

*Managing Insect Pests  
In Food Storage Facilities*



***“Servicing North America with Local Care”***

## *PREFACE*

Every dollar spent on insect pest prevention will, most likely, return additional dollars in reduced product losses. This fact quickly illustrates that managing pests is actually an investment and not an expenditure.

Prevention is one critical factor in any effective pest management program. Prevention of pests means prevention of losses -- losses of product, reputation and time. Prevention takes many forms. Two basic forms are exclusion and sanitation. Keeping the pests outside, along with proper sanitation inside, helps prevent infestation and leads to a more organized, more efficient and safer work place.

Copesan wants to help you control insects and other pests. Please call us so together we can prosper.



## *To Our Customers:*

This booklet will help you save time and money. More importantly, it will help you keep your most valuable asset - your good name. Please remember - today's quality is tomorrow's reputation.

Copesan is committed to providing pest management services for regional, national and international clients. Our goal is to be a quality leader in the marketplace. However, we realize we cannot do this alone. We need the cooperation of each and every one of our customers. With your help, we can provide an overall pest management program with CARE = Consistency, Accountability, Responsiveness and Effectiveness.

This booklet has been developed, in part, to share with you some pest management tactics based upon sound IPM (Integrated Pest Management) concepts. There is a section describing what you, our customer, can do to help assure that your products will remain insect-free and in top quality condition. This booklet should be a long-term reference for your operations and can be reinforced with our outstanding video and CD-ROM training units. We look forward to assisting you with managing insect pests and helping you save time and money.

Ole Dosland  
Director of Technical Training & Education  
Copesan

## *FOOD MANUFACTURING QUALITY CONTROL*

First a little background on typical food manufacturing quality control. Generally, food processes take many precautions during the production and storage of food, assuring a clean, safe and wholesome product. The next few pages will familiarize you with some of these controls and pest prevention methods used to assure food is free from various forms of insect pests.

1. Suppliers of raw materials are visited on a regular basis and supply shipments must adhere to quality standards before they are accepted. Insect control and sanitation are two critical items considered before a supplier is selected.
2. Incoming materials are closely inspected upon arrival at food plants. Materials must be completely free from insect infestation before being accepted.
3. Raw materials are segregated and stored in areas that are monitored in an ongoing manner for any deterioration.
4. Processing temperatures are high so that the various stages of insects which may be present are entirely destroyed.
5. During processing, and before packaging, products pass through various critical control points determined by a HACCP (Hazard Analysis Critical Control Point) system.
6. During packaging, products encounter additional control points before they are containerized and palletized.

7. Products are usually stretch wrapped before storage. At this time, the finished food product is free from the various stages of insects and other pests.

## *SANITATION AND PEST MANAGEMENT*

Well-managed food plants have written integrated sanitation and pest management programs. This section will highlight some that can be used in storage facilities.

1. Sanitation is everybody's responsibility. In addition to the daily cleaning performed by the various departments, special cleaning crews dismantle major machines on a regularly scheduled basis for thorough internal cleaning and sanitizing.
2. Prior to reassembling equipment, the quality of cleaning and sanitizing is inspected at various check points to assure it has been completed satisfactorily.
3. The Quality Department generally inspects plant equipment and the environment at many locations on a periodic basis to be sure there are no signs of insects or other pests.
4. Approved pesticides are applied by certified applicators to selected areas of the plant on a strategic, as needed basis, with each pesticide application documented. Strict precautions are taken to assure that no process or product contamination occurs.
5. As part of these preventative programs, the manufacturing plant is continuously cleaned, usually on a master sanitation, scheduled program.

6. There are basic departmental sanitation standards that must be passed before products can be made.
7. Before products are shipped, each truck is inspected thoroughly prior to loading.

*MONITORING:  
One step further*

The processing and quality controls which take place at each manufacturing plant help assure that food products are clean, safe, wholesome and free from any pest contamination. However, there is more:

1. Registered sanitarians, hygienists or other third party inspectors usually audit the entire plant sanitation and pest management programs periodically, sometimes on an unannounced basis.
2. The Good Manufacturing Practices (GMP's) outline many other steps to perform. Employee GMP training provides ongoing facility awareness of these important requirements.
3. Warehouses throughout North America where food products are stored are checked for compliance to these GMP's.

