



INTEGRATED PEST MANAGEMENT GUIDE FOR FACILITY MANAGERS

Understanding IPM for facilities, landscape and grounds management

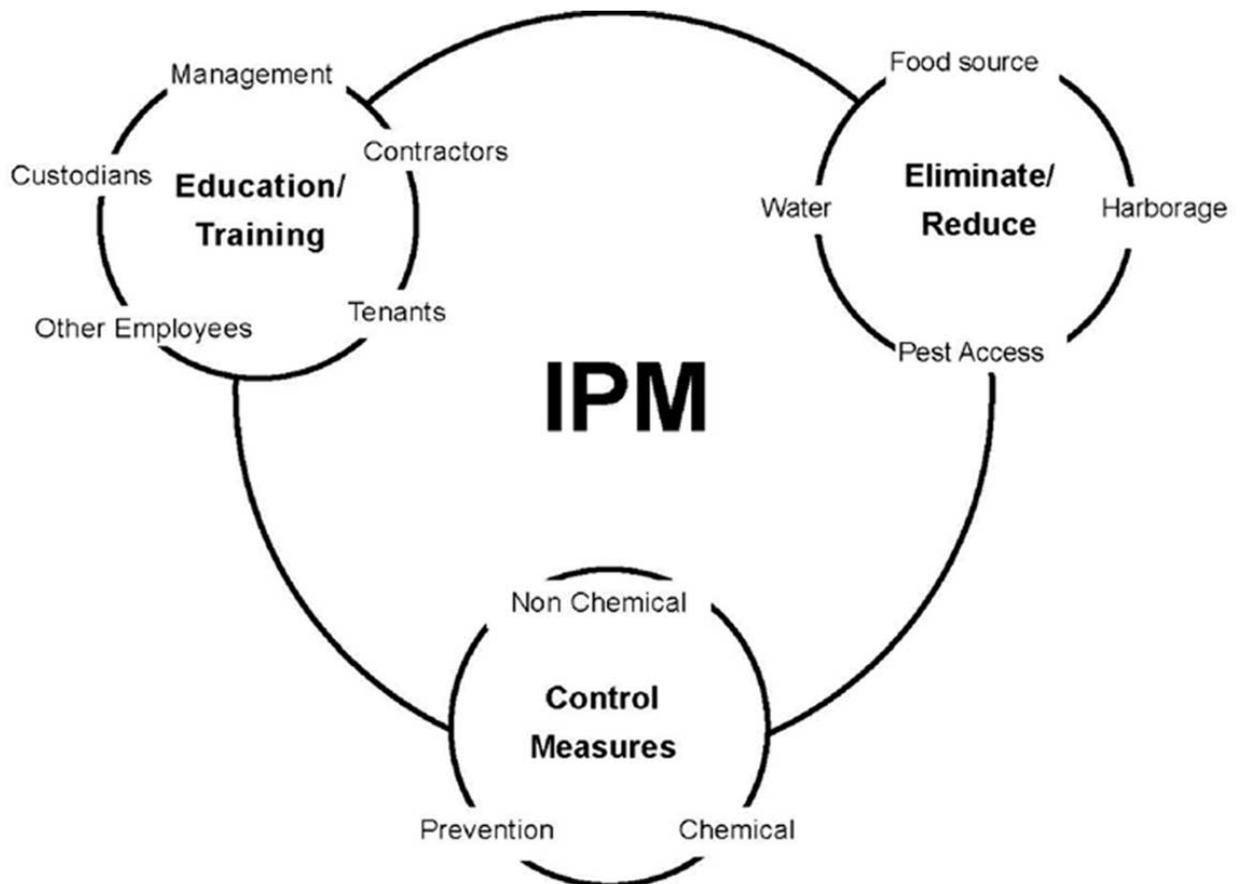
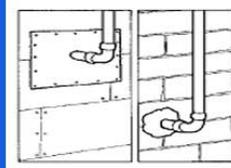


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Why This Manual?

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This manual is designed for those who are in charge of managing building and surrounding landscapes. The goal is to ensure that Facility management & building occupants and all concerned understand, what role they play in effective pest management within an IPM program and have a professional, responsible pest management plan in place.

Facilities management plan must include a proactive pest prevention program that is not only effective but is also environmentally responsible. Pests and the techniques used to manage them can greatly affect human health and safety. For example, allergens from insects and rodents can trigger or cause a host of human conditions and diseases when aerosolized particles of pest urine, droppings or remains become airborne and are inhaled. But the excessive use of pesticides is equally undesirable and potentially hazardous.

Experience has shown that applying IPM methods eliminates unnecessary pesticide use. At the same time IPM Project managers report better results than when they mainly relied on pesticides to control pests. This is not surprising because IPM programs are based, first and foremost, on preventing pest problems by preventive methods such as improved sanitation, housekeeping, maintenance, growing healthy plants in well-designed landscapes etc.

Lack of training is often cited as an obstacle to the wider adoption of IPM methods. Whether pest management services are provided in house or are outsourced, improper training could lead to an ineffective or dangerous pest management program. This manual describes the basic principles of IPM as they apply in structures & surrounding landscapes and gives examples of IPM programs for common pests. It is intended to be a training manual as well as a basic reference guide for facility managers, building occupants, project managers and department IPM coordinators. It may also be useful for pest control professionals who want to know more about IPM and least-toxic treatment methods.

Every IPM project must be tailored to suit a specific site as well as the needs of those who use the site. Each chapter contains a list of suggested references that provide more information. We hope that readers will be stimulated to go on and investigate this fascinating subject in greater depth and will continue to keep up with new developments in the field.

This is our first approach for the Facility Managers & building occupant IPM awareness and education so there may be unforeseen omissions and errors. We



would appreciate receiving comments that will help us improve future editions of this manual. This Manual may never be completed; to include all possible methodologies although many of the IPM principles as described here still apply to variety of structural situations and near vicinity (urban turf & landscape). Other outdoors IPM projects are or will be addressed in the Regional IPM Resource Manual and/or the Santa Clara County IPM Website. *The methods described in this manual, especially those directed at permanent modifications of structure, landscape and other components of the living environment, will help to prevent and control the pests.* **Note: This manual is a companion to SCC IPM Administrative Procedures & Guidelines.**

Why Use IPM?

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During the last two decades people are becoming more aware of and concerned about the use of chemicals and their effects on both human health and the environment. Pesticides, because they are toxic by definition and the impact of their use on drinking water, air, food production, structures and landscapes has become a significant social concern.

Traditional methods of pest control usually involve no more than periodic applications of pesticides. Landscapes associated with urban areas, public parks and gardens, golf courses, and lawns and ornamentals, right of ways have traditionally been managed intensively using chemical pest control thus increasing the risk and probability of pesticide exposures. Many people have begun to wonder if there are ways to reduce or eliminate pesticide use in non-agricultural and structural settings.

For building managers, one pesticide related issue that is gaining increasing attention is indoor and surrounding air quality. While pesticides are not the only factor associated with indoor and surrounding air quality problems, they are often implicated as a contributing element. Even where problems with indoor and surrounding air quality are not apparent, pesticide use is increasingly becoming a contentious and emotional issue with building occupants. Another issue is of pesticides affecting water quality. The driveways and sidewalks (impermeable surfaces) around the urban landscapes do not have planted buffer zones. This creates a rapid runoff of pesticides applied to the lawn and landscapes, off the site to storm water channels, creeks, watersheds and wetlands. Ground water is also vulnerable to leaching of pesticides.

As a result, building managers are being put under increasing pressure to address pesticide concerns, and account for pesticide use in their buildings. At the same time, they continue to be responsible for controlling insects and rodents. These pests may also pose health risks or damage buildings and goods. Many involved in this issue, ranging from pest control contractors to

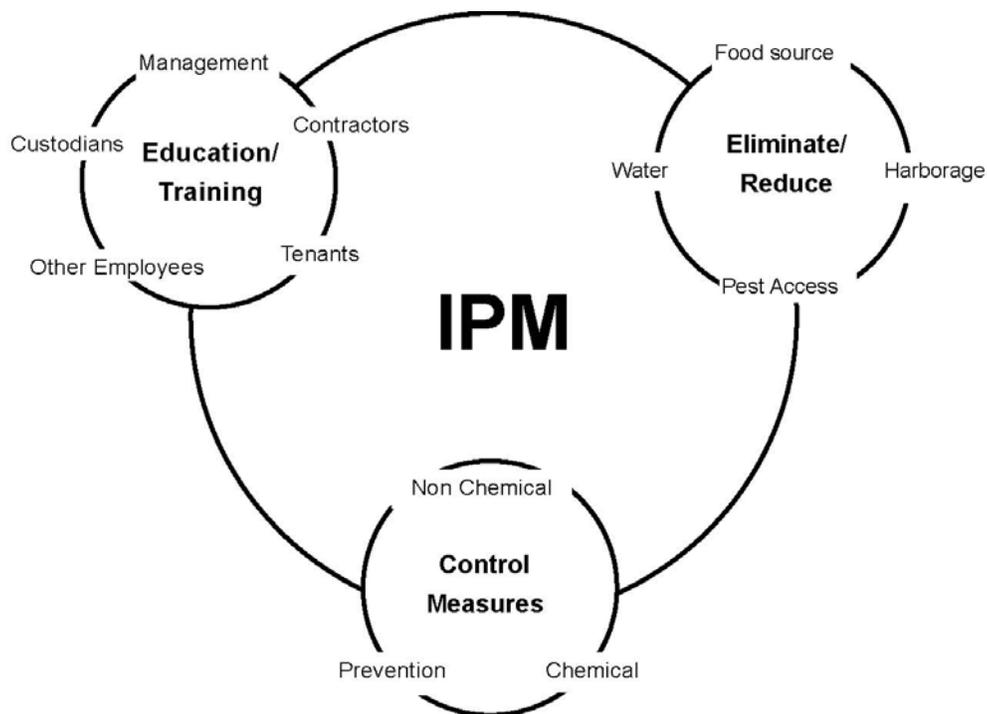
environmental groups, are putting Integrated Pest Management (IPM) forward as the best means of balancing the need for pest control, with the concerns pesticides may raise.

I. ROLE OF FACILITY MANAGEMENT IN IMPLEMENTING THE SANTA CLARA COUNTY'S IPM PROGRAM

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INTEGRATED PEST MANAGEMENT (IPM)

Integrated Pest Management is defined as the "use of all appropriate technology and management practices to bring about pest prevention and suppression in a cost-effective, environmentally sound manner." IPM is a common sense approach that uses a variety of methods to control pests with greater emphasis on non-chemical control techniques over chemical controls.



Chemical pesticides may be part of an IPM program and used as necessary. However, considerable effort is also put towards preventing pest problems by controlling conditions, which may attract and support pests.

In structural pest control (pest control in and around buildings), IPM focuses mainly on eliminating or reducing sources of food, water, and harborage that are available to pests, and limiting pest access into and throughout buildings. Control measures such as sanitation, and building maintenance and modifications are strong elements of a structural IPM program.

In landscape pest control, IPM focuses on preparing a site correctly and selecting plants best adapted to local conditions and then watering, fertilizing, and caring for them properly form the basis for integrated pest management. Keeping a

landscape healthy enables it to tolerate low levels of pests and makes the area a good habitat for beneficial organisms that help control pests. To make the best use of natural controls, it is important to understand the biology and ecology of the environment. In natural ecosystems, all the living organisms interact. Conditions in the ecosystem also depend on site and soil factors, weather, pollutants, and other non-living factors. Thus making IPM decision-making process complex in urban landscape.

In most situations where IPM has been implemented, both pesticide use and pest problems have decreased dramatically. The goal is to maintain acceptable quality and productivity while minimizing costs and any adverse effects, which pesticides may have on the environment.

BENEFITS OF IPM

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Benefits of IPM include:

1. Better Pest Control

Effectively applied, IPM programs have been shown to provide better results and last longer than traditional pest control

2. A Safer and Healthier Workplace

Both pests and pesticides pose health concerns for building occupants. Pests carry human pathogens and may produce potent human allergens. Building occupants may be exposed to pesticides through the air, or direct contact with treated surfaces. IPM is being recognized by many experts as the best means to control pests effectively, while using the least amount of pesticide necessary. An increasing number of states, municipalities and school systems are mandating that IPM programs be implemented in their buildings.

Since IPM results in fewer pests than traditional pest control, it usually results in less pesticide use. However, whether IPM will reduce the amount of pesticide used in a building will in large be determined by what was being done for pest control before an IPM program was implemented. Most facility managers report substantial reduction in pesticide use with IPM.

3. Optimum Cost

Changes in cost, like pesticide use reduction, will in large part depend on what was done for pest control before an IPM program was implemented. In many cases, IPM programs result in similar or lower costs than traditional pest control programs. Some pest control program may rise initially when certain aspects of an IPM program are put into place (such as structural modifications). Over time however, these costs usually balance out in terms of savings in pest control, or other budgets. Cultural controls and structural modifications applied for pest control purposes often have other benefits such

as improved work environments, reduced energy costs, and reduced building maintenance.

4. Better Public and Occupant Relations

IPM is a proactive method of controlling pest, which demonstrate that facility management is environmentally conscientious and is concerned about the health of building occupants.

BARRIERS TO IPM

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There may be barriers to implementing an IPM program. Barriers may include the following:

- Some facility managers may perceive **IPM as expensive** to implement. In some cases this may be true, especially if maintenance and pest problems of the past have been ignored or dealt with improperly. Costs must also be measured over a period of time. While they may rise initially, overall costs will go down and stay with an effective program.
- In most facilities, pest control is often seen as the **responsibility of one individual**. However, factors, which contribute to pest problems, are often under the control of other individuals who may not think in terms of how their activities affect pest populations. For instance plumbers, electricians, gardeners and custodians all have a role in managing pest problems. Training, cooperation, and coordination are keys to a successful IPM program.
- Even when individuals are trained and informed of their roles as in IPM project, they still may not care or feel that it is their responsibility. Everyone who has a role in IPM must be committed and **accountable**.
- IPM is relatively **new to decision-makers** using commercial and in-house pest control services. These persons may not know what considerations to take into account when issuing purchase orders, making budgets, and sending out requests for proposals (RFPs).
- IPM **requires more skill and knowledge** than traditional pest control, so some pest control contractors may not be up to the task of implementing IPM.
- Price is often used as the sole criteria by which pest control contracts are awarded. This often forces contractors to do the **“bare minimum”** and ignore many aspects of IPM. RFPs and contract proposals must contain language, which addresses specific elements of IPM.

- IPM requires a **degree of participation from tenants** and others who use buildings. In the past, these persons may have had a passive or nonexistent role in the pest management activities going on around them.
- **Lack of education** on IPM by Facility Management Staff and facility occupants contributes to **lack of public participation**. This results in little incentive to participate in the IPM program.

IPM & THE COUNTY OF SANTA CLARA

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IPM & Pesticide use ordinance

Although IPM has been implemented in Santa Clara County's structural and urban turf and landscape pest management projects for many years, renewed & continuous emphasis is needed. Santa Clara County's [IPM and Pesticide Use ordinance #NS-517.70](#), mandates a reduction in the environmental risk from pesticides used in facilities IPM projects. The success of such a program requires the ongoing collaborative efforts of everyone involved in the management and maintenance of a building including contractors, tenants, custodians, and other employees.

We expect IPM:

- To deliver sustainable pest free environment
- To minimize harm to human health and the environment
- To reduce the need for pesticides and minimize pesticide waste

Education and cooperation

Education and cooperation are necessary parts of any IPM program. It is incumbent upon all personnel involved in Santa Clara pest management projects to actively support IPM initiatives and provide resources for implementation. This includes trained Department IPM Coordinators, Project Managers, Facility Managers and Supervisors responsible for real property, food services and custodial services, Building Occupants, Pest Controllers, Pest Control Quality Assurance Evaluators, and Pest Management Consultants. It has never been more important for the Department IPM Coordinators to ensure that IPM strategies and methodologies are incorporated into facilities pest management plans, facilities program reviews and contracting processes, training for Santa Clara County's Pest Controllers, building occupants and management team.

Facility Manager's IPM Guidance Manual

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This is not a cookbook on IPM!

The purpose here is to present a sampling of techniques and procedures to illustrate the facilities management approach to pest control. All of the methods cited have been tried previously, and all have proved successful in real-world

situations. But since buildings vary enormously, no method will work equally well in all circumstances. The challenge of IPM is that it often cannot be delivered by formula. Once the basic principles have been understood, there is no substitute for resourcefulness and ingenuity in developing practical, site-specific pest management solutions. Another objective of this document is to illustrate the variety of control techniques that can be used in Integrated Pest Management.

How to Implement an IPM Program in the Santa Clara County, a multi-jurisdictional organization?

A successful IPM program will require a firm commitment from a fairly large number of individuals. Someone in a position of authority from Facility Management will have to stand behind the program and develop and enforce IPM-related policies. An IPM program will only be as strong as the commitment of those involved. The exact steps in implementing an IPM program will vary between facilities, depending on how the management organization (department) is structured, management styles, etc. Below are general guidelines on how to proceed:

STEP 1-Relationship between Facility Managers and Department IPM Coordinator

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Each department should designate a Department IPM Coordinator. The IPM Coordinator may have dual role as a facility manager and Department IPM Coordinator or may work with the Facility Manager(s) at each facility. If wearing the dual cap, this person will be responsible for overseeing all pest control operations and related activities at each facility or group of facilities. This person will serve as a liaison to and between tenants, other facility management persons, the County IPM Manager, pest control contractors and other contractors on all matters relating to pest control. The ultimate goal of this person is to ensure that an IPM approach is followed.

In multi-building facilities, it may be advisable to designate a person within each building (preferably the Facility Manager) to oversee the pest control activities. This person can either act on own or report to the Director of Facilities and or Department IPM Coordinator as needed.

The Facility Manager and Department IPM Coordinator should receive a complete copy of this manual, and may be responsible for implementing Step 2-6.

STEP 2-IPM Policy & Plan

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It is important for the Department IPM Coordinator, IPM Project Managers and Facility Managers to understand the SCC

Note: Before preparing departmental IPM Plan, consult with the County IPM Manager and review Santa Clara County's IPM Administrative Guidelines and Procedures. These guidelines are available on SCC IPM website.

County IPM & Pesticide Use Ordinance and also to follow department IPM Mission, IPM organizational/communication flow chart, implementation plan, tenant & personal education, contract provisions, responsibilities, etc.

