**Category 7A and 7B: Industrial and Institutional Pest Control**

If you wish to apply pesticides to public properties you must now be a licensed government applicator.

### Industrial and Institutional Pest Control Learning Objectives

After studying this section, you should be able to:

- Identify the different types of stored product pests and strategies to control or prevent an infestation of these pests.
- Describe general industrial and institutional pest control strategies.
- Describe microorganism pests in industrial and institutional pest control.
- List the most common invertebrate pests encountered in industrial and institutional pest control and methods to control them.
- Identify the most common vertebrate pests encountered in industrial and institutional pest control and methods to control them.

### Category 7a and 7b, Industrial and Institutional Pest Control

Recent changes in Nevada’s legislation limit industrial and institutional certified applicators to the following: homeowners, commercial establishments with their own pest control staff (hotels, casinos, resorts, restaurants, etc.), home owner association (HOA) employees, private golf courses or clubs with their own pest control staff, Nevada mine staff and Tribes.

As of July 1, 2017, pesticide applications at public buildings, public schools, all Federal (BLM, USFS, etc.), State, County, City or other municipality
Category 7a and 7b, Industrial and Institutional Pest Control, covers pests in grain elevators, warehouses, hotels, casinos, food establishments, stores, offices, operational sites, schools, rest homes, homes and hospitals.

Remember that all pesticides are considered toxic and should be used with caution around food, food storage and food preparation areas.

Category 7a and 7b, Industrial and Institutional Pest Control, describes management practices for pests found in both industrial and institutional sites. The primary pests found in industrial and institutional sites are insects and rodents. Birds can also be pests. This category does not cover pests in ornamental and turf sites or wood-destroying pests.

Both industrial and institutional settings have similar sites. For example, most hospitals, rest homes and schools have kitchens and offices. So, many industrial and institutional pest control practices overlap.

Industrial sites include:
- Stored product facilities and farm structures
- Food processing facilities
- Retail sites, such as stores, hotels, casinos and restaurants
- Related sites, such as offices, kitchens and operational sites

Institutional sites include:
- Schools
- Hospitals and rest homes

Good sanitation and cleanliness are the keys to control and management of pests in industrial and institutional sites.

**General Pest Control Strategies**

Most effective pest control plans include more than one control strategy or method. Using Integrated Pest Management (IPM) categories, the following are control strategies that have applications in Industrial and Institutional Pest Control.

- **Prevention:** Prevention is an essential management practice that includes sanitation and exclusion. Insects and rodents must have food, water and shelter to survive. Remove one or preferably all of these and pest problems will be significantly reduced.
  - **Food:** Clean food preparation areas, classrooms, and other problem sites frequently to greatly reduce pest problems. Thorough cleaning under and behind furniture, equipment, shelving and appliances may be necessary to remove all food sources. Remove trash regularly and...
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use trash can liners. Keep areas around dumpsters clean. Store food in rodent-proof and insect-proof containers.

- **Water:** Pests find water in numerous places. Wring out and hang wet mops to dry. Repair leaky pipes. Clogged rain gutters and leaking faucets are also important water sources for rodents, insects and birds. Clean floor drains routinely as they are sources of both food and water.

- **Shelter:** Restrict the pest’s access to shelter and food by sealing entry points. Install door sweeps and window screens. Seal cracks and crevices with screens, silicone or other sealant material. Eliminate clutter and keep stored products on shelving off the floor. Bird netting and metal bird spikes will restrict birds from accessing sites where they might roost and nest.

- **Inspection and Monitoring:** Routine monitoring is an important part of managing pests in industrial and institutional sites. Monitoring not only includes surveying for pests but also observing conditions that are favorable for pests, including unsanitary conditions, entry sites and shelter locations. When conditions favoring pests are found, they should be corrected as soon as possible.

Sticky traps and pheromone traps are used for insect monitoring. Sticky traps are simple devices made of cardboard with one surface covered in a glue-like material. When insects contact the trap, they become stuck. Some sticky traps include the use of pheromone lures. Pheromones are natural scents produced by insects that are used to communicate with each other. Some pheromones are sex attractants that attract only males and others attract both males and females.

