine whether the infestation is active. Wipe and vacuum all dust from the wood, and examine the area a week later. If the infestation is active, new holes and fresh sawdust should be visible. Be sure that what is seen is not old dust that has dislodged due to vibrations. Check more than once (even many months later) if it is unclear whether old or new dust is found. If no new dust is found, the infestation is not active, and no control is necessary. Another technique is to circle all the exit holes you see with a pencil. If weeks or months later no new holes have appeared, the infestation is not active.

The best control method for an active infestation depends upon the type and size of the wood product involved. Beetles can be killed by freezing the material at or below 0° F for four to seven days.

Because powderpost beetles can acclimate to gradually falling temperatures, the decrease must be sudden for this technique to be

effective. Wood left outdoors for extended periods of time should be placed in a plastic bag or wrapped in plastic. This prevents absorption of moisture which can damage wood products. Heating smaller wood products at 120° F for 2 hours should kill all stages of the beetle, but be sure that the item is heated all the way through. Use caution, however, since some wood products and their finishes may be damaged by prolonged freezing or heating.

Another control method is to protect the wood surface with varnish, paint, or other similar sealants. While this does not kill insects in the wood, it does prevent reinfestation by eliminating all sites appropriate for egg laying.

An application of insecticide can kill emerging adult beetles and prevent reinfestation, but it will not kill most insects already present in the wood. All insecticides effective for control of powderpost beetles, such as borates (e.g. Tim-Bor, Bora-Care), or cyfluthrin (e.g. Tempo), can be purchased and applied only by licensed applicators. All of these insecticide treatments must be done over raw wood. Fumigation with methyl bromide or sulfuryl fluoride is another option that is suitable in situations where an outside source of reinfesting beetles is not present. Fumigation can be done to individual items (in small "tents") or to an

entire structure, and is the only method that will kill beetles (in any stage) deep inside the wood that is part of the structure.

If the wood has been so badly infested that structural damage is evident, replace it with kiln-dried lumber. Because beetles may be present in the area of infestation, all new, unfinished, or otherwise susceptible wood should be protected with paint, varnish, another sealant, or an insecticide.

Managing Infestations

Moisture

It is important to reduce excessive moisture in humid situations like crawlspaces, basements, and other locations; leaky roofs or plumbing should be repaired. Ventilate humid situations where possible.

Single Items

If evidence is limited to a single board, piece of molding, or other item, removal and replacement is most effective and economical. Kiln drying kills larvae within infested lumber, but reinfestation is possible.

Extensive Infestations

If large areas of wood are infested and cannot be removed, the method for 100 percent control would be a structural fumigation. A second, less effective option would be to treat the wood using a borate or residual insecticide. Wood that is stained or painted cannot be surface treated unless the finish is sanded off and removed.

Conclusion

Common wood-destroying beetles encompass a variety of species that pose significant challenges to wooden structures and items. Among these, powderpost beetles stand out with their ability to infest different types of wood, leading to varying degrees of damage depending on the species involved. Lyctid or "true" powderpost beetles target hardwoods, while bostrichid or "false" powderpost beetles are more commonly found in softwoods. Anobiid powderpost beetles, including the deathwatch beetle and furniture beetle, are notorious for their infestations in wooden furniture and structural components. The Ptinidae family, exemplified by the brown spider beetle, contributes to the roster of wood-damaging pests. Controlling wood-destroying beetles necessitates a comprehensive approach involving prevention strategies, spot treatments, insecticides, surface treatments, and, in severe cases, fumigation. Understanding the host habits, life history, and significance

of these insects is crucial for effective management and mitigating infestations, particularly by addressing moisture issues and implementing targeted treatments tailored to the extent of the infestation. By employing proactive measures and vigilant monitoring, the impact of wood-destroying beetles on both structural integrity and economic value can be minimized, ensuring the preservation of wooden structures and items for generations to come.

Future Considerations

Future considerations involve a combination of research, technology, and proactive management strategies to address emerging challenges and mitigate their impact. Some key areas of focus may include:

1. Climate change can alter temperature and moisture patterns, potentially affecting the distribution, behavior, and lifecycle of wood-destroying beetles. Research into how changing environmental conditions may influence their population dynamics and infestation patterns is essential for developing adaptive management strategies.
2. Continued monitoring of wood-destroying beetle populations is necessary to detect any signs of resistance to conventional control measures, such as insecticides or fumigation. Developing alternative control methods and integrated pest management

approaches can help mitigate the risk of resistance and improve long-term efficacy.

3. Urbanization and habitat fragmentation can create conducive environments, increasing the likelihood of infestations in urban and suburban areas. Urban planners and policymakers need to consider the impact of land-use changes on beetle habitat and incorporate measures to mitigate potential infestation risks in building codes and development plans.
4. Advances in technology, such as remote sensing, genetic sequencing, and monitoring devices, offer opportunities to improve early detection and monitoring of wood-destroying beetle populations. Integrating these technologies into surveillance and management programs can enhance efficiency and effectiveness.

By addressing these future considerations through collaborative research, policy development, and public engagement, it is possible to better understand and manage the challenges posed by common wood-destroying beetles, safeguarding both natural ecosystems and built environments from their detrimental impacts.