The brief of the IPM plan should be shared with to all tenants, building staff and contractors and should contain the following information:

- 📖 **What IPM is?** The basic definition of IPM found throughout this manual can be used: for example: Integrated Pest Management (IPM) is a common sense approach to pest management that uses a variety of methods to control pests. Chemical pesticides may be part of an IPM program. However, considerable effort is also put towards preventing pest problems by controlling conditions in buildings, which may attract and support pests. A successful IPM program requires the collaborative efforts of everyone involved in the management and maintenance of a building including building tenants.
- 📖 **Why Building Management is dedicated to an IPM approach to pest management?** List the reasons why an IPM approach is being taken, such as problems with air quality, poor pest control, tenant concern about pesticide use, etc.
- 📖 **Tell who will be involved:** List the individuals you expect to cooperate and participate such as tenants, building management personnel, etc.
- 📖 **Explain how the IPM program will be implemented:** Give time frames. Describe your general plan including elements such as tenant and personnel education, contract provisions, responsibilities, etc.

STEP 3-Educate Facility management staff

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Facility Management personnel responsible for various activities in the facilities (sanitation, housekeeping, building maintenance, exterior ground maintenance etc.) should be educated/informed about IPM, and what their roles are in the IPM program. Department IPM Coordinator and or Facility Manager should be able to educate their staff through IPM guidance sheets. In many cases, personnel will have more than one responsibility, and may receive two or more different guidance sheets.

It may also be advisable to have pest control contractors provide training for facility managers and staff of that building they are servicing. The advantage to building-specific training sessions is that the contractors can then address particular situations and problems.

The County IPM Coordinator will provide the periodic updates on the IPM Guidance sheets or IPM Specific issues as well site specific field surveys, training and coordination.

STEP 4-Educate Building Occupants

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Tenants or building occupants and visitors play an extremely important role in an IPM program. If a large number of tenants do not cooperate, many IPM efforts will be unsuccessful and benefits will be lost.

Periodically, the County IPM Coordinator will send the IPM awareness brochures, Guidance Sheets to promote the Building occupants participation and overall cooperation. These awareness promos can also be downloaded from the [Santa Clara IPM website](#).

The County IPM Manager will also facilitate the site-specific meetings with building occupants, facility managers in order to obtain full cooperation from all concerned.

STEP 5-Determine IPM & Related Contract Provisions

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“A Stitch in Time Saves Nine”!

Ensure that adequate precautionary/proactive/preventive steps are taken by the planners/ design engineers/ renovators/ contractors at the building design, construction, and equipment selection and placement level to prevent tedious sanitation, housekeeping & maintenance later. Even in the existing buildings & grounds, through identifying major design problems with pest management in subset will prevent failures and solve reoccurring pest problems. Kitchenette, Cafeteria, Loading Docks, Lawn & Landscape designs require special attention. The Facility Manager & the Department IPM Coordinator should ensure that the following guidelines are considered in all pest management and related contract management:

- 1) Check to ensure that **SCC IPM Ordinance** is part of all leasehold, property management, structural or ground construction & related contracts and contractors are aware of their responsibilities in this regard
- 2) **Pest Management Service/Product Contracts:** IPM information pertinent to a variety of service contracts is contained in the request for qualifications and request for proposal (**RFQ & RFP's**). IPM contracts are procured on County Wide basis. Anyone involved in writing contracts should consult their respective Department Manager who will contact Procurement department for IPM contract needs. The County IPM Manager, with help of procurement department will facilitate all IPM related contract procurement.
- 3) **Contracts Related to: Sustainable Landscape Design, Plant Selection, Implementation & Maintenance and Engineering for Sanitation, Housekeeping & Maintenance: Construction, Remodeling, Renovations:**
 - a) **Example: For lawn/Landscape construction & maintenance**, a good environmental landscape design involves selecting slow-growing, drought-

- tolerant plants that require less water and maintenance, significantly reducing water consumption. Native California plants and well-adapted non-native plants can be combined in wildlife-friendly and visually attractive landscapes suited to difficult urban conditions. Lawns require more water than other plants during dry periods and their use should be minimized. Before putting in a lawn/landscape, you should decide where the grass, ground covers, shrubbery, and trees are to be located. Making the right decision at this time can avoid the problems that are caused by trying to correct mistakes later. For general guidelines refer to [Federal Guide for Green Construction Specs: 02900 Landscaping](#). For specific standards & guidelines refer to the [Sustainable Urban Landscape Information Series](#), by University of Minnesota and/or [IPM Based-Landscape Designs](#) by efn.org Examples as follows:
- i) [Shrub bed with mowing strip and weed control fabric](#)
 - ii) [Shrub bed preparation](#)
 - iii) [Tree Well Preparation](#)
 - iv) [Landscape Walk away Preparation](#)
- b) **Example: Cafeteria or Food Processing site construction/renovation.** For specific standards and guidelines refer to the [“Engineering for Food Safety and Sanitation”](#) A Guide to the Sanitary Design by Thomas J. Imholte 2nd Edition ISBN 0-918351-00-6.
- c) **Example:** For Green Construction Specification refer to [Federal Guide for Green Construction Specs: General Requirements, Site Construction, Concrete, Masonry, Metal, Wood & Plastics, Thermal & Moisture, Doors & Windows, Finishes, Specialties, Equipment, Furnishing, Special construction, Conveying systems, Mechanical, Electrical](#).
- d) **Example: Vermin Proofing:** Check to ensure that construction/engineering contracts include effective vermin proofing as part of their design. Ensure that all plumbing, electrical conduits and entry/exit doors/windows are adequately vermin proofed. Vermin proofing should be the part of **GREEN BUILDING DESIGN**. For Rodent Proofing Specifications refer to [Rodent Proof Construction-Structural](#) by University of Nebraska Lincoln and/or [Mechanical Rodent Proofing Techniques: Rodent Exclusion Manual](#), by National Park Service
- e) **Precautionary Measures during Construction & Related Activities:** Notify extermination contractor in advance of any demolition, unearthing, construction or related work. Unearthing operations disturbs the natural habitat of several vermin pests. It is essential to take necessary proactive & control steps to prevent vermin entering the surrounding structures. The extermination contractor should intensify preventive rodent control around construction site through perimeter defense baiting & trapping as necessary.

STEP 6-Record Keeping and Evaluating Program Progress

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The success of any IPM program will depend on the degree of participation from those involved. Compliance with IPM practices & policies by facility management personnel, contractors, and tenants will be monitored periodically.

A **logbook** should be maintained at each facility or group of facilities. Department IPM Coordinator is responsible to act as a liaison between the contractor and facility management and tenants and also to keep the logbook current. Recommendations from the pest control contractor should be reviewed in order to assess compliance and identify problems. When recommendations can or cannot be acted on, they will make necessary follow up with the facility management. An electronic web based version of the **IPM activities & Pesticide Use Reporting system** is under development. The Department IPM Coordinator must ensure that they have undergone appropriate training to use this software and data reporting system. The transition to the electronic system will allow effective & efficient data reporting and timely analysis to make necessary changes at an appropriate time.

Pest Control Contractor Reports: Pest Control Contractors should file the following reports to the Department IPM Coordinator:

- 📖 **Action Plan** -At the beginning of each contract period, the Pest Control Contractor should provide the Department IPM Coordinator & the County IPM Manager with an action plan for the building. This report should include any recommendations on changes that Building Management staff and tenants need to make.
- 📖 **Activity Report/Site Visit Report** - Pest Control Contractors should provide the Department IPM Coordinator and or Facility Manager with periodic reports (at least quarterly) of his or her activities. Activity reports should also contain further recommendations, and note where earlier recommendations have not been implemented. A sample Activity Report Form is included in the IPM logbook. Pest Control Contractors may have their Activity Report Forms, which are acceptable, once approved by the County IPM Manager.
- 📖 **Monitoring Reports (normally known as work tickets or service tickets)** - If your pest control contract calls for monitoring to be done, it should be recorded in the IPM Log **IPM monitoring forms**. The Department IPM Coordinator/Facility Manager should review the monitoring reports along with the activity report. Pest Control Contractors may have their Monitoring forms and reports, which are acceptable, once approved by the County IPM Manager.
- 📖 **Pesticide Use Report (normally part of work tickets or service tickets)** - If the pest control service calls for pesticide use, then the contractor and the Department IPM Coordinator should ensure that for

each pesticide use, necessary approval has been obtained from the County IPM Manager. A **pesticide use exemption (PUE) form** needs to be filled for each pesticide that has restricted use requirements or is not listed on the Santa Clara County Approved list of pesticides. Pesticide Use should also be entered in the web based **Pesticide Use Report database (PUR)**.

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II. PEST MANAGEMENT RELATED SANITATION, HOUSEKEEPING & MAINTENANCE INSPECTIONS & YOU

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GENERAL INSPECTION CONSIDERATIONS



Most of the pest control programs generally tend to be strongest in pest biology and pesticide technology. However, much of the specialized knowledge required for an effective IPM program can be more accurately described as applied facilities engineering and management rather than applied biology.

The standards, technology and procedures of the custodial maintenance, pressure cleaning, solid waste removal, and sealing industries are part of a rapidly expanding array of non-pesticide methods that have been successfully used to combat pests in buildings & surrounding grounds. Although pesticide application is a valid and necessary part of the IPM process, one of the central tenets of IPM is to emphasize a non-pesticide approach whenever possible. The following outline/checklist is intended as brief introduction to precautionary approaches and alternatives to pesticides now available to the facility management.

Most pest problems in a building are discovered and reported through regular monitoring by trained professionals and also by the occupants. The pest management professional inspection of specific areas where pests have been reported should provide answers to these questions:



- How are the pests getting in, and can this access be reduced or eliminated?
- What food source or other attractant has drawn the pests and can this source be reduced or eliminated?
- Where exactly are the pests living, and can these sites be physically altered, removed, or treated with traps or chemicals?

Ideally, once pest activity is noted, it is necessary to involve the facility manager for a secondary inspection(s) who is familiar with the building and grounds and who knows the staff and the way things are done. This also assists in making sure that a time schedule is set to provide the preventive maintenance & corrective measures as needed.

The inspection involves both looking and asking. The Looking for signs of pests and potential pest problems and asking questions about practices that might affect pest activity.

In order to prevent pest harborage, breeding and spread, facility managers should promptly follow recommendations made by pest management inspector. They should also focus their efforts on **facility-self inspections** (self/or designated staff) and corrective measures on general sanitation, housekeeping and maintenance.

The corrective measures “**A stitch in time saves nine**”, are **precautionary measures** to eliminate or minimize conditions conducive to pest thus averting pest to establish and subsequently the need for pesticide applications.

The outcome of any inspection is a list of recommendations that should be communicated for corrective actions and cooperation from all concerned. The following facility self inspection checklist will help you to identify key issues:

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FACILITY SELF INSPECTION CHECKLIST

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Sanitation and good housekeeping for most buildings require the daily removal of trash, garbage and all waste materials. Pest infestations are often due to poor sanitary conditions around the building. The facility pest management related inspection, or survey is intended to discover anything that might cause or permit conditions conducive to pest harborage & breeding. These inspections will also focus on non-chemical alternatives to pest management thus preventing the last resort i.e. pesticide applications.

1) Fence lines

- a) Ensure that fence line is vegetation free. Weed growth is unsightly, a fire hazard, and may provide harborage to pests.
- b) Inspect along concrete sidewalks, or hillsides, and next to fence posts for rodent burrows.
- c) Vacant lots
- d) If these lots are covered with weeds and/or overgrown vegetation, ensure to mow (or other means to remove vegetation) periodically. A bare land covered with mulch is highly recommended to minimize reoccurring weed growth. This will discourage rodents or other pests breeding and harborage in the near vicinity of the buildings.
- e) A neatly maintained lawn areas, or at least regularly mowed areas, are pleasing to both the community and to employees.



2) Roof

- a) Check roof areas for standing water and debris.
- b) Insure air exhaust and intake openings are properly maintained and tightly screened with proper filters to prevent pest entry.
- c) Check for bird roosting or loafing areas.
- d) Check for proper screening of roof vents and wall fans.



3) Exterior Grounds & Building Perimeters

- a) Remove pallets, containers, lumber, construction materials, old equipment and other litter
- b) Store usable item on blocks or racks at least 18 inches off the ground and away from buildings
- c) Never stack firewood against the side of building.



Stack firewood on concrete blocks and away from the building, preferably 10-20 feet away.

- d) Remove wood that is moist or constantly exposed to rain or leaks, such as near doors, windows, roofs, etc.



- e) Maintain vegetation free zone (at least 3 feet) around the buildings
- f) When planting shrubs, you need to think about how large the plants will be in 10-15 (or more) years. Do not plant shrubs too close to the foundation. Shrubs that are too close to the house may hide termite (and other pest) activity. Tree/shrub limbs touching the house can damage siding and allow ants and entry point. Prune shrubs to prevent them from blocking airflow through foundation vents.



- g) Maintain lawns, trees, vines and shrubs to eliminate potential pest harborage, preferably trim shrubbery or select ground cover at least 18" off the ground.

- h) Install a paved or mulched mow strip under fence lines to block weed growth and eliminate the need to use herbicides or trimmers. Extend asphalt surfaces; such as playing courts or parking lots, past the outside edge of fencing so there is no "weed zone" under the fence line proper. Fill cracks in asphalt and concrete surfaces with a sealant to remove germination sites.



- i) Tree limbs that press up against walls or the roof can provide access to buildings. They also scratch and can damage siding and shingling. Keep limbs pruned 12 inches or more from the building.



- j) Trees that are damaged or in otherwise poor health may become infested with insect pests such as ants. Remove such trees.



- k) Check ledges and overhangs and make necessary alterations to prevent bird roosting. With the first sign of birds take preventing actions, before it becomes an infestation.

- l) Keep water from draining toward your foundation. Water near gutter downspouts, in-ground irrigation systems and air conditioner condensate lines attracts ants, particularly during dry weather.



- m) Check irrigation systems and promptly repair the leaks

- n) Check drainage, grade around the building exterior and parking lots. Ensure proper flow of water to storm drains to prevent water stagnation.
- o) Siding should always be above the grade or soil line, preferably by 6-12 inches; otherwise, you could have decay problems as well as pest



problems. Flowerbeds and other gardening should never touch the foundation. You need to be able to inspect the foundation for signs of pest activity.

- p) Check all mulches, even inorganic ground covers such

as gravel or black plastic; they help to maintain moist soil conditions and to reduce weeds. Moisture in the soil may attract pests to the area. This doesn't mean you should avoid using mulch around buildings. Never spread mulch so that it touches the foundation or lowest course of siding on building. While it may have a nicer appearance this way, it can allow pests to use the cover of mulch to invade structure undetected.



- q) Even pressure-treated landscaped timbers can become susceptible to pest problems such as termite, ants and decay. Inspect and replace damaged timbers.

4) Shipping & Receiving Docks

- a) Loading docks should be free of spilled food, broken boxes, pallets.
- b) Check the construction of the dock; if it is not solid concrete, the area under the dock should be free of debris, open and easily accessible for inspection.
- c) Check under dock levelers for trash that can encourage pest build-up.
- d) Check overhead pipes and the pavement below pipes for accumulation of bird droppings. Ensure to bird proof the dock canopy to prevent bird nesting.



5) Pallets, construction & other misc. material storage

- a) Ensure to frequently store away surplus pallets in seldom travel areas, at least 24 inches off the ground and 18 inches away from the wall.
- b) If pallets are stored outside for longer period, a cleaning program for pallets should be implemented



6) Maintenance shops, Janitor supply rooms, Mechanical, Boiler, and Air Conditioning, Electrical switch panel rooms etc.



- a) These areas are often neglected and pest infestations which buildup in these areas can quickly spread to other areas. Vents, louvers, doorways and holes in walls for pipes and conduits are common entryways. Ensure there is adequate vermin-proofing.
- b) Ensure tidy/organized storage practices in the maintenance facility. Portable equipment, boxes and stored items should be off the floor. Unused equipment should be repaired or discarded.
- c) Examine wash stalls for debris or spilled food
- d) Inspect storage areas, parts departments, and workshops for any potential pest harborage. Sanitation is usually poor in such areas and can affect pest population in other areas.
- e) Ensure that mop heads are cleaned/sanitized and hung upside down for air-drying after each use; Slop water should be drained and buckets cleaned



after each use; slop sink drains are kept clean of any residue accumulation; supply storage in janitor closets should be at least 18 inches off the floor stacked on plastic crates; only store supplies adequate enough for one week so that the area can be cleaned on regular



basis.

7) Garbage Handling and Storage

- a) Garbage storage areas should be constructed of concrete or tile and equipped with drains and hoses. Check for leaks in the compactor. If you are dealing with liquid disposal, ensure compactor platform has proper drainage and this area is cleaned/sanitized daily to prevent pest attraction and breeding.
- b) Trace the flow of garbage generated from its point of origin until it leaves the property.
- c) Check the areas around the compactors or garbage storage for any signs of pests (for example rodents, birds, insects or other pests) and report



8) Garbage Containers, trash bins and Cleaning

- a) Install vermin proof-above ground trash bins, Ensure that these are made of sturdy plastic, stainless steel or other rust proof material that are easily washable. Ensure that waste containers have tight fitting lids, be large enough to prevent overflow.
- b) If needed, increase frequency of maintenance service to prevent overflow and decay.
- c) Arrange prompt pick up of spilled trash.



- d) Always use plastic liners or bags inside the waste bins.
- e) Garbage containers should be regularly and thoroughly cleaned. When replacing plastic bag or liner, ensure that waste container is properly cleaned/sanitized from inside out. Sludge or residue buildup on, in or around the containers produces odors that may attract pests.
- f) Ensure that grease drums are on dollies or the on metal platform 12-18 inches from the ground. Liners and covers should be used where practical. Areas around the grease drum storage should be cleaned with high-pressure sprayers to clean any deposits or residue.
- g) Check the areas around the trash bins or garbage storage for any signs of pests (for example rodents, birds, insects or other pests) and report.

9) Trash

- a) By definition, trash contains no food, however, it may attract pests or provide harborage. Ensure to store trash at least 18 inches off the ground and away from the building.
- b) Ensure that staff do not mix food into trash, ensure this policy throughout the system
- c) Ensure paper bailers and scales are regularly checked for pest activity.