When monitoring, look for pests and evidence of pests, such as fecal material, shed insect skins, tracks and grease marks left by rodents. Routine monitoring will indicate if pests are present and help you to evaluate whether your pest management strategies are successful.

- **Mechanical/Physical Control:** While stepping on and smashing an occasional ant or cockroach is considered physical control, it is not a sustainable, effective long-term management method. Trapping is the most common means of mechanical control for both insects and rodents in industrial and institutional sites. Trapping is also a monitoring technique used to determine where pests are present and what species are present.

Sticky traps can be used for insects and small rodents, but they are not considered to be the most effective means of control. Mechanical kill traps, such as snap traps, are used for mice and rats. Live traps may be

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Traps can be used both as inspection and monitoring tools and as mechanical controls.
used, but releasing live rodents is illegal. Most often, live trapping is followed by humane euthanasia. Rodents can transmit diseases, so use proper precautions when working around live or dead rodents.

Other mechanical or physical management options include vacuuming and sweeping up pests such as ants. Mechanical control should be done in conjunction with prevention. If you trap mice or vacuum ants but don’t remove food sources and eliminate access, you will never solve the pest problem.

- **Pesticides:** Pesticides including rodenticides and insecticides are applied as sprays, dusts, fumigants, baits and granules. The site where the pesticide is applied must be listed on the product label. Applying a pesticide to a site not listed on the label is a violation of federal law.
  
  - **Rodenticides:** Rodenticides are usually applied in bait form. Pesticide labels describe how and where to apply baits. Tamper-resistant bait boxes or bait stations are often required. Some rodenticides are applied as tracking powders that are sprinkled in areas where rodents are present. They are picked up by rodents on their feet and fur and are ingested during grooming.

  Many rodenticides are classified as restricted use pesticides and may be used only by certified applicators or persons under their direct supervision.

  Rodenticides should be used in combination with preventative methods, including exclusion and sanitation.

  - **Fumigants:** Fumigants are used in industrial sites to control commodity pests. This category does not cover commodity fumigation. Refer to the Category 9: Fumigation, commodity fumigation (L1) subcategory in this manual.

  - **Insecticide baits:** Baits used for insect control are typically applied as gels or granules. Some are applied in bait stations, while others are applied in cracks and crevices where insects occur. Baits used for cockroach or ant control are picked up by insects and taken to the colony where they are shared with the rest of the colony.

  - **Insecticide sprays:** Insecticide sprays may be applied to cracks and crevices, by broadcast treatment, or as perimeter applications. Applicators must identify the insect, select the proper insecticide treatment, and apply the product according to label instructions.
Stored Product Insects

There are four classes of stored product insects:

- **Internal feeders**: The larvae feed inside the grain. Examples are the rice weevil and the granary weevil.

- **External feeders**: Larvae enter through holes in the outside shell and the larvae then eat inside the kernel. Examples are the lesser grain borer and the drugstore beetle.

- **Scavengers**: These organisms are eaters of damaged grain. The sawtooth grain beetle (most common) and the confused flour beetle are examples.

- **Secondary**: These are mold and fungi eaters. An example is the yellow meal worm. It eats products that are out of condition.

These pests require very definite temperature ranges (40°F to 70°F) and humidity ranges (40% to 70%) to survive. Moisture and temperature are important factors for reproduction of stored product pests. The importance of good housekeeping cannot be overemphasized. Do not store packaged goods for long periods. In some situations, storing foods in two sealed containers may be required.

Good sanitation and cleanliness aid in prevention and control. In warehouses, grain elevators or retail establishments, any infestation discovered should be immediately removed and destroyed. Seal all cracks and crevices to eliminate additional infestations. If a pesticide application is warranted, apply according to label directions. Cover and avoid contamination of unpackaged goods or exposed foods. Always cover foods with plastic or a nonporous cover. All pesticides are considered toxic, and most have residual effects. Never apply pesticides to uncovered food or utensils. Pesticide formulations change all the time. Consult your local pesticide dealer for the correct product to use in the situation.