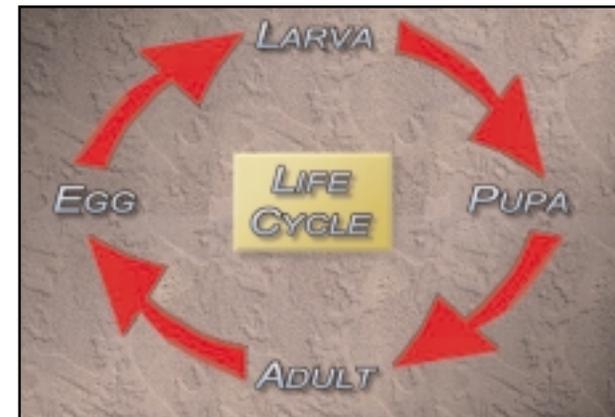
Quality is the personal responsibility of every manager, supervisor and employee of your company. As today's quality is tomorrow's reputation, then it's our collective future.

As you can see from this information, the controls over the manufacturing and initial distribution of food products from ingredient suppliers to food warehousing, are

extensive. The responsibility to assure food remains clean, safe, wholesome and free from any contamination is then transferred to the next storage handler and/or retailer.

*LIFE CYCLE OF STORED-PRODUCT INSECTS*

While little attempt will be made here to give a detailed scientific description of insect development, a basic understanding of the stages in their life cycle is appropriate. Most insects we are concerned with are in a complex category. They are the result of what is known as complete metamorphosis, a change in appearance. This metamorphosis consists of four stages of life: egg, larva, pupa, and adult.



**Metamorphosis Diagram**

The length of time for each stage differs with the various species, but the pattern is the same. The fertilized female adult deposits 50-500 eggs in or close to food supplies. After a few days, a larva (worm) hatches from each egg. The larva begins feeding at once. Growth is dependent upon temperature, humidity, and food. As time passes, the

larva outgrows its skin. A new skin is developed, and the old one is shed. This will be repeated several times. When a larva hatches from the egg, it is in the first instar. When it sheds its skin for the first time, it is in the second instar, and so forth. There are indefinite numbers of instars in the larva stage of some insects, leaving many skins behind, known as cast skins. Insect frass includes cast skins as well as their excretions and waste products.

When the larva is full-grown, and has shed its skin for the last time, it transforms into the pupa stage. The non-feeding pupas are normally white at first, become yellowish, then brown. The metamorphosis from larva to adult takes place in the pupa stage.

The newly emerged adult insect darkens in color and immediately begins its adult functions - foremost, mating and laying eggs. In this stage there is usually no further growth. This development pattern, (dependent mostly upon temperature), applies to most insects that are considered stored-product pests.

### *INSECT INFESTATION IN STORED FOOD PRODUCTS*

There are thousands of insects associated with the food industry. These same insects are associated with many foods such as cereals, nuts, fruits, candy, and non-food items such as tobacco, birdseed and pet foods. The most common insects, which you may see in areas around stored products anywhere in the world, are described and illustrated in a number of commonly available fact sheets and pamphlets.

There is a second group of insects that can infest storage facilities and stored products. These are related to exclusion

and sanitation. Some of these scavengers are cockroaches, flies and ants.

### *INSECT PENETRATION OF PACKAGES*

Insects can penetrate through small openings in packages not noticeable to the human eye. The newly hatched larvae are very small. An example of this is the first instar of the Indian meal moth (a typical stored-product insect). It measures nearly 1/250th of an inch across its head, a distance smaller than a needlepoint.

Penetration can also be made through sealed packages by insects chewing through the packaging material. Most insect larva has the ability to chew many materials. Some adults such as the cigarette and larder beetle can chew through paper.

Insects are primarily attracted to a food source by the product odor or possibly the odor of infestation itself. They have an extremely sensitive odor detection system.

Female insects will move around stores and warehouses in search of a suitable food supply. Some products such as pet food give off strong odors. The insect detects this odor and lays her eggs on or near this food that will satisfy her offspring's needs. Once these eggs hatch, the larva penetrates packages.

### *WHAT YOU SHOULD DO*

This section will highlight for food storage personnel some of the more important GMP's, pest exclusion practices and sanitation considerations.