10) Recycling Material Storage

- a) Set up appropriate recycling programs in administrative offices, food service areas and waiting rooms. Unless a large amount of recyclable material is present, it is generally not practical to collect recyclables from offices, hospital patient rooms and clinical areas.
- b) Walk through the facility noting what type of waste is discarded in each area. A walk-through will help you determine which types of bins are needed. Typical programs are likely to involve some of the following:
- c) Administrative and office areas - office paper, corrugated cardboard, other paper, cans, bottles.
- d) Food service areas - glass, metal, cans, plastic containers, corrugated cardboard (make sure that food waste is separated or that it goes down the garbage disposal).
- e) Public areas - newspaper, magazines, bottles, cans.
- f) Make sure that bins in public areas are well marked. For these areas, it is best to choose bins with specialized openings, such as a hole for cans or a slot for newspapers. It is also important to place bins where the materials are generated.
- g) Ensure recycle containers are placed in ideal locations for easy access for all employees and these containers are promptly cleaned or replaced.
- h) Remind employees to keep food waste out of recycling containers and trash. Food waste should go down the garbage disposal or be handled separately from trash and recyclables



11) Waste Paper Disposal

- a) The management of waste paper, cardboard and

plastic debris is a monumental task. These articles if not handled properly, provide excellent harborage for rodents and insects.

- b) Ensure policies in this regard are well communicated to all employees.
- c) Ensure that compression box bailers if used on the facility are inspected regularly for pest activity; trailers used to store or ship baled material is also inspected regularly.
- d) If baled material is stored inside or outside the facility for a period of time prior to pick up; these areas should also be inspected for pests regularly.



12) Paving and Drainage- Outdoors

- a) Ensure that paved areas are well drained, since standing water attracts many pests.
- b) Ensure timely repairs of potholes and pavement cracks particularly in receiving and garbage handling areas. Ensure to seal blacktop paving to prevent accumulations of organic material in which insect can breed.
- c) Areas where rainwater tends to pool or where air conditioning condensate lines drain, particularly if the area is shaded and algae or mold is growing on the soil or foundation.
- d) A floor drain provides harborage and nourishment to moth flies. Ensure to check regular maintenance of all floor drains indoors or outdoors.
- e) Check & repair damaged or faulty septic lines
- f) Check the area (usually a concrete or gravel covered) beneath air condition cooling units on roofs or adjoining a building.



13) Paving and Drainage-Indoors

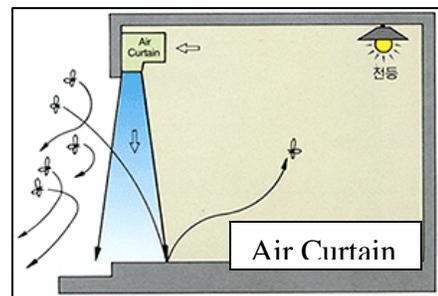
- a) Check toilets (particularly if they are not used frequently). Be sure to check the toilet tank, as well for proper drainage
- b) Check Sink and bathtub/shower drains
- c) Check floor drains throughout the building and basements Ensure regular maintenance of all floor drains indoor or outdoors.
- d) Check condensate lines for icemakers, refrigeration units etc.
- e) Check loose ceramic floor tiles where water may collect

14) Weed Control

- a) Weed control reduces harborage for rodents, flies, or other insects. Ensure to control weeds along fence lines, receiving areas, lawn and surrounding landscapes. The subject is more discussed under the lawn and landscape maintenance section

15) Dock Doors

- a) Ensure that dock doors have proper brush seal (vertical & horizontal



thresholds)

- b) Ensure that dock doors have functional air curtains.

16) Warehouse or General Storage Areas

- a) Ensure that all stored material is at least 18 inches away from the perimeter wall and 12-18" off the floor, preferably on plastic crates to allow easy access for regular inspection and cleaning.
- b) To make this practice easier, a white stripe (18 inches) should be painted on the floor between the wall and stored products and up the wall the same distance.
- c) Ensure to periodically inspect stored material for pest activity. Not every pallet stack must be checked, but a representative number should be. Product expected to be stored for longer periods should be rotated periodically.
- d) Ensure to segregate food & related material storage from the general item storage.

17) Repack and Salvage Area

- a) Damaged goods are generally stored together in this area where adjusters can determine settlement or for possible distribution after inspection and reprocessing. Ensure to promptly clean spillage, remove damage cardboard packaging, plastic wrapping, empty pallets etc. Keep such areas tidy and organized at the end of each shift.
- b) Check to be sure that there is no food on the floor and all salvage items are on pallets or 18 inches off the floor on shelves.
- c) Spilled or exposed foods should be discarded or destroyed as soon as possible, or held in tightly sealed containers.
- d) Leaking material should either be in drop pans or removed immediately.

18) Cooler and Deep Freeze Storage Area

- a) Ensure that all stored material is at least 18 inches away from the perimeter wall and 12-18" off the floor, preferably on plastic crates to allow easy access for regular inspection and cleaning.
- b) Ensure a white stripe (18 inches) is also maintained inside the cold storage rooms.
- c) Inspect the deep freeze, wall insulation, and refrigeration motor unit for rodent infestation
- d) Check & promptly repair/seal any damage to insulation, plumbing and electrical conduit holes.
- e) Ensure that condensate from these areas is properly drained; humidity around the unit is controlled to prevent condensation. Ensure to periodically clean/sanitize the coolers and deep-freeze units.



19) Refrigerator, Water Coolers, Cold Boxes, Deli Coolers, Deep Freeze units and Vending machines in cafeteria and break rooms

- a) A water leak or high humidity can lead to mold, mildew attracting insect pest. Ensure that condensate from these units is properly drained; humidity around the unit is controlled to prevent condensation. Ensure to periodically clean/sanitize these units.
- b) Ensure to promptly fix leakage or condensation.
- c) Ensure to promptly clean food spillage in and around these areas.
- d) These areas are prone to fiber lint accumulation due to electro static build up. Ensure to periodically clean around these units.
- e) Periodically check for pest activity inside the rubber gaskets (seal), insulation and motor housing.
- f) Ensure that employees remove their personal food items at least on weekly basis.
- g) Vending machines should be periodically opened to check for pest evidence, leakage in soda machines using syrups, condensation etc



20) Microwave, Toasters, Coffee Stations, Vending Machines

- a) Ensure to promptly clean food spillage in and around these units and areas.
- b) Ensure that these units are wipe cleaned at the end of each shift or at least on daily basis.
- c) Ensure that spent coffee grains/filters are properly disposed off in food trash bins on daily basis. These units are cleaned and kept dry at the end of each shift.



21) Lunchroom, Break rooms, Kitchenette, Pot luck/Pizza parties, birthdays, anniversaries and other festivities

- a) Ensure to promptly clean food spillage in and around these areas, dining table, chairs, couches etc. are cleaned and sanitized after each shift.
- b) Ensure that employees are reminded to dispose off food waste only in designated garbage bins.
- c) Ensure that recycle cans are disposed off in designated recycle bins. If recycling is not the policy of the unit, then these should be disposed off in the designated food waste bins for prompt pick up.
- d) Check under the washbasins; ensure that storage in these cupboards, kitchen cabinets is tidy/organized. Left over material stored for long, should be discarded.
- e) Leftover treats or food from potluck parties, and other festivities should be discarded or destroyed as soon as possible, or held in tightly sealed containers.



f) Leaking material should either be in drop pans or removed immediately.

22) Lockers, Employee storage/message shelves etc

- a) Ensure that lockers tops are not used for any storage. It is ideal if lockers have sloping top and as few legs as possible to facilitate cleaning. It is important to visually check underneath lockers for any spilled products.
- b) Ensure all lockers are opened, inspected and cleaned frequently, at least once per month.
- c) Ensure storage on shelves is tidy/organized. Food items if stored are held in tightly sealed glass containers.
- d) Ensure that lockers are free of soiled clothes and shoes, discarded food and trash.



23) Rest Rooms

- a) Rest room facilities should:
 - i) Be adequate for the current number of employees
 - ii) Be furnished with soap, hot and cold water, towels and a proper trash receptacle



- iii) Have trash receptacle with liners
- iv) Be sanitary with no rolls of paper and trash lying on the floor
- v) Have toilet area sanitary and in good repair
- vi) Have self-closing doors
- vii) Have toilet area with adequate ventilation by means of one or more screened window and/or exhaust fans.

viii) There should not be any offensive odors. If deodorizers are used, be certain they are not masking problems that may present. A good washroom, cleaned not requires deodorizing.

ix) Have false ceiling perimeter, doorframes, toilets, sinks and urinals sealed at the wall. Mount for soap dispensers, hot air hand dryers, towel and sanitary napkin dispensers and toilet rolls should also be sealed at the wall.

24) Laundry rooms

- a) Laundry and linen storage rooms require special attention since they are subject to incoming infestations.
- b) Ensure to use stainless steel, fiberglass or plastic units that can be more easily cleaned.
- c) Ensure all crack and crevices around doorframes, opening around pipes and conduits are properly sealed.
- d) Ensure that condensation build up in such wet environment is properly off set by increased aeration with in the room or other appropriate method.



- e) Ensure cleaning supplies are stored at least 18 inches away from wall and off the floor on plastic crates or dollies.

25) Office floor as a whole and Individual Office cubicles etc

- a) Examine offices for pest evidence.
- b) Trash must be removed at least every two to three days.
- c) Ensure employees follow best management practices; keep office storage tidy/organized, off the floor, filing cabinets tidy/organized
- d) Check desk drawers, filing cabinets for food items. Ideally the policy for food storage should be not to store food in offices. Employees should be asked to remove such items. Encourage them to store in the segregated lunchroom storage areas. If they still prefer to store food or snacks then it should be held in tightly sealed glass containers.
- e) Plants and planters, both real and artificial should be checked for insect and rodent activity. Ensure planters (potted plants or flower vase) are maintained and soil treated to prevent fungus build up that attracts harborage & breeding of fungus gnats, ants and other vermin. Preferably, it should be the policy of the department, not to allow planters in individual offices. Ideally, it is better to maintain planters in the corridors, reception areas that can be maintained professionally.
- f) Watch for seasonal festivities and treats – These are the crucial time, when we all tend to forget the pesky bug and become generous to store large amount of candies, chocolate, popcorns in and around our offices.
- g) Ensure that all leftovers from Potlucks, Birthday, Anniversary or Recognitions parties are properly stored or disposed off. Don't leave any food items exposed overnight or over weekend.
- h) Check heating, ventilation and air conditioning (HVAC) convectors for moisture or drainage problems if pests or odors are present.



26) Waiting Rooms and Reception Area

- a) Ensure to provide adequate service for trash receptacles. Overflow in the trash results in attractive flies and other vermin.
- b) Ensure professional service for all Planters or potted plants
- c) If waiting room is meant for medical services (for example medical radiation unit in a hospital), trash receptacles in these areas need cleaning/sanitizing on frequent basis.

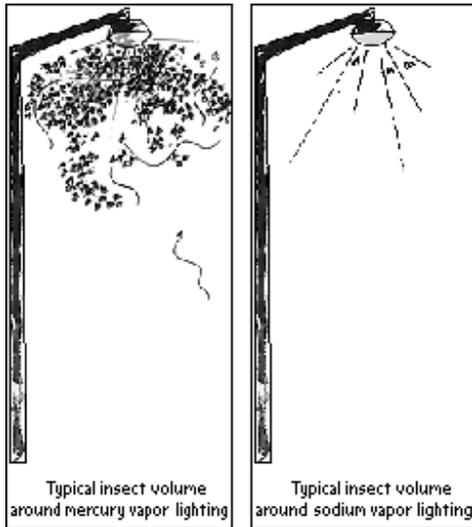
27) Atrium and Potted Planters

- a) If plants can not be managed by a professional group, planters should be avoided in the offices
- b) Preferably encourage no plant/planter policy inside the offices

- c) Ask employees to avoid live plant or planters inside offices if possible.
- d) In case a policy cannot be written or agreed upon, then check the plants for maintenance issues such as over watering, plant health etc. Planters should be maintained through optimum/appropriate watering, fertilizing, cleaning, and pruning.
- e) Over watering causes plant root to decay, resulting in fungus growth a conducive breeding environment for fungus gnats and fruit flies. Ants also nest in the wet potted soil.

28) Exterior Lighting

- a) Pest problems in and around buildings can be reduced by proper selection and placement of outdoor lighting. Many nocturnal flying and crawling



arthropods are drawn to exterior lighting. Once attracted, they find their way into buildings through cracks and crevices and open doors.

Bulbs vary in brightness or intensity and associated heat. Reducing wattage or luminous area (reflectors) will reduce light and heat, making the bulb less attractive to insects. Standard filament bulbs and floodlights generate more heat than by sodium vapor or fluorescent bulbs.

The color and type of light are also important: Lights with mercury vapor or fluorescent bulbs produce much higher levels of insect-attracting ultraviolet (UV) light than do sodium vapor lamps. Generally, the wavelengths of light attractive to most insects are in the 330 to 370 nm UV range. Switching to high pressure or, even better, low-pressure sodium vapor bulbs will make lights much less attractive to insects. More insects are attracted to white incandescent, blue mercury vapor, and fluorescent lights than to yellow light produced by sodium bulbs. Since the sodium lamps change perceived colors to yellowish, pinkish, brownish, or gray tints, sodium lamps should only be used where color definition is not important.

Lights mounted on buildings near entrances can be moved and placed on poles away from buildings. If lights can't be moved from entrances, they should be used only when needed. Lights away from buildings can be blocked in the direction from which insects typically come, and the light

can be directed toward important building zones to minimize attracted pests. Bright white lights (spotlights), UV, or mercury vapor lights attract insects; they may be placed 150 to 250 feet from buildings to attract some pests away from the structures themselves or to intercept incoming insects.

29) Solid Waste Management checklist

- a) General Housekeeping for Building Occupants: Keep sugar, cream, coffee and other foods in sealable, pest-excluding containers. Refrigerate other foods. Do not store food in desks. Have a dedicated container available in food areas for food remains. Employees should be educated to use these (labeled) containers for food wastes.
- b) Trash Receptacles: Discussion items for this topic should include: designs and materials for interior and exterior use and problems with usage; design and distribution of dedicated containers for food residues; plastic liners and mil recommendations for general use, recycling containers, etc.; custodial maintenance and cleaning of receptacles.
- c) Trash Collection: Discussion items for this topic should include: custodial pickup schedules; design, use, and maintenance of mobile drums and utility carts; trash chutes.
- d) Trash Holding Areas: Discussion items for this topic should include: trash rooms, recycling holding areas, compactor zones at loading docks, refrigerated holding rooms; general recommendations for location, design and management.
- e) Non-compacting Holding Containers: Discussion items for this topic should include: the differences between conventional rear load and container service, cans and other receptacles for rear load service, front end load dumpsters, open top debris service.
- f) Compaction Equipment: Discussion items for this topic should include: stationary vs. self-contained; various self-contained designs, including double-rams for recycling programs, vertical packing models, small-volume indoor models; pad, access, space, and electrical requirements, including waste volume formulas and standards to determine correct compactor size; "doghouses," multi-cycle control systems, interlock switches, pressure gauges; the problem of tampering by personnel.
- g) Odor Reduction: Odor reduction reduces attractiveness to pests. Discussion items for this topic should include: ozone generating units; non-ozone odor reduction technology, e.g. granular products, spray systems. Optional ozone generators may be attached to the compactor at additional cost. Ozone is a powerful oxidizer that breaks down odor molecules and converts them into water vapor and other odorless, harmless gases. Ozone generators contain all the electronic equipment and fans needed to generate ozone automatically using a low-wattage "corona discharge." The most common generators do not require the addition of chemicals and only incidental, routine service.
- h) Grease Storage: Discussion items for this topic should include: equipment and procedures.

30)Cleaning checklist

Discussion items for this topic should include: basic review of sanitation and cleaning problems, procedures and inspection for various facilities; general custodial contractual overview and relationship with solid waste management programs; the limitations of traditional cleaning methods; resources of the Cleaning Equipment Manufacturers Association.

- a) Steam Cleaning. Discussion items for this topic should include: various designs, capacities, and uses, with particular emphasis on compact, portable equipment for kitchens, trash rooms, pallets, etc.; electric models, handheld vs. wheeled, various attachments; centralized, wall-mounted systems.
- b) Hot Pressure Washing: Discussion items for this topic should include: various designs, capacities, and uses, with particular emphasis on compact, portable equipment for kitchens, trash rooms, pallets, etc.; electric models, handheld vs. wheeled, various attachments; centralized, wall-mounted systems.
- c) Cold Pressure Washing: Discussion items for this topic should include: various designs, capacities, and uses, with particular emphasis on compact, portable equipment for kitchens, trash rooms, pallets, etc.; electric models, handheld vs. wheeled, various attachments; centralized, wall-mounted systems.
- d) Cleaning Agents: Discussion items for this topic should include: the issue of disinfectants and the use of other additives, e.g. soaps and caustic degreasers.
- e) Air Purification Equipment: This item is of importance for "paper mite" and dust mite remedies.

31)Sealing and Exclusion checklist

Permanent sealing of pest harborages and runs will reduce populations of pests such as cockroaches. The long-term benefits of sealing are reduced pest control costs and reduced reliance on pesticides. Sealing techniques can be used to eliminate cracks and crevices in offices, food areas, loading docks, machine areas, etc. Typical areas that can be sealed include joints between different elements of construction, expansion joints, foundation cracks, utility runs, wall-floor junctions, door thresholds, window frames, rolled edges of stationary equipment, floor molding, bumper rails, etc. Energy conservation literature is an excellent source for techniques and procedures.

- a) Caulking and Related Sealing Products: Since there are many types of caulks on the market, the label should be read prior to use. Some caulks are flammable and can cause respiratory and dermal distress. Joints larger than 1/2 inch wide and 1/2 inch deep should first be stuffed with fiberglass insulation, plumber's oakum, copper gauze, or similar filler. Preparing surfaces in accordance with the product label is the most important step in successful caulking. Dust, grease, old caulk, and paint chips should be removed. The surface should be cleaned with water or specified solvent and then primed to ensure adhesion.

A 10 oz. tube of caulk covers 96 linear feet to a width and depth of 1/8 inch or 24 linear feet to a width and depth of 1/4 inch. A caulking gun is recommended for most work but rope cords or tubes may be used for small jobs. Electric cordless guns or industrial equipment can be used for the larger jobs.

The construction materials to be treated and other local conditions (heat, humidity, need for elasticity, etc.) will determine which type of caulk should be used. Oil-based caulks are inflexible and short-lived. Water-based acrylic latex applies easily and dries quickly. Some can be painted almost immediately. Butyl rubber seals very well and resists water. A stringy appearance may preclude use where appearance matters. Silicone, a good multipurpose material, is easily applied with a caulking gun, adheres to most surfaces and is unaffected by moisture and UV radiation. Silicon acrylic latex can be used outdoors as well as indoors. Caulk is available in white, clear, and various colors.