**Microorganism Pests**

The only microorganisms of importance are fungi and water molds. They both require moisture. Fungi may cause additional damage to structures by the growth of their hair-like mycelia. For control, dry up and aerate the area or materials. If chemical controls are necessary, use phenols and oil, especially borates. Avoid breathing these products, use a respirator and protect the skin from contact with gloves and protective clothing. Correct underlying conditions such as excessive moisture and poor ventilation.
Selected Invertebrate Pests

Invertebrate pests include insects and arachnids, such as spiders and mites. The following are those insects or arachnids most commonly encountered in industrial or institutional settings.

Cockroaches: There are four species of importance.

- The German cockroach is the most common. Usually found outdoors, these cockroaches enter the premises in search of moisture. Limit food and water sources and eliminate access to aid in control. The German cockroach has developed resistance to chlorinated hydrocarbons, so use one of the newer insecticides developed for cockroach control. Contact your local dealer for specific insecticides.

- The American cockroach is large and red. Like the German cockroach, the American cockroach is usually found outdoors and enters the premises in search of moisture. Limit food and water sources and eliminate access to aid in control. A quick knockdown residual insecticide is generally used to control these pests. Contact your local dealer for specific recommendations.

- The Oriental cockroach is black and shiny. Usually outside, these cockroaches also enter premises in search of moisture, like the German and American cockroaches. Limit food and water sources and eliminate access to aid in control. A quick knockdown residual insecticide is generally used to control these pests. Contact your local dealer for specific insecticides.

- The brown banded cockroach is very common in certain areas. Unlike the other three species mentioned, brown banded cockroaches prefer warm and dry locations. They are found in structures generally away from water sources. Good sanitation is important. Eliminate food sources. Block entry points by filling in cracks, crevices and other entry sites at ducts, moldings or other openings. Baits and traps are used to control these pests, along with quick knockdown residual insecticides. Contact your local dealer for specific recommendations.

Clothes Moths: These pests eat holes in clothing and furniture. While termites are able to digest cellulose, the clothes moth is capable of digesting keratin for its protein requirements. Keratin is a protein component found in all animal hair, such as wool and the hair of hide-producing animals. These pests feed on wool clothing, fur garments, animal hides, upholstered furniture, carpets and rugs. They may also feed on wool blend fabrics. They are small, ¼ inch in length. They generally do not fly far from the site of...
infestation. The larval stage is the damage-producing stage. Storing susceptible items in air-tight containers can limit infestations. They prefer humid conditions, so lowering the humidity inside structures can aid in limiting infestations. Practice good sanitation by removing pet hair accumulations or wool debris and removing infested items before they spread. Insecticidal sprays may be used, but make sure the sprays themselves will not damage the infested fabric, fur or hide.

Ants: There are many types of ants that are very common and widespread. Most colonies contain at least three castes: queens, males and workers. The feeding habits of ants are rather varied. Many are carnivorous, feeding on the flesh of other animals; some feed on plants and some on dew or similar substances. All ants may bite, and some bites are rather severe. Identification of the specific species is important in control. Adequate control is only possible when the species and habits are considered. Satisfactory results rely on insecticides that provide prolonged exposure. Formulations used are wettable powders (WP), emulsions (EC), dusts (D), granules (G) and poison baits. Contact your local dealer for specific insecticide recommendations once you have identified the species of ant. For aid in identification, contact the University of Nevada Cooperative Extension or the Nevada Department of Agriculture.

Wasps: Wasps include those insects called yellow jackets, hornets, umbrella (paper) wasps and mud daubers. Wasp control varies with the location of the nest. It is recommended that control applications be made at dusk or during the coolest period of the day. When treating aerial nests, spray the insecticide directly into the nest opening as well as the entire nest. Liquid insecticides may be poured into openings of subterranean nests. Contact your local dealer for specific recommendations.

Spiders: Most spiders are beneficial, preying on insect pests. In an industrial or institutional setting, tolerance for spiders is not as high as it is in a garden or outdoor setting. The brown recluse is very rare in Nevada. It has been found only in the southern portion of state. Black widow spiders are the most common poisonous spiders. Black widows can be found both inside and outside dwellings. They do not like direct sunlight, but favor cool, dark and quiet areas. They are not aggressive. Contact your local dealer for recommendations on pesticides for spider control.
Selected Vertebrate Pests

Rats and Mice: Rats and mice are the rodents most likely to be found in industrial and institutional sites. These rodents eat and contaminate food and animal feed. They also cause structural damage by chewing both wood and wiring. They carry diseases contagious to humans, such as Rickettsial pox, bubonic plague and leptospirosis.