## *OUTSIDE GROUNDS*

1. Keep the immediate 50-foot area free of litter and idle storage. Foliage should be maintained at a height less than 3 inches. Proper drainage must be provided.
2. Keep the immediate 2-foot area free of any foliage. Small rock at a depth of 3-5 inches on perforated plastic is suggested.



**Outside of a Warehouse**

3. Provide timely trash removal (at least weekly in most cases and twice a week during warm seasons). Containers must be clean, and covered when not in use.
4. Dock areas should be clean, and closed when not in use, unless screened.

## *BUILDING*

1. All roofs and walls should be in good repair and free from bird nesting/roosting areas. No openings for

insects (16-20 mesh), rodents (> ¼ inch), or other pests should be observed. False walls or other "voids" should be avoided.

2. Exterior lights should be non-insect attracting, (sodium vapor) and preferably not attached to immediate building (certainly not near doors). Interior lights should be clean (insects like the warmth) and shielded, providing adequate candle power (25-30) for cleaning activity.
3. Floors should be in good repair, reasonably free of oil, dirt, product, and other residue buildup. All cracks, especially at floor/wall junctions, should be caulked.
4. Doors and windows must be tightly closed (use flexible rubber sealing devices and nylon screens where applicable) to avoid pest entry. Avoid product storage near windows.
5. Heating, ventilating, and air conditioning (HVAC) systems should be filtered/screened and accessible for cleaning.



**Warehouse Truck Dock**

## GENERAL OPERATIONS

1. Inspect incoming product shipments before unloading for evidence of pests or contamination. If evidence is noticed, do not place this product in your warehouse with other good products. Investigate for the source. Any returned product should be considered suspect and segregated.
2. Establish effective stock rotation, first in, first out (FIFO) procedure. This is for all materials, not just for food.
3. Store all products and materials 18 inches from walls. Products must not have any direct contact with floor. Aisles should be at a width to prevent handling damage. It is preferred to use white paint along the 18-inch wall perimeter.
4. Toxic materials (gasoline, propane, batteries, pesticides and cleaning compounds) must be kept a safe distance from all food to avoid the possibility of contamination. Also, these items should be secured.
5. Empty pallets should be segregated from products, stored flat, kept dry and reasonably clean, in good repair, and removed in a timely manner. So as not to provide undisturbed pest harborage, the slip-sheets should be separated.
6. Any spillage must be attended to immediately. Damaged or punctured bags, or bags, where product is exposed, must be attended to on a daily basis.
7. Mechanical pest control devices (multiple-catch rodent traps, glue boards, insect light traps) should be a primary consideration. Rodent baits and/or other toxic poisons should be used as a last resort and only at the direction of a certified individual.
8. A record of all pest activity and control measures taken should be maintained. A pest management program manual consisting of contracts, insurance, pest sightings, service reports, etc. should be kept at each facility.
9. Establish a regularly scheduled program of general housekeeping, incorporating: area to be cleaned; how; by whom; and at what frequency. Initiate internal and/or external inspections to evaluate the overall program.
10. Prior to loading any trailers, inspect the interior for cleanliness and dryness. Do not load a dirty, damp or infested trailer.
11. Provide ongoing employee awareness sessions and training of GMP's, IPM, pest exclusion practices and sanitation. Copesan has some excellent video and CD-ROM training units available to help you train your personnel, assuring a pest free environment in your operations.