- b) Waterproofing Membranes: Discussion items for this topic should include: bituthene and similar materials.
- c) Weather-stripping: Discussion items for this topic should include: materials for crevices, e.g. extruded polyethylene rope, wax-polymer adhesive cords, sealing tapes, etc.; seal, sweep, and threshold products for doors, including overhead rolling and hangar doors, rubber, synthetic, and bristle designs.
- d) Metal and Metal Fabrics: Discussion items for this topic should include: gauges for rat proof sheet and expanded metal; steel wool, Stuf-fit copper mesh, rolled hardware cloth.
- e) Concrete and Cement: Discussion items for this topic should include: various small-volume products and procedures; correct mixtures and thicknesses for rat proofing; cap blocks for concrete block walls; rapid setting cements.
- f) Screening, Grills, and Plugs: Discussion items for this topic should include: gauges for rat proof hardware cloth & other materials, mesh sizes for screens; include design and installation of window, door, vent, and intake screening, basket screens and sleeves for floor drains, dumpster drain hole screens, plugs for weep holes, hinged anti-rat plugs for toilets.
- g) Air Curtains: Discussion items for this topic should include: design, installation, and maintenance.
- h) Strip Doors: Discussion items for this topic should include: pen-adore hanging strips and other products.
- i) Rat and Squirrel Guards: Discussion items for this topic should include: flat, disk, cone, barrel, and rotating tube designs for pipes, cable, and wires.
- j) Bat Exclusion: Discussion items for this topic should include: basic procedures; various check valve designs and applications, e.g. draped netting & one-way net doors, funnel cone/chute devices, collapsible pipes or bags; use of smoke generators, air flow indicators, and other devices to

find access holes. For detailed information see Prevention and Control of Wildlife Damage, Robert Timm, ed., Great Plains Agricultural Council, Wildlife Resources Committee, Nebraska Cooperative Extension Service, ISBN 0-9613015-0-3, SF84.4.P74, 1983, and House Bat Management, Arthur M. Greenhall, U.S. Department of the Interior, Fish and Wildlife Service, Resource Publication 143, 1982.

32) Ventilation and Indoor Drainage checklist

- a) Soffit Vents: Discussion items for this topic should include: the Brenner design and others.
- b) Other Vent Designs: Discussion items for this topic should include: floating shuttle and hinged flap products.
- c) Sump Pumps and Other Problem Areas: Discussion items for this topic should include: procedures for excluding pests from sump pump areas; identification of other problem areas amenable to IPM.

33) Landscaping and Grounds Maintenance checklist

- a) Pest Barriers: Open areas: Discussion items for this topic should include: gravel foundation strips for rodent and other pest deterrence; mowed verges for tick control; pruning away tree limbs in contact with walls and removing climbing ivy to discourage ants and spiders; removing debris and dense vegetation, such as ivy and similar groundcover, to discourage rodents and snakes; mulch types and application in relation to invertebrate pest harborage, e.g. smoky brown cockroaches, millipedes. For more information contact the National Arborist Association, 174 Route 101, Bedford, NH 03102; CML 603-472-2255.
- b) Fencing: Discussion items for this topic should include: deer exclusion fences; fencing techniques to exclude burrowing animals, e.g. "L" bend below ground line.
- c) Other Exclusion Methods for Vertebrate Pests: Discussion items for this topic should include: planting bed surface and subsurface meshes; tree shields and collars to deter mouse, vole, rabbit, and deer feeding.
- d) Playground Equipment and Design: Discussion items for this topic should include: rat deterrence principles for outdoor space, e.g. pier-supported rather than slab-based play equipment, use of resilient synthetic surfacing rather than sand, mulch, or turf, some considerations for location, fencing, and plantings. For more information contact the National Recreation and Parks Association, 2775 South Quincy, Suite 700, Arlington, VA 22208; CML 703-820-4940.
- e) Drainage. Discussion items for this topic should include: principles to reduce mosquito/midge-breeding areas adjacent to structures.

FACILITY MANAGER'S GUIDANCE/CHECKLIST FOR PEST CONTROL AT CONSTRUCTION SITE

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Why to provide pest control at construction site

Pest control especially rodent control around construction sites is a challenging process that can require adjustment and flexibility with each change in construction operations. Control of commensal rodents as part of construction/demolition projects is rarely planned and implemented comprehensively and there is no standard reference guide.

New structures are sometimes completed with rodents built into them because rodent control and sanitation were inadequate during construction. This leaves the owner with a rodent problem right from the start of building occupation.



There are many specialized aspects of rodent control for construction/demolition projects. They include:

- Understanding the infrastructure of site,
- Construction methods and scheduling,
- Local or state construction regulations,
- Contract specifications and
- The neighborhoods adjacent to the work site.

Keeping construction sites free of "vermin" is an enforceable Occupational Safety and Health Administration (OSHA) requirement and it has been identified as part of management practices during remediation at hazardous waste sites. Ideally, rodent control measures would be included during land-use planning and urban design, thereby limiting the potential resources (i.e., harborages) for rats and mice. Inclusion of rodent control as part of "mitigation" is the most proactive form of rodent control.

The Facility Manager and structural IPM contractor involved in this work should implement an IPM approach. However, it must be dynamic because by their nature, these projects create an ideal habitat for rodents.

Critical phases of construction prone to rodent problems

There are three time periods when rodent problems can occur during construction/demolition projects:

1. When a project mobilizes, rodents can be dispersed with initial excavation, clearing/grubbing or demolition;
2. During the project, rodents can quickly colonize the work site because of exposed soil, debris, fence lines, trailers and food from workers. As rodent numbers increase and construction activities shift within the site, rodents may be dispersed to abutting properties; and

3. During de-mobilization, when debris and fence lines are removed, dispersal of rodents to adjoining areas can occur with loss of cover and on-site food sources.

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Contracting for Pest Control at the Construction Site

Well-written specifications by the project designer, defined regulatory requirements and contract compliance are key for effective rodent control.

Contract specifications should identify several tasks to be performed by a structural IPM contractor, tailored to the particular situation. Basic tasks include:

Although structural IPM contractor can't control all of the activities at a construction site, the facility manager should ensure that rodent control must be implemented with adequate time to ensure that rodents are eliminated to the extent possible before construction mobilization and site disruption begins. Also, rodent control should be maintained throughout the work duration and until all equipment and materials are removed. Sanitation measures should be required as well.

1. A documented baseline (pre-construction) survey of rodent activity and sanitation on the proposed work site and observable areas nearby (within 300 feet of the site; up to 1,000 feet for a major project);
2. Poison baiting or trapping so the site and nearby public areas are rodent-free prior to construction/demolition; and
3. Installation of monitoring (bait/trap) stations at the site perimeter and trailer/storage locations. Subsurface (manhole) baiting may be necessary if utility systems will be impacted. Catch basins in bordering streets should be inspected and baited if necessary.

Once construction begins, the structural IPM contractor should be on site weekly to inspect for sanitation conditions and rodent activity — more often if activity is found. Inspection and baiting records should be maintained for the site and adjacent areas and the program adjusted to match construction sequencing.

Sanitation an integral part of construction site pest control

In addition to the tasks specified for a structural IPM contractor, there should be a specification for site sanitation. It should require that contractors (and subcontractors) provide and use:

- Rodent-proof refuse containers,
- Conduct site cleanup for litter daily,
- Properly contain refuse,
- Remove unnecessary debris piles and control weeds and other undesirable vegetation

Length of Pest Control Contract

A minor construction project may require a 10-day initial effort, while a major project can require four to six weeks of rodent control before construction should begin. Pay items can be defined as a lump sum to establish the rodent control program and a monthly unit price thereafter for maintenance. Complaint calls and other pest control problems (e.g., insect) can be handled on an hourly rate basis.

Strategy of Pest Control

The goal is to resolve sanitation and rodent problems on and around the work site prior to the start of construction/demolition. This prevents displacement and reduces the likelihood of subsequent colonization. The distance that the program should stretch must be tailored to the type of construction environment and the likelihood for rodent movement to and from the work site. Locations near food establishments and residential housing will need a wider ranging program.

It is critical to document the level of rodent activity, sanitation problems and actions taken at all stages of program implementation. It may be necessary during construction to defend against false claims of impacts as expressed by residents and businesses; such claims can be common and expensive to resolve when the control practices, outreach efforts or documentation have been inadequate. Conflicts can be avoided by talking with abutters about problems before construction begins.

The construction contractor, through his or her subcontracted structural IPM contractor, should be responsible for rodent problems within the work area limits and public accessible areas adjacent to them. Responsibility for rodent control on private properties should remain with the facility management or the property owners, except in the situation where construction activities have actually caused an impact. In some cases, however, it may be necessary to assist an abutter in solving a problem because the rodents could become a source to infest the work site.

It may be necessary to establish communication with the local housing or health authorities and share observations on sanitary code violations on private properties. Ideally those agencies would address private property issues and facilitate public participation through outreach and code enforcement concurrent with the construction program.

Construction Work Site Sanitation

Several sanitation actions should be incorporated into the construction contract:

- Heavy-duty refuse containers (e.g., 44-gal.) with domed lids that have an entrance flap are ideal (lined with a plastic bag) for locations where construction workers will congregate and eat. These should be emptied daily into a secure dumpster unit (e.g., 4 to 6 yard) with a tight-fitting lid (and a drain plug if a drain exists). Construction debris should be stored separate from food and food-related litter and discarded into a roll-off container (e.g., 30 yard). Storage and pickup of refuse must be adequate for the amount of material generated. Lunch and break areas should be consolidated.
- Erosion control is a common aspect of construction and described by contract specifications and permit conditions. Hay/straw bales may be specified along the limits of disturbance and they can be attractive to rodents as harborage. Bales may be stockpiled on the site or thrown in a heap following the end of

their usefulness. Contractors should be required to promptly discard old and unnecessary bales.

- Catch basins covered with debris and soil can provide burrowing and protected habitats for rats. This can occur in adjacent streets and along truck routes and loading areas. Catch basins should be kept clean and functional and be adequately protected from soil spillage and turbid runoff. Street sweeping should be maintained to help keep soil out of catch basins.
- Work site perimeters typically are fenced or barricaded and trash can accumulate on both sides. The construction contract should specify cleanup of perimeters daily. Large debris should not be allowed to pile up along site perimeters and provide harborage.

Site inspection

Closely inspect and monitor work site perimeters. Fence line or edge environments are most likely to be colonized. Jersey barriers (concrete barriers) around work sites can provide harborage and protected runways underneath, but also can be used as protected locations for baiting. Jersey barriers and fence lines adjacent to dumpster areas, residences and restaurants will be at greatest risk of infestation. Monitoring can include use of non-toxic bait suspended by wire at the end of jersey barriers, flagged for easy identification. Landscaped areas next to work sites should be closely monitored as well.

Placement of Rodent Bait

Because rodents are not normally distributed evenly throughout the construction site, bait placement should be concentrated into high-activity areas as determined by inspection. Place and secure bait stations (tamper resistant with secured baiting chambers) strategically such as in corners of work sites, near trailers and lunch break areas, in storage areas and near sensitive abutters. It is inappropriate to place numerous bait stations at systematic intervals along site perimeters, if most of the rodent infestation is concentrated in only one or two areas. Bait stations on an active work site are often destroyed by equipment and thus construction personnel should be informed to avoid them. The structural IPM contractor should track changes in site fencing so that bait stations are not lost or left unsecured and also maintain bait station placement location map/log.

Be predictive of potential movement routes & harborage:

- For example, sites abutting waterfront edges need sentinel monitoring stations to intercept rats moving along waterfront edges. Use engineering drawings to evaluate the subsurface environments and the need for control measures there. Closely track and know the construction schedule and sequencing.
- Temporary (metal) street decking over a cut-and-cover excavation can provide harborage when the decking is not well secured and a gap exists between it and the street. This allows access to soil in the underneath trench. Any decking placed for an extended period must be properly secured. Exposed soil can be a limiting factor for rats in urban areas and thus if left undisturbed, it may be colonized.

- Shift control measures and monitoring seasonally. The skirt underneath a construction trailer and storage trailers can be particularly attractive to rodents during cooler months of the year. Anticipate more rodent activity during late spring and fall months as a result of seasonal breeding. Intensive trapping colonization, breeding and dispersal events that can occur.

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For demolition projects

For demolition projects rid the building of rats and mice prior to demolition and any remediation work (e.g., asbestos); this may take one to three weeks depending on the structure. Once demolition begins, shift control efforts to the site perimeter. Major demolition projects can result in dispersal of rodents through utility systems to other buildings if subsurface control is not comprehensive.

Worksite Safety Requirements

Also know the work site's safety requirements. This can include a hard hat, work boots, safety glasses, safety vest and ear plugs. Work sites can change quickly, so it's important to check in before entering the site and follow all safety procedures.

Communication

Health and safety plans are written for construction and demolition projects. Rodent control and sanitation should be identified in them, including communication about rodent problems. The project safety representative can use a "tool box" talk at the beginning of a work shift to highlight the importance of site sanitation. Construction workers should be asked to report any observation of rodent activity so the structural IPM contractor can target control measures promptly.

Communication and positive public relations should be maintained with abutting residents and businesses during the project. An effective rodent control program can be a positive point — or a major disaster — with neighborhoods and the news media when poorly implemented and ineffectively explained.

Public complaints should be handled as soon as possible, always within 24 hours. For large projects, there must be an established communication network for receiving complaints and notifying those who can take action. Projects will have a construction superintendent and field engineers. There also will be a contract administrator identified for managing the pest control subcontract. The structural IPM contractor must coordinate effectively in the field and build a team relationship with the field engineers.

Rodenticide Bait

Block Bait only, example: Conrac Blocks, Maki Mini Blocks



Rodent Bait Stations

Heavy-duty metal or plastic tamper resistant bait stations with secured baiting chamber or bar. Example: Protecta RTU for mice, Protecta Junior for mice, Protecta LP for Rats by Bell Laboratories.

Rodent Traps

Example: Victor Rat Snap Trap, Ketchall Multi-catch mousetrap

III. TECHNIQUES AND MATERIALS FOR PEST PROOFING

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Gaps and openings allow pest access to buildings and, once the pests are inside, permit movement within buildings. Pest proofing should be part of virtually every professional facility/pest management program. Knowing the pest's habits and biology can help in determining the proper techniques and materials for pest proofing. The goal of this chapter is to provide a practical approach to pest proof buildings. It does not address the entire aspect of pest proofing a building. Nor does it attempt to provide a comprehensive guide to all the various types of construction and repair materials. It focuses only on those areas that vermin (insects, rodents and birds) most frequently gain entrance to structures.

Insect Proofing

In reality, it is extremely difficult to totally prevent the insects and other arthropods (spiders, mites, millipedes, etc.) from entering the building from outside. Generally, insect proofing measures include:

- Measures to prevent them from flying in, such as improving the insulation, screening of doors and windows, installing air curtains on building entryways and improving lighting source measures;
- Measures to prevent them from walking/crawling in, such as keeping greenery a distance away from the building, and blocking/caulking gaps at the bottom of doors and in the outside walls;
- Measures to prevent them from being carried in and breeding inside, such as preventing them from spreading through zoning, and controlling their breeding after being brought in through caulking of crack & crevices, improvement in sanitation, housekeeping & general building maintenance;
- Measures to prevent them from breeding in drains, such as preventing waterways from becoming dirty and preventing them from entering through drain pipes.



These measures are based on the routes of entry, but preventing insects require detailed measures by also looking at the problem from an architectural or design point of view. For example: [Type and Placement of Exterior Lighting Source](#): As

a measure to prevent insects from flying in, by simply replacing the mercury lamps around a structure, with sodium lamps, one can achieve a reduction in the amount of insects attracted to the light by 50 percent or illuminating the building from at distance of 20 feet will further reduce the amount of insects entering the structure. This topic itself would require a full chapter to discuss each component thoroughly. (Refer to [item#28 Exterior lighting on page#26](#)) Facility Manager should consult the County IPM Manager, as and when such need arise.

Caulking operations alone can have tremendous impact on denying many outdoor arthropods pest entry into buildings (such as cluster flies, ladybird beetles, yellow jackets, etc.) as well as denying harborage and breeding of indoor arthropods (such as cockroaches, ants, etc.). Caulking various cracks and crevices around equipment and walls indoors can help corral cockroaches away from the sensitive areas and into areas that are easily accessible during service visit. Effective heavy-duty caulking compounds and powered caulking guns are available in the market for those who perform caulking services on a serious level.

The focus of facility maintenance personnel should be on carefully planning caulking and sealing of entryways, crack & crevices (not overdoing it).

Rodent Proofing

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The majority of interior urban rodent problems could likely be eliminated if facilities managers emphasized rodent proofing of buildings, but unfortunately the majority perceives rodent-proofing efforts as too time consuming, costly, or requiring special expertise. Nevertheless, rodent proofing in conjunction with sanitation efforts provides the best long-term management of urban rodent infestations.

Remember a house mouse can squeeze into cracks only one-quarter inch high, rodent proofing procedures around building must be thorough.

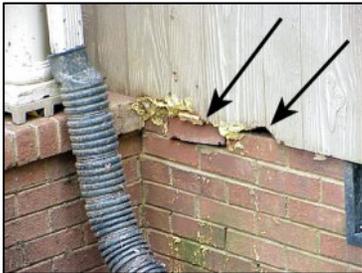
- 1 **[Pest proofing Commercial Receiving Bay Doors:](#)** Most rodents that gain entry to buildings enter beneath doors that aren't rodent proofed or doors that have been left open or ajar. To eliminate spaces beneath doors, tension brushes and strips or heavy-duty compression seals should be installed. Heavy-duty brushes and seals offer excellent rodent proofing for a wide variety of structural situations. Vinyl or rubber seals, which are less expansive than quality brush strips, lack the excellent abrasion resistance and wide temperature range flexibility by the brushes. Nevertheless, the high-quality products provide the most cost effective results. This is because it is the labor associated with pest proofing operations that is most expensive. It makes little sense to spend valuable time installing inexpensive weather-stripping or



cheap pest-proofing materials that will only need to be replaced repeatedly over the course of several months.

Regardless of the type of rodent-proofing devices used on doors, all portions of doors must be completely sealed. This includes the spaces directly beneath hinges, as well as the center space created with double doors. Sealing off these center spaces, for example, usually requires that vertical brush strips be installed along the center (interior) surfaces of both doors where the doors meet when closed.