No control method will be successful unless mice and rats are kept from entering the site. Seal any opening over ¼-inch wide. Use good sanitation practices and remove any food supply that may attract these rodents. Use rodent-proof containers to store all food and animal feed to prevent attracting and feeding these pests.

Anticoagulant baits are the most commonly used chemical controls. Use care when placing them. Pesticide baits must be applied in approved bait stations.

Snap traps can be effective, provided exclusion measures are also put in place. Baits for trapping include peanut butter plus oatmeal, bacon, gumdrops (for mice), sardines (for mice), nutmeats and dried fruit.

Rat and mouse urine fluoresces under UV light. This characteristic can be used to locate their trails and commonly frequented areas. Bait and trap in these areas. Check traps daily and use care when handling dead rodents.

Norway rats are good climbers, jumpers and diggers. They contaminate 25 times as much as they eat by urination and defecation. They eat a wide variety of foods, but are wary of new food items. Pre-baiting may be required. They are active mainly at night.

Roof rats are not widespread in Nevada, and are primarily found in Las Vegas and the vicinity. Excellent climbers, they live in trees and often nest in palms, etc. They can transmit diseases, especially plague. Controls are similar to those for the Norway rat.

House mice are very prolific and can have six to eight litters per year. Mice harbor mites that spread rickettsial pox. They are random feeders, so set baits or traps 10 to 15 feet apart. Use sardines, peanut butter, candy or anything that is oily. The life span of a mouse in the wild is usually less than one year.

To prevent infestations, remove food sources, line garbage cans with plastic bags, make entranceways rodent-proof, and put garbage cans up on racks. All of these practices will discourage both rats and mice.

Deer Mice: Deer mice can carry hantavirus. Although the chance of infection is low, the mortality rate is high. As with other mice and rats, anticoagulant
baits, snap traps and excluding the mice from structures are recommended
management measures. Clean up droppings and urine with disinfectants or a
five percent to ten percent bleach solution. Do not sweep, vacuum or
atomize these wastes. Use a micron-filtered dust mask and gloves during the
cleanup. Close openings over one-quarter inch in size to exclude further
infestation. See the General Knowledge: Hantavirus – An Update chapter in
this manual for further information.

**Bats:** Big brown and little brown bats are the most common species found in
buildings in Nevada. Nursery colonies are produced in summer. Occasionally,
these nursery sites are in the attics or basements of buildings or in other
structures. These sites may also be used for hibernation during the winter.
The best control is exclusion. Young bats must be able to fly before an
exclusion strategy will work. If you seal entry/exit points while young are
present, they will die inside the building. This results in additional problems.
Make sure the bats have departed for the evening and then seal up all
openings greater than ¼-inch wide. This includes vents, chimneys and other
opening in the roof, eves or soffits, gaps around windows or doors, gaps
around conduits or pipes, and holes or gaps in window screens. For
migratory species, the best time to implement exclusion measures is during
fall or winter.

Bats can carry rabies, but the infection rate is low. Most bat bites occur when
people handle or provoke a bat. As with all animals, use caution and
common sense when handling dead bats. Some species of bats in Nevada are
protected. No chemicals are registered for bat control.

**Summary**

Exclusion is the best method of control for all industrial and institutional
pests. Good sanitation and cleanliness will aid in prevention and control. Any
infestation discovered should be immediately removed and destroyed. Seal
all cracks and crevices to eliminate additional infestations. If a pesticide
application is warranted, use extreme caution when applying the pesticide.
Avoid contaminating unpackaged goods or exposed foods. Always cover
foods with plastic or nonporous covers. Never apply pesticides on or near to
uncovered food or utensils. All pesticides are considered toxic. Most have
residual effects. Pesticide formulations change all the time. Consult your
local pesticide dealer for the correct product to use in your situation.

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and B. Allen and C. Moses, Nevada Department of Agriculture.
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