# *COPELAN FOOD STORAGE PEST MANAGEMENT SPECIFICATIONS*

ITEM	FREQUENCY (Minimum)	STANDARDS
<b>DOCUMENTATION</b>	Each service	Neat, legible and accurate. The type and number of pests, materials used, conducive conditions and corrective actions must be documented.
<b>RODENT CONTROL</b> – Outer Property Perimeter Bait Stations	Every 4 weeks	Anchor stations with lids secured by screws, padlocks, keyed top cover or plastic ties. Note: Re-usable plastic ties are not permitted. Approved bait must be secured according to rodenticide label requirements and each station identified with number, date service sticker or punch card, servicing partner and poison (if appropriate), spaced no more than 75 to 100 feet apart. Record what bait is used and/or changed with reason (old, eaten, moldy). Keep accurate site map with station numbers.
<b>RODENT CONTROL</b> – Exterior Building: Perimeter Bait Stations and Mechanical Traps	Every 2 weeks	Anchor stations with lids secured by screws, padlocks, keyed top cover or plastic ties. Note: Reusable plastic ties are not permitted. Approved bait must be secured according to rodenticide label requirements and each station identified with number, date service sticker or punch card, servicing partner and poison (if appropriate), spaced no more than 50 feet apart. Optional weather protected multiple-catch traps near building entry areas is suggested. Record what bait is used and/or changed with reason (old, eaten, moldy). Keep accurate site map with station numbers.
<b>RODENT CONTROL</b> – Interior Building: Perimeter Mechanical Traps and Traps with Glue Boards	Every week	No poison rodent bait may be used. Multiple-catch traps identified with wall marker, number, inside service date sticker or punch card, servicing partner, spaced around no more than 25 feet apart and on both sides of doors and between every 3 to 5 overhead doors. Glue boards or sticky traps used within traps must be replaced after 14 days or when pest activity requires more frequent change. Keep an accurate site map of all devices.
<b>RODENT CONTROL</b> – Recording data	Each service	Record information for each station or trap, such as missing, damaged, feeding, number of rodents caught, no activity, etc.

## *COPELAN FOOD STORAGE PEST MANAGEMENT SPECIFICATIONS*

<b>ITEM</b>	<b>FREQUENCY (Minimum)</b>	<b>STANDARDS</b>
<b>INSECT CONTROL</b> – Building Exterior	As necessary	Treat along immediate structure base, roofs, doors and windows with residual insecticide, preferably wettable powder, microencapsulated materials and/or insect baits. Outdoor spray applications should not be performed near operating air intakes, nor if the wind is greater than 5 miles per hour. Use only approved materials. Label directions must be followed. Seal cracks and keep openings closed or screened.
<b>INSECT CONTROL</b> – Building Interior	As necessary	Seek out active infestations and/or potential harborages and treat using IPM tactics such as vacuum and caulk. Place emphasis on least toxic but effective solutions such as baits, growth regulators and other approved materials. Label directions must be followed.
<b>INSECT CONTROL</b> – Monitoring Insect Light Traps (ILTs)	Every week	ILTs are for indoor use only. Only shatterproof black light lamps should be used and replaced on a semi-annual basis. Specific placement (low or high) of ILTs depends upon day or night flying insects respectively. The catch trays or glue boards should be serviced in a manner to identify predominant species and examine closely for any stored product insects. Record information and keep an accurate site map.
<b>INSECT CONTROL</b> – Monitoring Traps	Each service	Maintain traps (glue with/without pheromone lures) in areas susceptible to infestation. Specific rodent multiple-catch traps with combination glue pheromone lures are positioned carefully inside plant where temperature is greater than 60 degrees F. To monitor insect activity outdoors, place lures beyond 30 feet of any building openings. Monitoring traps should be placed inside to provide a grid pattern, generally spaced no more than 30 to 50 feet apart. Lures should be replaced approximately every 90 days. Sticky traps should be replaced every 14 days or more frequently when insect activity justifies. Traps may contain multiple lures and should be placed at floor level when monitoring for crawling insects.

## *COPESAN FOOD STORAGE PEST MANAGEMENT SPECIFICATIONS*

<b>ITEM</b>	<b>FREQUENCY (Minimum)</b>	<b>STANDARDS</b>
<b>BIRD CONTROL</b> – Building Exterior	Each service	Nesting of birds is not permitted. Seek out active infestations and/or potential nesting areas. Treat these areas using IPM tactics, such as use of exclusion nylon netting. Remove nests wherever practical as soon as noticed. Any chemical control application must be approved in writing by plant management.
<b>BIRD CONTROL</b> – Building Interior	Each service	Birds, or evidence of birds, are not permitted. Seek out entry source and eliminate with IPM tactics such as plastic strip curtains, rapid rollup doors, and/or screening of entry areas. Remove birds in an immediate manner by approved methods.
<b>ATMOSPHERIC MODIFICATION OF STRUCTURE/ COMMODITY</b> – Fumigation – Heat Treatment	Justified on an as needed basis	Since these atmospheric modifications are considered to be severe, dangerous and costly, approval must be obtained from a designated management individual with authority. A formal proposal is required and must be approved in writing by the designated management individual.

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## *Integrated Pest Management (IPM)*

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