2 **Foundations and Walls:** Rodents commonly gain entry through various structural defects and damaged foundation walls. All cracks and holes (1/4 inch/6mm) must be patched with cement or some other appropriate material. For temporary repairs steel wool or copper mesh materials can be tightly plugged into



any exterior cracks and holes to deny rodent entry, until more permanent repairs can be made. Where necessary rodents can be deterred from climbing by applying a 12 inch band of hard glossy paint around the outside of brick or stone walls to heights reaching about 3-1/2 ft. above the ground.



Rats often burrow beneath the foundations of buildings lacking basements. Such buildings may be protected from rat entry by placing a “**curtain wall**” or barrier of metal, concrete, or brick around and below the foundation of the building. Vertical curtain walls 2 ft. below the surface of the ground with 8 inches horizontal L-flange directed away from the building are usually effective. Although rats may burrow deeper than these distances, the horizontal flange discourages them from doing so. Concrete or corrugated iron sheets, 29-gauge, can be used for this purpose.

3 **Utility Lines and Vents:** The work “lines” is important relative to rodent proofing and inspections. Rats often utilize linear elements around buildings, and mice for travels and as access avenues to buildings. Such lines include plumbing lines (e.g. pipes), electrical conduits and lines, sewer lines and drains, and various other types of utility lines.

Inside office complexes and similar areas, telecommunication wiring with in conduit channel boxes installed into floor or suspended ceiling areas often provide highways and harborage to mice and rats.

Gaps are often created when utility lines are installed into structures because contractors frequently seal off lines and/or install escutcheon plates around pipes and lines to prevent pest entry. Similar to gaps beneath doors, gaps around utility lines allow for the escape of warm air currents or food odors that will attract exploring rodents. Nearly all lines can be properly sealed using the appropriate sealants (caulking compounds often are not appropriate for this type of sealing because elements subject to movement). Stuffing steel wool or mesh into these spaces only provides temporary protection.

Rodent can be deterred from climbing pipes on the outside of buildings by fitting metal rat guards around the pipes. Guard should be made of 26-gauge sheet metal, fitted close to the wall at the rear, and projecting 12 inches outward from the pipe. A 12-inch band of glossy paint around vertical pipes will also help prevent climbing. These measures, however, may not be very effective against roof rats.

- 4 **Drains and Vents:** Rodents may also gain entry via drains and vents. Rats are excellent swimmers and are notorious for coming directly up through sewer pipes and emerging through improperly fitted or damaged drains. Therefore, drains and the openings around drainpipes must all be tightly sealed and in good working conditions. Coarse steel wool, sheet metal, hardware cloth, and mortar can be used to seal the spaces around these types of openings.

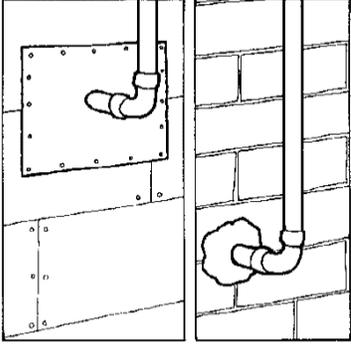
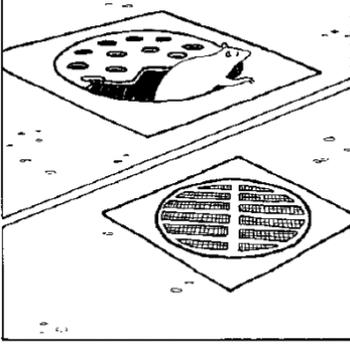
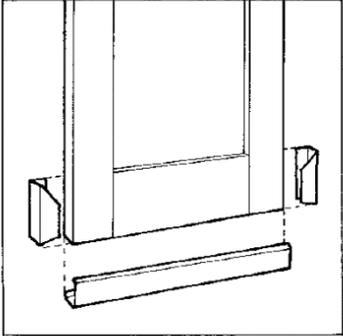
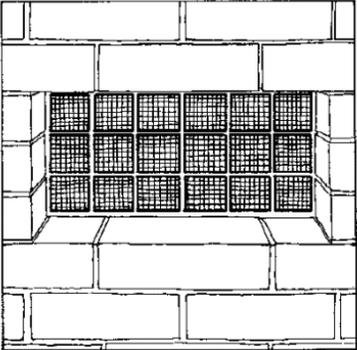
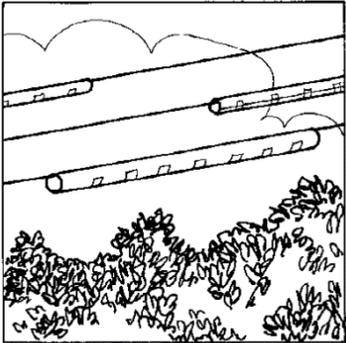
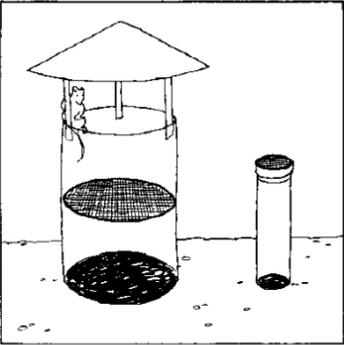
Sewer, utility tunnels, and other underground passageways provide below-surface highways for rodents (especially rats), and access to otherwise rodent proof buildings. Where there are combined sewers (i.e. sanitary and surface drainage collect together), the movement of rats from the surface into the underground labyrinth and then into building is facilitated. Rats emerging from toilets are common throughout the United States, mostly in the older sections of cities and towns. Plastic one-way rodent proofing valves can be used in toilets to prevent rats entering structures through this manner.

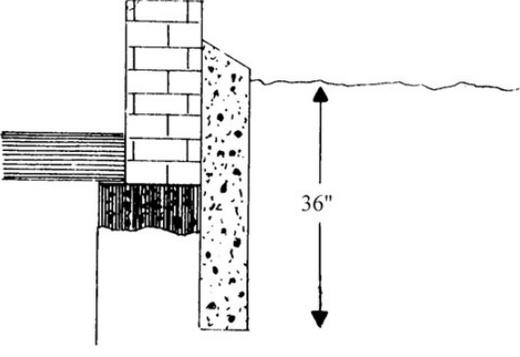
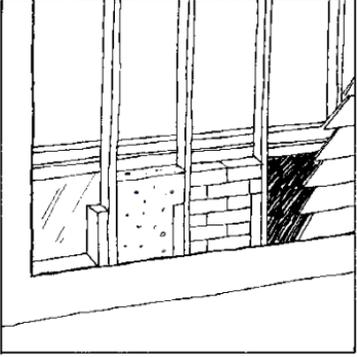
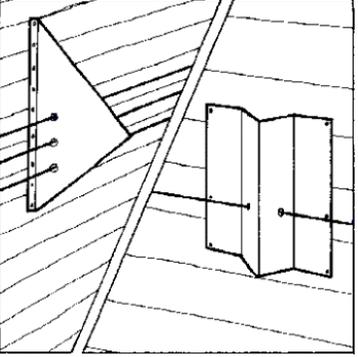
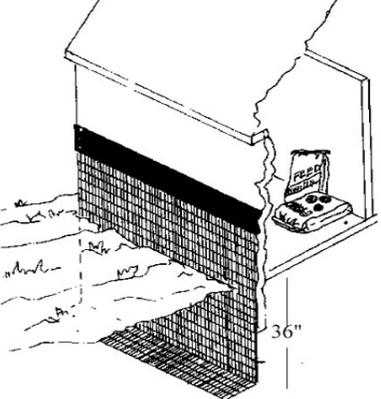
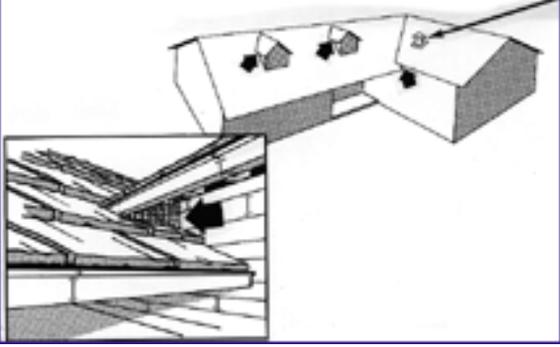
Rodents also gain entry via exterior vent openings that are not adequately pest proofed. Ventilator grills should be covered with 18-gauge, ½ inch mesh or 16-gauge galvanized wire cloth. Low windows can be protected with 19-gauge, ½ inch mesh galvanized wire cloth.

- 5 **Roof Area:** Roof areas are commonly overlooked as sources of rodent entry because they are not readily accessible. One of the most common entry points for rodents (especially roof rats) into open eaves of an attic is via a tree limb touching the roof of the building. All tree limbs should be pruned back six feet. Similarly any vegetation climbing up foundations to roof areas should be managed. Fascia boards must be kept tight against foundation walls. Otherwise, rats and mice will climb rough-sided walls and squeeze beneath the fascia boards – or from unsealed pipes and lines – and gain entry to the

inside of building. Here again, using the proper sealing materials and techniques is crucial. Expanding foam sealants when “sprayed” beneath fascia boards often will cause fascia boards to warp away from the foundation creating more problems for the building from not just rodents but insects (e.g. cluster flies, carpenter ants, cockroaches, etc.) as well.

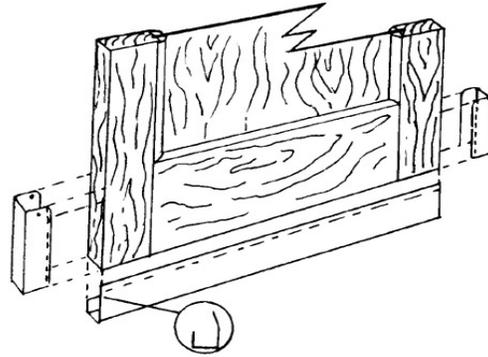
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RODENT PROOFING STRUCTURES.	
	
Rodent proofing openings around pipes with sheet metal (left) and concrete (right).	Rodent proofing drains with 1/4" hardware cloth.
	
Rodent proofing a door, placing sheet metal channel at bottom and cuffs at sides, over channel.	Rodent proofing a vent with 1/4" hardware cloth.
	
Rodent proofing utility wires to limit access to buildings using rolling plastic tubes made from rectangular sheets of plastic. The tube rolls when the rodent tries to walk over it.	Rodent proofing air vents and chimneys using 1/4" hardware cloth.

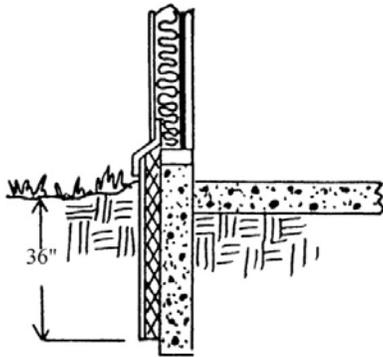
	
<p>Foundation curtain wall should extend at least 2 ft. below ground level and horizontal lip should be at least 1 ft. wide. Thickness should be at least 4 inches.</p>	<p>Blocking end spaces of wall void using sheet metal, concrete, brick, or wood.</p>
	
<p>Rat guards for utility wires near wall.</p>	<p>Install hardware cloth, topped by a band or sheet metal, to protect feed sheds, corncribs, and other existing wooden structures. Galvanized hardware cloth can also serve as a curtain wall to prevent rodents from burrowing beneath slabs.</p>
	
<p>Some unusual holes may exist, such as roof mounted chimney covers that have no pipes in them and open directly into the attic.</p>	<p>Rodent proofing openings around pipes underneath cupboards</p>



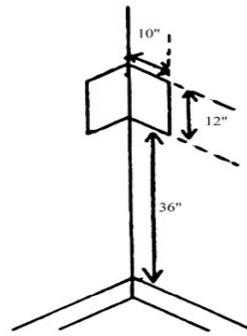
Rodent proofing gaps under doors with sheet metal



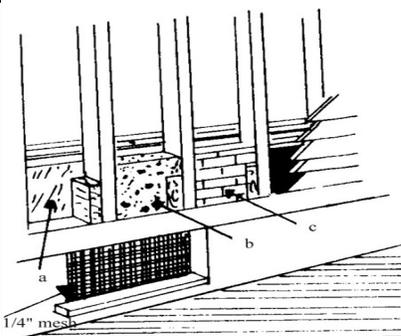
Metal flashing or a metal channel prevents rodents from gnawing at the bottom edge of doors.



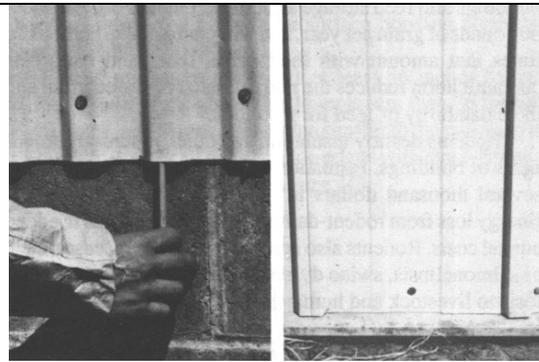
Protect perimeter insulation that is installed on the outside of a foundation, curtain wall, or stem wall. Install metal flashing along the top and to a depth of at least 36 inches below the soil surface.



Use sheet metal guards at the interior corners of rooms to prevent rodents from climbing.



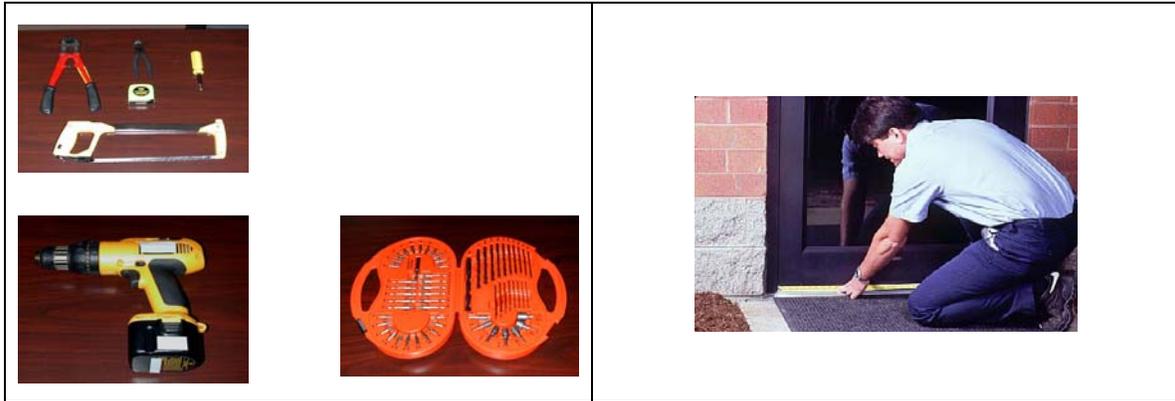
For double walls in old buildings, use galvanized sheet metal cut to fit and nailed into place between studs, joists, sills, and the floor. (a) Noncombustible stops of concrete (b) or brick (c) are recommended for buildings under construction.



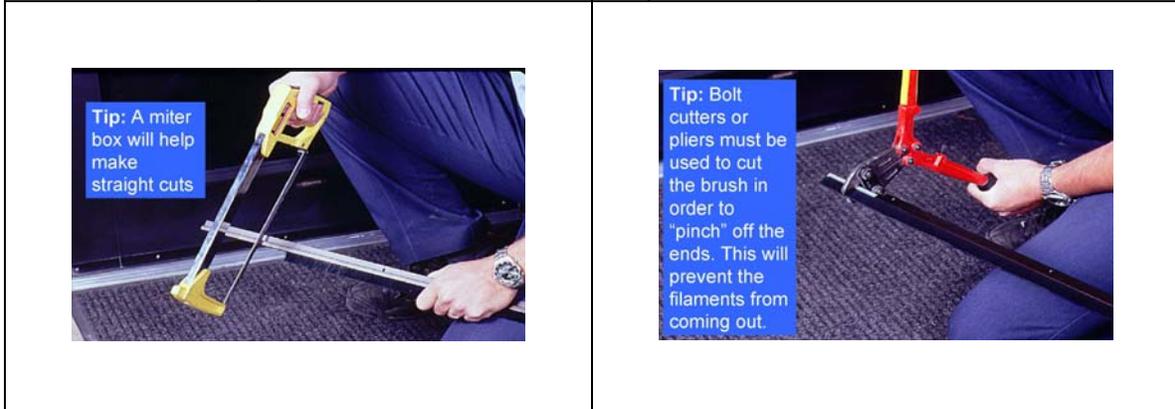
Mice can enter the wall space where the ends of metal siding panels are open (left), by gnawing through the weather shield or vinyl gasket. Use concrete, angle iron, or heavy duty flashing (right) to block access to rodents.

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RODENT PROOFING STRUCTURES.	Photographs & Info from: Sealeze. For more information contact 800-446-7325 or visit Sealeze.com
Steps to Door Sweep Installation	Page 1 of 2



Tools for Door sweep installation	Step-1 Measure the door
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Step-2 Cut Aluminum holder with hacksaw	Step-3 Cut the brush with bolt cutters
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Step-4 Pry the holder open slightly to allow easy insertion of brush	Step-5 After inserting the brush peen the ends of the holder closed
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RODENT PROOFING STRUCTURES.	Photographs & Info from: Sealeze. For more information contact 800-446-7325 or visit Sealeze.com
Steps to Door Sweep Installation	Page 2 of 2

	
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Step-6 Apply to door using self drilling screws	Step-7 Or Use silicon gel adhesive; Just peel and Stick!
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	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>Once you get hang of it, less than 10 minutes!</p> </div>
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How long will installation take?	
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	<p>The Door seal installation text & photographs (page1-2) are from Sealeze Inc. Website. The content is taken only for educational & informational purpose. For more information contact Sealeze Representative at 800-446-7325 or visit their website www.sealeze.com</p>
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Bird Site Cleaning & Bird Proofing

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The following text & photographs are taken from Bird Barrier America Inc. Website. The content is taken only for educational & informational purpose. For more information contact Bird Barrier Representative at 800-503-5444 or visit their website www.birdbarrier.com

The Importance of Cleaning a Bird Site: Site cleanup is something that should be done, to some extent, on every bird job for many different reasons.

- **Droppings:** Damage Bird droppings are very acidic and can cause [damage](#) to structures and machinery if they remain for extended periods of time. Cleaning a nesting site can also remove existing bird-related odors, reducing the birds' desire to return.
- **Worker Safety & Ease of Installation:** Working around droppings is [unsanitary](#). It is also difficult for adhesives to adhere to a dirty surface.
- **Liability & Disease Potential:** [Bacteria and parasites](#) from droppings & nesting materials remaining at the site are an even greater threat to building occupants, as they will look for a new host after the birds are forced out. Many businesses must also be concerned with meeting federal, state and local cleanliness requirements.
- **Public Image:** Installing bird control products on a dropping-splattered area gives the [impression that you don't care](#) about the way the building looks, didn't do the job correctly or used ineffective products - otherwise why would there still be droppings around?



Evaluate the situation carefully before cleaning a bird site. Some sites are much easier to clean than others. Simply hosing, scrubbing or pressure washing the area may accomplish cleanup of smaller amounts of droppings in open areas. For more serious accumulations, you should follow these steps:

- 1.) Bag and remove loose layers of droppings. (Be sure to wear protective coveralls, gloves and respiratory equipment when cleaning any bird site. At all sites, debris and other nesting materials should be shoveled into double bagged heavy duty garbage bags and disposed of properly.
- 2.) To remove remaining stubborn droppings, apply Dissolve-It. Mix in 1:1 ratio with water and let the mixture soak into the droppings for at least 15 minutes; droppings will generally wipe easily away with a brush and water (see page 7 for more information on Dissolve-It).
- 3.) Follow with a clean water rinse.
- 4.) After area is clear of droppings, apply Disinfect-It or other hospital grade virucide/ germicide to kill any remaining bacteria.

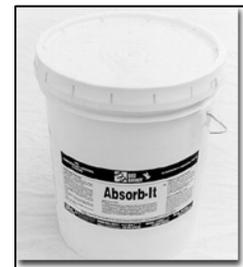
If the site contains old bird gel, use a putty knife or comparable scraper to remove the bulk of the gel. Use Bird Barrier's Gel Remover to make the job of removing the gel less time consuming and messy

Bird sites can contain dangerous bacteria as well as foul smelling materials. Bird Barrier has developed a family of products for site cleanup Enzymes actually break down the droppings, special disinfectants make the site safe for workers and visitors, and deodorants replace the smell with a clean, fresh aroma. These products are non-toxic, environmentally safe, non-flammable, and biodegradable.

Dissolve-It TM: Dissolve-It efficiently breaks down bird droppings, reducing the solids and eliminating odors. It allows for easy removal of even stubborn, caked-on droppings and other organic matter. Simply mix Dissolve-It in a 1:1 ratio with water, saturate the target area and let the solution work for at least fifteen minutes. Solution can be applied with a hand sprayer. The residue will easily spray away with hose or power sprayer. Dissolve-It is a biochemical live enzyme formulation consisting of a synergistic blend of three selected *Bacillus* microorganisms, special surfactants and a unique odor neutralization formula. This product is nontoxic, nonflammable and biodegradable, plus it is USDA accepted, environmentally safe. It can be poured over piles of bird droppings, as well as into drains, trash cans, sewers and grease traps. It can be used in unlimited areas: beneath and around rooftop air conditioning units, rain gutters, balcony areas and tops of ledges and pipes, use at 1:1 spray mixture with water.



Absorb-It TM: Newly developed granule odor counteracting and liquid absorbent manufactured from naturally grown corncob. Absorb-It is three times more efficient than competing products and contains no dust or crystalline silica normally present in clay-based products. It absorbs 150% to 300% its own weight, compared to clay at 70-90%. Its porosity allows the odor counteracting property to dispense for longer periods of time in its area of influence, leaving a fresher, odor-free atmosphere. Simply spread Absorb-It on the affected surfaces and allow it to do its work. Especially effective when used in areas where there is standing water mixed with bird droppings. Product weighs 4.25 lbs. (packaged in 1 gal. container) Absorb-It (1 gal.).

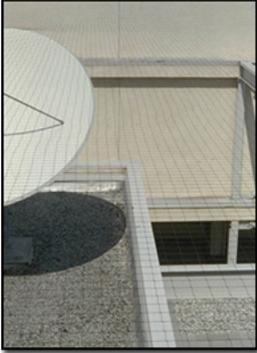
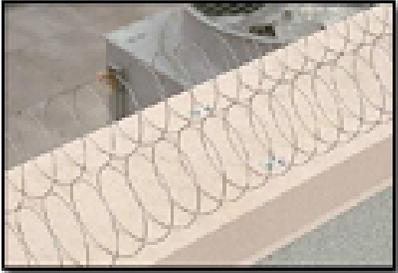


Bird Gel Remover TM: There are many different brands of Repellent Gel on the market that are all very sticky and, if applied incorrectly, are very messy as well. Our Gel Remover actually dissolves gel, leaving an almost perfect cleanup It is water soluble and will not damage most surfaces, with the notable exception of tar-based roofing materials. Instructions for use included.

Bird control is a specialized, technical trade requiring an in-depth knowledge of bird behavior, mechanical concepts and access equipment. Successful bird control installation companies excel at evaluating problem bird sites and offering solutions to building owners. It is recommended the use of a certified installer.

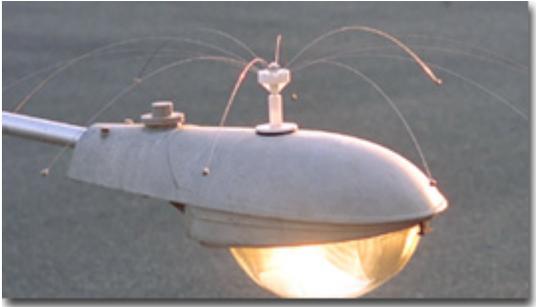
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BIRD PROOFING STRUCTURES.	Photographs & Info from: Bird Barrier America Inc. For more information contact 800-503-5444 or visit BirdBarrier.com
	Page 1 of 4

<p>Bird Flight Spikes Where to use: Ledges, parapets, signs, beams, pipes, chimneys, cutouts, security cameras, lights, etc. Target Bird: Pigeon or larger Bird Pressure: Medium-Heavy Material: Stainless steel and polycarbonate.</p>	
<p>StealthNet Where to use: Enclosed areas, opening or configuration where birds are to be excluded Target Bird: All species Material: UV Stabilized Polyethylene twine and various attachment systems</p>	
<p>Bird-Coil Where to use: Long, exposed ledges, parapets, signs, beams, pipes, etc. Not recommended for committed birds. Target Bird: Pigeon or larger Material: Stainless steel</p>	

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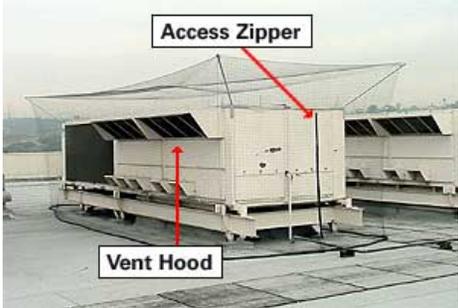
BIRD PROOFING STRUCTURES.	Photographs & Info from: Bird Barrier America Inc. For more information contact 800-503-5444 or visit BirdBarrier.com
	Page 2 of 4

<p>Gutter-Point Where to use: Specifically designed for attachment to the inside lip of rain gutters Target Bird: Gulls, Pigeon or larger Material: Stainless steel and Polycarbonate</p>	
<p>Daddi Long Legs Where to use: Roofs, chimneys, boat canopys, decks, booms and other open areas, A.C. units, streetlights, billboards Target Bird: Gulls, Pigeon or larger Material: Stainless steel and UV stabilized plastic</p>	
<p>Bird Slide Where to use: Ledges, eaves, angle irons, I-Beams and most "L" shaped ledges where total exclusion is the goal. Target Bird: All species including Swallows Bird Pressure: All pressure levels Material: Ultraviolet stabilized polycarbonate.</p>	

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BIRD PROOFING STRUCTURES/ BIRD DETERRENT DEVICES	Photographs & Info from: Bird Barrier America Inc. For more information contact 800-503-5444 or visit BirdBarrier.com
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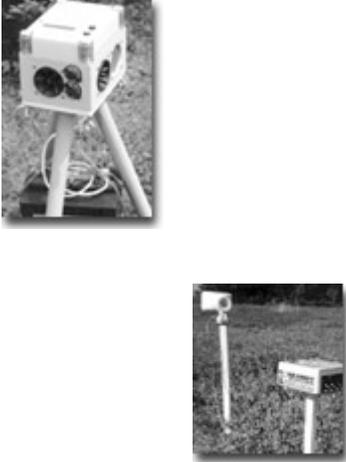
<p>Roll UP Screen Door 110v UL-rated tubular motor & galvanized steel roll tube 10 oz./sq. yd. nylon mesh screen Low -profile galvanized steel C-channel guide tracks Full- Width wind stabilizer profiles Foam- filled bottom draft seal</p>	
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<p>HVAC Netting System</p>	
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<p>Scare Streamer The Scare Streamer is a motion-activated device that scares pest birds from your property. When it detects motion, the Scare Streamer sprays a blast of water, scaring pests from your yard, pool, roof or patio.</p>	
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BIRD PROOFING STRUCTURES/ BIRD DETERRENT DEVICES	Photographs & Info from: Bird Barrier America Inc. For more information contact 800-503-5444 or visit BirdBarrier.com
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<p>Scare-Eye Balloon Species: Woodpeckers, small birds like sparrows etc. The bright colors, large eyes and hanging reflective streamers on this 2' balloon are threatening to birds - they think they're being watched by a predator. Scare-Eyes available in Yellow and Black.</p>	
<p>Bird Wailer & Squawker - Electronic Bird Deterrents Species: Black birds, crows, gulls etc. Ideal for large-scale infestations, crops, fish farms, airport hangars, etc. The Bird Wailer & Squawker are the most technologically advanced electronic bird deterrents available, creating a "scare zone" where it is uncomfortable for many species of pest birds to remain. Different combinations of electronic and/or natural sounds move randomly from speaker to speaker for varying durations, at variable intervals, decreasing the bird's familiarity with a pattern, which can happen with conventional scare devices.</p>	
<p>Pressure Washer: For more information on pressure washer visit K'A'RCHER website. The content is taken only for educational & informational purpose.</p>	

IV. ROLE OF BUILDING OCCUPANTS IN AVERTING PEST PROBLEMS

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Shared Responsibility



Old-fashioned pest control did not require much understanding or support from building occupants. Pesticides were expected to overwhelm pests. Sometimes this happened; other times it did not. But the pest control effort operated more or less independently. Urban IPM has the potential to provide long-range, effective control with much reduced reliance on pesticides.

Effective pest control requires a division of responsibility among the facility management, the pest control contractor and the tenant/building occupants. The best control programs will fail if pest management personnel and facility managers cannot convince their building occupants to eliminate competition with alternative food sources. Prerequisite cleaning must be emphasized as the essence of the control program. The pest manager must convince decision-makers that saving money on cleaning immediately increases the costs of pest management and does not save the facility management money over the long term.

Cooperation is required because *urban IPM often depends on structural modifications and sanitation performed by others*. The tenants must maintain *housekeeping practices* that do not support pest infestation and they must cooperate with pest control efforts by the contractor

The facility managers and pest management professionals should educate, sell or otherwise "convert" building occupants through a comprehensive public relations effort. The County IPM Manager, the Department IPM Coordinators and Pest management contractors should be proactive in educating building occupants and workers on their role in urban IPM public relations tools, which include face-to-face on-site briefings, demonstrations, newsletters and handouts. Cross sectional awareness, dialogue and education among the facility managers, supervisors and others up through the chain of command to gain cooperation, the linchpin of success. **Remember it is shared responsibility!**

Structural Modifications

Sometimes the need for structural modifications imposes the greatest constraint on a successful pest management program - particularly if building managers and building occupants outside the pest management school of thought are not educated on the absolute value of these modifications. These two groups of people are often key to ensuring that such modifications are completed; however,

they can balk at the cost or effort involved in this "extra" work.

Educating facility users involves pointing out pest "expressways, freeways, and hideouts" (call them what you will, but use terms that have an impact on the user) and discussing their connection to the pest problem. What one lives with on a daily basis may not necessarily be what one sees. Discussing and, more important, demonstrating the ease of caulking, taping, and repairing small, medium and large cracks and holes, while pointing out how they will aid in further exclusion, will go a long way towards helping to decrease your overall use of chemicals.

Acceptance of Slow-Acting Controls

Building Occupants must tolerate slow-acting controls and occasional low-level pest sightings. Easy to use, long-lasting baits and pheromone traps are often safer and more effective than sprays but may not eliminate certain pest infestations, such as pharaoh ants or grain moths, for several weeks. Many IPM techniques may fall into the category of slow-acting controls. The facility management should ensure/support the servicing technician to convince occupants/customers to resist the urge to "reach for the spray" even when occasional sightings occur.

Occasional sightings are common with baits and traps because, unlike "quick knock-down" agents, insects and animals frequently may be observed returning to their nests with the newfound food that baits provide.

Tolerance of Occasional Low-Level Sightings

Building Occupants must also support ongoing surveillance programs. Scheduled, preventive chemical control will preclude most flare-ups in pest populations. However, this method is costly, introduces unnecessary pesticides, and accelerates resistance to the chemical in use or occasionally to ones not yet introduced. Also, food service managers and others may sometimes "sacrifice" cleaning, to save money and manpower, when they expect the pest control service to come in and take care of their pest problems. And if chemicals are expected to do the trick, managers may delay or postpone the actual long-term repair and renovation efforts absolutely necessary for proper pest management.

Surveillance

Although pest managers place and retrieve survey devices, it is the occupants who must live with them. Don't just install survey devices (pest monitors) without an explanation - use the opportunity to describe sell your service or program. Taking the time to discuss the importance of surveillance - why it is often essential to proper control and should precede actual pesticide application - contributes to a truly successful IPM program.

For example, a rat or a cockroach sighted by workers may emanate from the attic, from basements or from outdoors. A full-scale application of pesticides in

the working spaces will eliminate only a handful of the pests, not the source of the problem. Often explaining this to the building/facility manager and building occupants could harness their enthusiastic cooperation in the monitoring/surveillance program. A few might need consulting with the County IPM Manager. People are often quite amazed that others take an interest in "their" problem! Building occupants must protect survey devices (pest monitors) and maintain their positions, not move them around or throw them away. They must also be willing to accept sightings, whether in or near the traps themselves. Most of all, they must accept new methods of doing business.

Lastly, successful cooperation also depends on a prompt and accurate servicing schedule by the pest management technician and correct follow-up actions once surveillance techniques reveal the problem. In essence, traps and baits must not be placed only to be ignored until the next frantic (and by now frustrated) call from the building occupant. The pest control professional must show interest in "their" problem!

Design a handout specifically addressing "their" problems

Periodically the County IPM Manager will provide the miniature posters/memos for a particular facility, encouraging good sanitation as a method of pest control. Most people don't enjoy working around cockroaches; they just need to be convinced that they can make a difference in helping to decrease cockroach populations (as the pest management technician, you are only there to help them). Focus on major problems. The County IPM Manager will assist the departments in designing handouts specifically addressing "their" problems for example; that roach baits cannot out-compete grease, leftover food and standing water; rodent baits cannot out-compete uncovered garbage; full pet food bowls will probably be more enticing than a smaller, containerized bait station. Contact the County IPM Manager for your specific needs in this regard.

The following awareness brochures will assist the facility manager in communicating the same to the building occupants:

1. [Role of building occupants in averting ant problems](#)
2. [Role of building occupants in averting rodent problems](#)

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V. COMMON SENSE APPROACH TO NON-CHEMICAL PEST CONTROL

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Topics

Common Pest Problems

Vertebrate Pest Management

Rats

Mice

Ground Squirrel

Pocket Gophers

Invertebrate Pest Management

Cockroaches: German, Brown banded, American, Oriental Cockroaches

Ants: Argentine Ants, Pharaoh Ants, Fire Ants, and Carpenter Ants

Small Flying Insects: Drain Flies, Fruit Flies, Fungus Gnats, Non Biting

Midges – Non Biting

Stinging Arthropods: Yellow Jackets, Wasps, Hornets, and Honey Bees

Miscellaneous Crawling Arthropods: Spiders, Centipedes, Millipedes

Termites

Weed Management

Common Pest Problems

The following paragraphs describe common pest problems in the Santa Clara County's buildings and the techniques for dealing with them. These general guidelines can be used when preparing contract specifications. Special circumstances may arise that require alternate or modified approaches. Consult the County's IPM Manager for additional information.

Pest management information bulletins/fact sheets should be distributed to tenants with questions about the pest control program.

VERTEBRATE PEST MANAGEMENT

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Rats

Rats dig burrows around foundations, in earthen banks and in planting beds. They are also attracted to debris and food in unsecured waste storage containers. Rat problems originate outside the building. Rats usually stay at ground level and below but, if they gain



access to wall voids, may climb to upper floors.

Rat control starts with three principal operations that do not involve the pest control contractor:

- Sanitation,
- Housekeeping and
- Structural maintenance.

These operations are generally more important than trapping and poisoning.

Securing Garbage and Trash: Since trash may contain food scraps attractive to rats, all collected waste must be stored for pickup in rat proof containers or kept in a rat proof room constructed of materials that cannot be easily gnawed. Rats can penetrate gaps greater than 1/2 inch. Compactors should be of a self-contained design and equipped with protective doors that close over the charge box.



Eliminating Unnecessary Storage and Debris: Exterior:

Building grounds, loading docks, and interior space at street level and below should be kept as free as possible of debris that rats can use for shelter.



Anything soft, such as rolled carpeting, insulation, or padded furniture, is particularly attractive to rats. Interior: Ensure that general office storage practices, sanitation and housekeeping do not support rat harborage and breeding. [Refer to the Facility Inspection Checklist for more details.](#)



Eliminating Access To Buildings: Rats commonly enter buildings through open or poorly fitted doors and windows, unscreened vents, cracks in masonry, or holes gnawed in weather-stripping or where utilities enter buildings. Contract specifications require contractors to notify the facility management office when conditions contributing to pest problems are observed. Once pest controllers report these conditions, facility management should follow up on rodent proofing as described in [Section III](#).

Bait boxes: Rodenticide baits are normally effective only if there is little alternative food for the rats. Sanitation, therefore, is a prerequisite for baiting. Although pest control contractors often place bait boxes around building exteriors, their use on the Santa Clara County properties is not recommended unless other control measures have failed or are impractical. All bait boxes on the Santa Clara County properties should conform to the following EPA

guidelines:

- Box anchored in place so that it cannot be picked up
- Box lid secured with fastener or locking tie
- Box of a "tamper-resistant" design, with a protected feeding chamber and constructed of a sturdy material
- Bait placed only in the feeding chamber (not placed in box entrance or inserted into burrows); In case rodent activity is not present, then poison bait should be replaced with non-poison baits.
- Box label with name of rodenticide and last date of service

All pesticides must be used in strict accordance with the label directions. Using a pesticide in a manner inconsistent with its label directions is a violation of Federal law.

Rodenticides: Rodenticide bait is generally not recommended for rat control inside buildings because of the potential odor from dead rat behind walls.

Tracking Powder: Tracking powder applied deeply into burrows (grounds) with a hand operated duster is one of the most effective ways of poisoning rats and may be the only way of poisoning bait-shy individuals. Treatment with tracking powders is most effective in dry weather. Tracking powder is generally not recommended for rat control inside buildings because of the potential odor from dead rat behind walls. In addition, there is always the chance that tracking powder applied in out-of-the-way locations may be disturbed during future renovation work. **The County IPM Manager approval is required to use such formulations.**



Trapping: Indoor control of rats is accomplished with snap traps and large glue boards. Either may be used outdoors in protected locations. Care must be taken to place traps in safe locations and out of public view. Check traps and boards regularly.

Mice

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Mice may enter buildings from the outside, but many mouse problems originate indoors. Although large numbers can build up in food service areas or trash rooms, small numbers can survive practically anywhere. Mice generally nest within 15 feet of their food source and frequently spread through a structure along pipes, cables, and ducts. The increased use of raised flooring for electric cables in telecommunications and computer facilities has greatly increased potential mouse harborage in public and commercial buildings.



Sealing Entry Points: A practical control measure for limited areas is blocking access routes into occupied spaces by sealing utility openings or chases. Young mice can squeeze through cracks just wider than one-quarter inch. Entry points can be sealed with caulk, copper mesh, steel wool, or polyurethane foam. Large, open office areas or rooms in older buildings may have so many potential access points that sealing is sometime impractical. Contract specifications require Structural IPM contractors to notify the facility management office when conditions contributing to pest problems are observed. Once Structural IPM contractors' report these conditions, facility management should follow up on rodent proofing as described in Section III.

Cleaning and Housekeeping: Sanitation for mouse control is similar to that required for controlling cockroaches. All food and refuse should be stored in sealed containers. Surfaces, crevices and containers should be free of food residue. Refuse should be removed daily. Strict attention to cleanliness is essential for mouse control in food service areas. However, it is often difficult to achieve a level of office sanitation that actually makes a difference for a scattered, low-level mouse infestation. Once mice gain entry inside buildings, they gravitate toward dark and shadowy areas as created by supplies stored directly next to walls or where supplies stored directly next to walls or where cracks and crevices formed by wall/floor junctions provide them harborage. Ideal storage practices (temporary or permanent) should also be encouraged to prevent pest harborage. Pest control and cleaning efforts are hampered when ideal storage practices are not followed. When inspection aisles and access spaces are not maintained in the storage areas, these spaces inside the buildings become vulnerable to rodents and other pests.

Rodenticides: Rodenticide bait is generally not recommended for mouse control inside buildings because of the potential odor from dead mice behind walls.

Tracking Powder: Tracking powder applied deeply into burrows (grounds) with a hand operated duster is one of the most effective ways of poisoning rats and may be the only way of poisoning bait-shy individuals. In some cases tracking powder is also used in PVC tunnels around the exterior as well as interior perimeter of structures. Treatment with tracking powders is most effective in dry weather. Tracking powder is generally not recommended for mice control inside buildings because of the potential odor from dead mice behind walls. In addition, there is always the chance that tracking powder applied in out-of-the-way locations may be disturbed during future renovation work. **The County IPM Manager approval is required to use such formulations.**

Trapping: Glue boards and snap traps are usually the most effective devices for controlling small numbers of mice. Extreme care must be taken to conceal traps in order to avoid adverse occupant reaction. Windup, multiple-catch traps can be useful for controlling large infestations in kitchens or unoccupied spaces, provided the necessary sanitation and sealing measures are also carried out.

Examples of rodenticide bait, bait stations and traps:

Rodenticide Bait: Block Bait only, example: Conrac Blocks, Maki Mini Blocks



Rodent Bait Stations: Heavy-duty metal or plastic tamper resistant bait stations with secured baiting chamber or bar. Example: Protecta RTU for mice, Protecta Junior for mice, Protecta LP for Rats by Bell Laboratories, Rat Glue Boards by CatchMaster



Rodent Traps: Example: Victor Rat Snap Trap, Ketchall Multi-catch mousetrap, Mouse glue boards by Catchmaster.

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California Ground Squirrels

For more information of this pest click the following link- [California Ground Squirrels Management](#) – UC IPM Online

Pocket Gophers

For More information on this pest click the following link- [Pocket Gopher Management in Landscape](#) – UC IPM Online

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Birds

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Three species of birds - [Pigeons](#), [Starlings](#) and [House Sparrows](#) are serious pests when they roost and nest on or in buildings. Their excrement is unsightly, harbors microorganism that can cause [severe illness](#), and [corrodes structural materials](#). Bird nests may block air intakes, damage the building surface by holding water against it, and contain parasites that can become indoor pests. Bird control is difficult and highly specialized. Consult the County IPM Manager for additional information.



Concerns of Structural Bird Control: There are three primary requirements that must be met by a bird control program:

1. Maximal Effectiveness: In addition to providing long-term protection against pest birds, cost effectiveness must be considered. The utility and appearance of some exclusion devices deteriorate more rapidly than others.
2. Minimal Damage to Structure: Permanent physical and aesthetic damage to any structure should be avoided in bird control work, particularly in historical buildings. Repellent systems must be harmless to building materials and finishes and must be reversible, so that if they are eventually removed the building can be returned to its original state; they must also be inconspicuous to passers-by.
3. Public Relations: Even the perception that birds are being harmed is likely to draw considerable criticism from individuals, special interest groups, and the media. Bird control efforts, therefore, should always be as humane and discreet as possible.



Bird Management Methods: Several lethal bird management methods have long been used as a last resort. Although they may be appropriate in restricted or specialized circumstances, they are not recommended for large-scale projects, historic structures, or high-visibility sites. Bird management options include:

- Shooting: Shooting is an effective way to reduce starlings and pigeons in large buildings such as hangars and warehouses. A pellet rifle, or a .22 rifle with cb caps, is an effective tool for this effort. Shooting is species specific (no non-target kills), and has no secondary toxic effects. While no federal permit is required, it is imperative that the individual marksman be trained and experienced in bird identification. To reduce adverse public

reaction, the minimum number of personnel should conduct the effort during nonduty hours. All dead birds should be carefully handled so as not to attract attention later. Public affairs personnel should be advised prior to the effort to prepare themselves in the event adverse attention is created. While reducing the population with lethal methods eliminates the immediate problem, the potential for birds returning is high (an open niche will be filled). Periodic shooting may be required to keep bird populations at an acceptable level. Shooting is not an approved control method under SCC IPM Program. Consult the County IPM Manager.

- Toxic Baiting and Toxic Perches: Control by avicides (bird poisons), either added to feed or incorporated into special perches, is undesirable in most situations - there are always more birds to take the place of those killed and adverse public reaction may result. Toxic baiting and toxic perches are not approved control methods under SCC IPM Program. Consult the County IPM Manager.
- Porcupine Wire: There are several anti-roosting products consisting of wire spikes or coils that stick up from ledges to prevent birds from landing. Although usually effective against pigeons if precisely installed, these materials are unacceptable for sites in public view. Their attachment to historic structures also produces an unacceptable risk of damage to masonry. Furthermore, smaller birds such as sparrows often use the wire to anchor their nests, adding to its unpleasant appearance. Porcupine wire is most useful for relatively concealed applications on utilitarian structures, such as overhead pipes and beams in garages.
- Repellent Gels: Sticky gels that birds find unpleasant can be applied to ledges with caulking guns. These gels are not recommended in most circumstances because they are eventually degraded by dust and air pollutants and are capable of staining or even spalling underlying masonry. In addition, applying sticky gels can be a messy job.
- Electrical Wire: "Shock wire" systems are not recommended in most circumstances because they are prone to shorting out when exposed to water, ice or airborne debris or during maintenance work on a building's exterior. Since these systems are typically "zoned" for large areas of a structure, a single break or short can disable hundreds of feet of wire. Like the spikes of porcupine wire, the insulators of electric systems are conspicuous and often aesthetically displeasing. Unless installed exclusively on mortar joints, with no damage to adjacent masonry, they would be automatically prohibited on historic structures.
- Scaring Devices: Plastic owls and snakes, balloons with eye patterns, brightly-colored objects that turn in the wind, and dozens of other "scarecrow" variations are intended mainly for temporary protection of

crops and are almost always ineffective for protecting buildings. Falcon silhouettes may be used to prevent migratory birds from flying into large windows. Recorded distress calls can effectively repel starlings when used by an expert. Various noisemakers, including pyrotechnics, may also be used to repel pest birds.

- Screening: Barriers and cages of hardware cloth or other wire screen are often the most efficient way to keep birds off and out of limited areas on utilitarian structures that are not in the public view. A 3/4-inch mesh is the largest size that will eliminate sparrows and starlings. Horizontal nesting areas afforded by ledges and window air conditioners can be eliminated by the use of aesthetic structural materials affixed above them and at a 45-degree angle.
- Tensioned Netting and Pin and Wire Systems: Two relatively new types of systems are the current recommended solutions for bird proofing on a large scale, on historic structures, or on any high-visibility site. "Pin and wire" installations consist of spring-tensioned stainless steel wires strung at different heights along projecting elements such as ledges, lintels, sills, and stringcourses. The wires are attached to slender, stainless steel pins inserted into mortar joints. Tensioned netting installations consist of various types of net fabrics stretched taut across recessed elements such as niches, colonnades, and the coffered ceilings of porticos. Wires or cables threaded through the net edges provide an even tension that can be adjusted by turnbuckles. The cables run through hooks or screw eyes that are attached to the building only at mortar joints. When correctly installed, both of these systems are effective, durable, and inconspicuous.
- Dangling Filaments: Migratory swallows can be deterred from nesting under roofs by an easy-to-use and inexpensive system. A 1/4-inch, 4x8 foot CDX plywood sheet is cut into strip slats 1 inch wide. Holes .063-inch in diameter are drilled into the slats at random 8, 10, and 12-inch intervals. Four-foot sections of 60-pound monofilament line are knotted at one end and then drawn through the holes to be left dangling. The slats are nailed onto wood or spot-glued onto concrete and steel using construction adhesive and installed so that the monofilament projects into the flight path of the swallows. When areas behind the monofilament line are bright, the line is nearly invisible to birds. As birds try to land, they contact the monofilament line, which acts like netting, interrupting their flight pattern. Within 48 hours, the surprise of sudden contact stresses the birds to such an extent that they leave the area.

Removing Bird Excrement: Microorganisms that can cause serious illness live in bird droppings. However, infection typically occurs by inhaling these pathogens through the nose and mouth. Therefore, bird excrement is dangerous mainly when it is dry and subject to becoming airborne as a fine dust, particularly when

disturbed by sweeping or scraping. Germicides are sometimes applied to accumulated excrement prior to cleaning. However, thorough saturation with water and use of a respirator are usually sufficient protective measures. Many disinfectants are oil-based formulations that may permanently stain building materials. For an example of bird site cleaning procedures click [here](#) or visit the web site www.Birdbarrier.com. The following concepts should be incorporated in bird excrement removal on building exteriors. If possible, cleaning efforts should be coordinated with the installation of a modern bird proofing system and the removal of any old, ineffective systems that are in place.

- Worker Protection: All personnel working with accumulated bird excrement should wear a full-face respirator with a High Efficiency Particulate Air (HEPA) filter for screening particles of 0.3-micron size. Dust and particle masks are better than nothing, but they will not give complete protection. In addition, all personnel should wear protective coveralls, gloves, boots, and hats.
- Application of Water: Droppings are usually easier to clean when they are dry and crusted. Nevertheless, prior to removal, all excrement must be saturated with water to prevent the debris from becoming airborne. If a hose is used on the exterior of buildings, water pressure should be low. A hand-held compressed air sprayer filled with water is also satisfactory and will reduce run-off. Higher pressures may be used for hosing small amounts of excrement off sidewalks and pavement.
- Nonmetallic Tools: On historic structures, only nonmetallic tools (such as plastic spatulas and brushes with natural fiber or nylon bristles) should be used to remove excrement. Tools that can easily damage building surfaces, such as coarse wire brushes, should not be used under any circumstances.
- Disposal: Removed excrement should be collected in plastic bags, sealed, and disposed of at a sanitary landfill.
- Public Protection: Bird excrement removal on public buildings should not be performed during normal working hours and should be scheduled for weekends, if possible. All work should be done from the outside of the building. Barricades and signage must be provided to keep the public clear of the work site during all operations.

INVERTEBRATE PEST MANAGEMENT

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Cockroaches

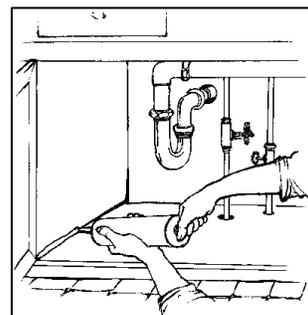
Small Cockroaches

Two species are responsible for most pest complaints and pesticide use in public and commercial buildings in the United States: the "German" and the "brown-banded" cockroaches, each less than three-quarters inch in length. Although it is widely believed that these insects can never be eradicated from the workplace, it is possible to totally eliminate them from a limited area such as an office. However, the degree of success depends not only on control measures but also on occupant attention to detail when it comes to cleanliness and housekeeping. Cockroaches and their egg capsules are continually reintroduced on custodial trash carts and with packaged food. These invaders will not survive and multiply if they cannot find enough to eat.



Sanitation: Cleanup to reduce cockroaches in an office environment must focus mainly on the food residue in and around coffee machines, microwave ovens, refrigerators, trashcans, and furniture where exposed food is stored. Occupants concerned about cockroaches in their workplace must understand their own responsibility for storing all food in tightly sealed containers and for cleaning surfaces on which food is prepared or consumed. Daily afternoon trash and food garbage pickup is recommended. Removal of corrugated cardboard is especially important since it provides excellent harborage for cockroaches. Dedicated containers with a tight lid and a plastic liner, replaced daily, for disposal of all items will reduce cockroach problems. The most effective cockroach control technique for food service areas and trash rooms is regular steam cleaning or pressure washing of all possible structural crevices and equipment.

Caulking: Permanent reduction of cockroach populations may be achieved by eliminating harborage. A caulking gun is probably the most appropriate symbol of modern pest control. Care must be taken to completely seal the entire crevice so that cockroach access is totally eliminated. Types of space where caulk or grout are most effective include foodservice areas, restrooms, and janitors' closets. The most common types of cracks to eliminate include: where sinks and fixtures are mounted to the wall or floor, around all types of plumbing, baseboard molding and corner guards, where shelves and cabinets meet walls or door frames, and any cracks



on or near food preparation surfaces. Care must be taken to clean surface areas around cracks before applying caulk; surface dirt can reduce the adhesive ability of caulking material.

Vacuuming Cockroaches: Another way to quickly reduce cockroach populations is with a vacuum cleaner equipped with a HEPA (High Efficiency Particulate Arresting) filter. But one should NOT use an ordinary household or shop vacuum cleaner for cockroach removal. Cockroaches and their by-products contain allergens and pathogens (disease-causing organisms) that can be spread through the air by non-HEPA vacuum cleaners.

Place a narrow tube/attachment on the end of the vacuum hose to extract cockroaches from cracks and crevices. When an infestation is isolated in a small area, you may be able to completely eliminate adults, nymphs, and egg capsules with the vacuum method. Even if the infestation is large, vacuuming helps in preparation for other control methods. It cleans out old and new egg capsules, loose fecal materials, and living and dead cockroaches. Vacuuming will not kill live cockroaches, so you will need to place the bag in a freezer or seal it in a cockroach-proof container for disposal. Never leave a vacuum that has been used for cockroach control unattended without properly disposing of the bag, because cockroaches will quickly escape.

Controlling cockroaches by Heating & Freezing: Because they are cold-blooded organisms, insects do not survive very well in extreme cold or hot temperatures. Each insect species has certain temperature and humidity conditions where it thrives. Although there are some differences between species, it should come as no surprise that our domestic cockroaches are best adapted to temperatures that we maintain in our homes. They do not develop or reproduce when temperatures are too cold (below 45degrees F) or too hot (above 115degrees F).

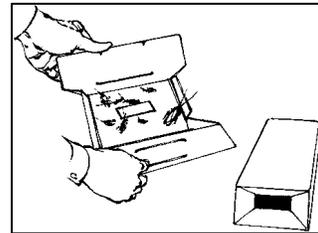
Hot and cold temperatures can be very effective in killing cockroaches, but the adverse temperatures must be maintained for a period of time. Hot and cold treatments are also most effective when they "shock" the cockroaches' system. If cold temperatures are gradually lowered, insects have physiological mechanisms that allow them to survive the cold. But, if you take a jar of cockroaches from room temperature and put it into a sub-zero freezer, the insects will be dead within a half hour. They just cannot adapt that quickly.

Because cockroaches cannot survive temperatures above 115degrees F to 120degrees F, it is possible to use heat to eradicate cockroaches from restaurants and food service establishments. After all heat sensitive equipment is removed from the building, the temperature is increased to about 140-150degrees F for five to six hours. It may not be possible for the homeowner to increase the heat that much inside the home. But if a small, infested appliance has many small crevices and can withstand 150degrees F heat, a similar procedure can be used. The procedure is simple -- place the heatproof metal

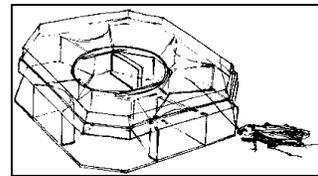
appliance in an oven, and after several hours at 150degrees F, the roaches will be dead.

Cold can also be used to kill cockroaches, but it takes a prolonged exposure to low temperatures to kill egg cases. Appliances or furniture can be left in a garage when temperatures are below 0degrees F for several days. If moving, leaving possessions in a truck or van will do the same thing. Infestations in wall voids or indoor cavities can be subjected to extreme cold by using a CO2 (carbon dioxide) gas canister. This will freeze a localized area. Infested appliances can also be fumigated with CO2. Place it in a plastic bag or other airtight container and inject carbon dioxide gas. Allow freezing to occur. If a small item can be subjected to freezing, it also can be placed in a freezer for several hours (or overnight) to kill the cockroaches.

Sticky Traps: Many types of cardboard or plastic sticky traps are available to help the pest control technician or installation personnel pinpoint sources of cockroach infestation, or monitor areas where occupants have complained but no infestations can be visually detected. Sticky traps are not intended for control but rather to guide and evaluate control efforts as part of the inspection process.



Baiting: Containerized paste or gel baits should be the standard insecticide treatment for cockroaches in most occupied spaces. The small plastic bait containers should be placed as close as possible to the dark, concealed spots where cockroaches are actually living, preferably adjacent to edges and corners. The most common mistakes in using containerized bait are failure to eliminate nearby alternate food, and failure to use enough containers. For example, at least 2 - 3 bait stations should be placed in infested desks. Containers should be replaced after 3 months or sooner at the beginning of a baiting program if cockroaches are very numerous. The newer transparent bait stations facilitate checking baits for consumption. Paste or gel baits are most effective when applied in many small dabs, preferably with a syringe-like dispensing tool but must be carefully injected into crevices.



Boric Acid & Silica: Boric acid powder and silica aerogel dust are inorganic insecticides that can control roach infestations. Both are relatively inexpensive, low in toxicity to humans and pets, and retain their potency long after the initial application. In addition, roaches have not developed resistance to these products. These chemicals are slow acting and often take a week or more to reduce roach numbers. Silica aerogel is particularly effective in controlling roaches in attics, wall voids, or other closed spaces. The dust loses its effectiveness if it becomes wet, so do not use it in damp areas. Consult the

County IPM Manager for current recommendations and for products that are available in California.

Crack and Crevice Application of Insect Growth Regulators: "Crack and Crevice" treatment implies that the stream of insecticide is never visible during the spraying process. Insect Growth Regulators (IGRs). Insect growth regulators are a relatively new group of compounds that alter growth and development of insects. Their effects have been observed on eggs and growth and development of nymphs.



Hydroprene (Gentrol®). Hydroprene is an IGR that is registered for cockroach control in apartments and homes. It is formulated as a liquid or aerosol to be absorbed into the cockroach body. Consult the County IPM Manager for current recommendations and for products that are available in California.

Large Cockroaches

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Several types of cockroaches grow to over an inch and a half long; these are commonly called water bugs or, in Florida, palmetto bugs. The most common are American and Oriental cockroaches. Large cockroaches may wander along pipes throughout a building, but in temperate climates they live mainly at ground level or below. Treatment should focus on warm, moist areas such as basements, boiler rooms, pipe chases, sumps, and elevator or sewer shafts. In warm climates, even attics and mulched outdoor planting beds may be infested with large cockroaches.



Drying: One of the most effective ways to control large cockroaches in buildings is to reduce moisture by fixing leaks, improving drainage, and installing screened vents to increase airflow.



Sealing Entry Points: Cockroach access routes from wall voids into occupied spaces can be blocked with caulk or grout applied around plumbing and electrical fixtures. Basement floor drains should be fitted with screens or basket inserts that are cleaned regularly.

Housekeeping: In addition to eliminating food residue, reducing clutter is critical for large cockroach control. Large cockroaches like to hide in stacked boxes, cartons, rolled carpeting and any stored paper or cardboard materials, particularly in dark, damp locations.

Vacuuming cockroaches: As with the small cockroaches, vacuuming can also be used to minimize large cockroach infestation.

Baiting: As with the small cockroaches, pesticide control should emphasize the use of baits rather than sprays. Consult the County IPM Manager for current recommendations.

Ants

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Habitat Modification:

Sealing Entry Points: Most species of indoor pest ants come from nests located outside the building or inside wall voids. Therefore, the most effective control typically entails sealing up cracks (usually around windows and other locations on exterior walls) where the ants are entering. Close observation on the outside often can help pinpoint these access crevices.

Correction of contributing conditions has the greatest impact for carpenter ant infestation such as:

- Trim branches of trees and shrubs back that touch structure to keep ants from crawling across to the roof or siding.
- Remove stumps and dead limbs from trees
- Provide a dry, vegetation-free border, such as brick walkways or stones, around the building foundation to discourage nest building.
- Avoid stacking wood or trash next to structures. Regularly inspect compost and firewood piles, plant containers, and woody debris for ants.
- Repair water leaks around plumbing, around windows, and in the roof
- Improve drainage along the foundation
- Remove or dry out moisture damaged wood
- Improve attic and crawlspace ventilation
- Sealing exterior crack and holes around windows, doors, and soffits
- Clean clogged gutters



Contributing conditions for other ants include:

- Clean up alternate food sources used by ants inside and outside (Sanitation)
- Keep landscape mulch to a thickness of 2 inches or less
- Remove piles of lumber, bricks, stones, debris, leaf litter, etc.
- Seal cracks in the foundation and around windows and doors
- Reduce moisture sources, including condensation and leaks

- Some ant species are attracted to the sweet honeydew deposited on plants by aphids and scales. Reduce the numbers of these insects on trees and shrubs near the buildings. Consider removing plants that host these insects.

Baiting: When faced with an ant problem there is temptation to reach for an aerosol container. ***For many ant species, baits are the best management tactic because the entire colony is destroyed.*** The trick to using baits is to make sure that the offending ants find the bait, eat it voraciously and take it back to the nest to the queen. If residual insecticide sprays are used, the foraging worker ants may die before they feed or take the bait back to the nest, counteracting the effectiveness of the bait. Do not use insecticide sprays if you want to bait for ant control. Moreover, ***spraying around the foundation will not provide long-term control because it kills only foraging ants without killing the colony.*** If the bait is attractive to the ants, the entire colony will be destroyed within a few weeks. No insecticide sprays will be necessary!

Not all ant species can be controlled by baits and some baits work better than others. In general, baits will less affect ants that eat a wide variety of foods because the bait will comprise a smaller proportion of their food. Sugar-loving ants are the easiest to control. Containerized, slow-acting bait (dual action sugar/protein bait station) is usually the most effective type of pesticide treatment for temporary control. Permanent control requires that the nest be located and destroyed or wide scale baiting may be warranted when multiple ant colonies are experienced under or around the structure. For use of baits in the granular formulations, consult the County IPM Manager.

To improve bait effectiveness, be sure to remove any particles of food or other attractive material from cracks around sinks, pantries, and other ant-infested areas. For the most effective and economical control, use baits only when there is an ant problem. Treatments made in late winter and early spring when ant populations are just beginning to grow will be most effective. Ant preferences can change throughout the year; to increase your success rate, set out different formulations of various bait products in a single baiting station, giving ants a choice. Do not use any insecticide sprays while you are using baits. Check and refresh bait stations regularly. Baits can dry up or become rancid and unattractive over time.

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Tips for Successful Baiting for Ants:

- ❖ The biggest mistake made with ant baits is to place them and then forget about them until next scheduled service visit. Ants baits should be checked, preferably the next day or at least within one week. Are the ants finding the bait? Has there been noticeable feeding on the bait? If no, switch baits. If more trails are found, place additional baits. Baits must be eaten to be effective.
- ❖ Place baits as close as possible to the ant colony. If an acceptable food source is available close to the colony's location, that food source or ant

bait is likely to be more heavily exploited. When possible, place ant baits near where the trail is exiting a wall or crack in a slab.

- ❖ Whenever possible, place ant baits along edges and corners. Ants like to trail along structural guidelines formed by the edges of cabinets, the edges of a wall or a crack in concrete, along corners, the edges of landscape timbers, the edge of a tack strip under a carpet, along wires and plumbing pipes, etc.
- ❖ Place baits in electrical outlet boxes in walls, especially when dealing with pharaoh ants, because these ants most often use electrical wires to move throughout buildings. If ant bait stations do not fit in these boxes, use gel ant bait placed in a piece of plastic straw.
- ❖ Have all other potential food sources removed by advising the customer of the importance of cleaning up all food particles and grease deposits.
- ❖ Skimping on bait placements is also a frequent mistake made in ant baiting programs. Each active foraging trail needs to be baited because that trail could be from a separate colony, especially in the case of pharaoh ants. Follow up inspections are important for identifying new ant trails.
- ❖ Don't place baits on treated surface or apply insecticides over bait placements.
- ❖ Outside bait placements are a must, particularly for pharaoh ants, which commonly forage outside during warm weather.
- ❖ With the coming of autumn, the nectar in flowers and nectarines decreases or disappears and rains wash the honeydew from the plants. During spring, aphid and mealy bug populations are at very low levels, which reduces the available amount of a preferred food source. Under these conditions, sweet loving ants, such as the Argentine ant, may feed much readily on ant baits. The fall and spring of the year, therefore, may be the best times to use ant baits for this ant and others, such as odorous house ants.
- ❖ Some ants just do not feed on baits and certain ant species are very difficult, if not impossible, to control with baits. Crazy ants, ghost ants, carpenter ants, Argentine ants, and acrobat ants historically have been difficult to eliminate using baits.

Ant species controlled by bait are:

- Argentine ants (sweet bait)
- Odorous house ants (sweet bait)
- Small honey ants (sweet bait)
- Pavement ants (sweet and grease baits)
- Little black ants (sweet and grease baits)
- Pharaoh ants (use hydramethylnon bait)

- Big-headed ants (sweet and grease bait)

Are you considering aerosol insecticide treatment of for flying ants? Many types of ants produce winged queens and males, which swarm at certain times of the year. Large numbers of swarmers may pour out of crevices into a room, even in locations that never had a problem with crawling ants. Swarming ants can severely disrupt operations and often result in occupant demands for spraying. In cases where the ants are relatively concentrated, such as at windows, they may be vacuumed and disposed of in an outdoor trash receptacle. However, in some cases, a space spray with pyrethrins based (insecticide) aerosol spray labeled for use against ants, may be the only practical response. Winged ants emerging inside a building usually die quickly or disperse, so spraying tends to be of little value if not done immediately. Rooms should be unoccupied during a space spray treatment, all electronic equipment should be well covered, and the space should be ventilated for at least several hours before reoccupation. The standard procedure to prevent future swarming is to locate the ants' entry points (and the nest itself, if possible), inject a pesticide into these crevices, and seal up entry points afterwards.

There are four species of ants causing problems that require a special response after positive identification:

Argentine Ants

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Argentine ants are light to shiny dark brown ants. The nest will often be found in open ground with small piles of excavated earth a short distance from the nest holes. Form boards along walks and wooden objects of any kind are preferred as nesting sites and permanent runways, as are cracks and crevices in concrete walks. The area beneath a plant infested with aphids often will be honeycombed with their tunnels. The ants may be encountered in enormous numbers in and under dead and decaying stumps. During warm weather they are partial to the under areas of the structures and may use the mudsills as their runways. The huge nests may be found beneath boards, sheets of tin, buildings, etc. The nests are commonly established inside structures with nests occurring in wall voids, bath traps, and even insulation in attics. The ants are often found crawling inside freezers and refrigerators and dying by the hundreds or thousands. The argentine ants have been found over wintering in enormous numbers in tunnels containing hot conduit pipes. It is an omnivorous feeder, living off a wide variety of foods.

Pharaoh Ants

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Pharaoh ants are tiny yellowish-brown to reddish-brown ants that can nest in almost any hollow place inside a building. In an office, for example, these ants could come from inside a table leg or room divider, behind a baseboard or switch plate, above the ceiling or under the floor. In warm climates, colonies may be

located outside. It is important that sprays not be used for control attempts. Colonies stressed by sprays often respond by dividing. If spray is continually applied, this dividing process results in many widely scattered colonies that infest an increasingly greater area. Bait specifically labeled for pharaoh ants must be used.

Fire Ants

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In warmer climates, fire ants can be a stinging hazard on building grounds, and sometimes indoors. Use of pesticides for fire ant control is usually unavoidable. Treatment often combines injection of spray into individual mounds with use of bait formulations broadcast over wider areas. Consult the County IPM Manager for current recommendations.



Carpenter Ants

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Carpenter ants are large ants that tunnel in wood. Small numbers in a building may simply be invaders from an outdoor nest that can be controlled by sealing up their point of entry. Large numbers inside typically indicate a nest within the building. Carpenter ants generally prefer wood that is moist and are considered to be an "early warning signal" of structural leaks or drainage problems. Control consists of locating the nest, injecting pesticide directly into it or replacing the damaged wood, and eliminating or reducing any source of moisture.

Small Flying Insects

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Drain Flies

Drain flies (also known as "moth flies" or "filter flies") are common nuisance in/around commercial buildings, including sewage treatment plants. Adult flies may become so numerous indoors that they congregate at windows, around light fixtures, and around showers, bathtubs, sinks and floor drains. They can annoy people sitting indoors or outdoors. Since these flies often originate in unsanitary conditions, there is the possibility of disease transmission that can affect human health.



Drain flies breed in polluted, shallow water or highly moist organic solids. You will find the eggs, larvae and pupae in the muck, slime, or gelatinous film often accumulating on the sides of drains and condensate pipes for air conditioners, in the sewage filtration tanks, septic tanks and moist compost. Other breeding sites include dirty garbage containers, rain barrels and tree holes or in low-lying areas adjacent to buildings where storm water collects and algae or mold grows.

Identifying breeding source of the drain fly: The key to solving a drain fly problem is to find and eliminate the source, i.e., find the areas of excess moisture and a buildup of organic debris. In case the re occurring drain fly problems, contact the County IPM Manager for site inspection.

Outdoors: Areas that are likely to be a source of moth fly infestations outdoors include:



- Damaged or faulty septic lines
- Areas where rainwater tends to pool or where air conditioning condensate lines drain, particularly if the area is shaded and algae or mold is growing on the soil or foundation



- Water-soaked lawns, compost piles, discarded carpeting, padded furniture, insulation and clothing may become moldy
- For commercial buildings - check the area (usually a concrete or gravel covered) beneath air condition cooling units on roofs or adjoining a

building.

- If a local source of the flies cannot be found, it is possible that the flies are being carried on wind currents from a nearby sewage treatment plant or another faulty septic system



Indoors: One way to determine if the flies are coming from a particular drain is to cover the drains with glue boards (elevated on cardboard "collars" to keep them from sticking to the floor or drain. There is also a simple method that you can use in smaller facility. Take a translucent container (e.g., a margarine container) and coat the inside with a thin layer of petroleum jelly. Place the container upside down over the drain and leave it in place overnight or for a few days, but check it daily. Emerging flies should be trapped in the petroleum jelly. In commercial buildings, the source of the problem may be more difficult to identify. Pest control companies often use backlight traps indoors to determine areas where the flies are most numerous and then proceed with a thorough inspection of the area. Areas that are likely to be a source of moth fly infestations indoors include:



- Toilets (particularly if they are not used frequently); be sure to check the toilet tank, as well.
- Sink and bathtub/shower drains
- Floor drains in commercial buildings and basements
- Condensate lines for icemakers, refrigerators, air conditioners
- Loose ceramic floor tiles where water may collect

Sanitation: Cleaning & Treatment of Drains/Septic Systems: The most effective method to correct (or to prevent) drain fly problems is to clean toilets, drainpipes and traps to eliminate any gelatinous rotting, organic matter, thereby eliminating the larval food source. Many of the commercially available drain and toilet bowl cleaners can be used for this purpose. Many of these cleaners are biodegradable and pose less of a hazard to the environment. If you have a septic system, read the product labels carefully to make sure that the product is compatible with the system (i.e., will not disrupt the microbial action in the septic tank). Routine cleaning of floor and sink drains is important particularly in commercial establishments.

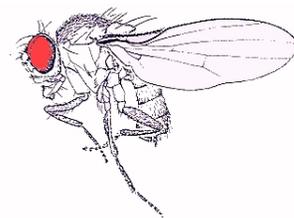
Alternative methods include cleaning pipes and traps with a good, stiff, long-handled brush. It is best to remove the drain trap and use a plumber's "snake" in clogged drains to dislodge the gelatinous material in the drains. If you use mechanical cleaning methods, you should also flush the lines with boiling water and bleach to remove any material left behind. Caustic drain cleaners may also be used, although they are not necessarily as effective as other cleaning methods. **IMPORTANT: NEVER rinse a drain with bleach after using a caustic drain cleaner.** Mixing of these two chemicals in the drain line may produce chlorine gas, which is extremely hazardous to anyone who inhales it.

Chemical Treatment: Space sprays are not recommended for drain fly control since the potential for adverse occupant reaction to the pesticide usually exceeds any short-term benefit. However, in cases where very large numbers of drain flies are severely disrupting operations, Adult flies can easily be killed with pyrethrin based aerosol spray labeled for use against "drain fly" or "flying insects." However, these chemicals are a very short-term and very temporary solution. Unless you can access and clean the source of infestation, once the chemical dissipates, more drain flies are likely to appear. Similarly, treating outdoor areas may produce mixed results particularly if you cannot identify the key areas that are infested with drain flies. Rooms should be unoccupied during the treatment, all electronic equipment should be covered, and the space should be adequately ventilated. Regardless of how "safe" you consider any pesticide or insect control product, always read the label and follow directions and safety precautions.

Fruit flies

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These tiny flies are introduced into buildings many times a day during warm weather, usually as nearly invisible immature (eggs, larvae, pupae) on or in fruit. Since large numbers of these immature can develop into adult flies within several days, and since one female fruit fly can then lay several hundred eggs, infestations build up rapidly when sanitation is not rigorous. Adult flies are easily dispersed throughout a structure by the air handling system and by hitchhiking on trash pickup carts. Although fruit flies are



totally harmless and cannot bite, many people consider them an intolerable nuisance.

Sanitation: Fruit fly breeding sources are often difficult to find but eliminating the breeding sources is essential. Fruit fly larvae (maggots) require moist, fermenting material in which to develop. Typical sites that generate large numbers of flies include trash rooms and trash pickup carts, can and bottle recycling areas, and any space where food is routinely prepared, dispensed, and consumed. However, there may be dozens of smaller, local sources throughout a building that contribute to the problem. These include leaks under refrigerators, dirty mops, clogged drains, or peels and rinds left in trash receptacles.

Trapping: Fruit fly problems can be greatly reduced by the use of traps. There are many different trap designs, but all work by using bait to attract the flies into a container. Two of the most effective baits are ripe banana and vinegar. Some traps lure the flies through a funnel or similar "one-way" opening, while others rely on the collected flies eventually drowning in liquid bait. Homemade traps can be easily fashioned from mason jars fitted with paper funnels, but several inexpensive plastic models are commercially available. Traps are remarkably effective, but problems can arise when either too few are deployed or servicing (removing flies and renewing bait) is too infrequent. An increasing number of pest control contractors are using traps as part of their normal service for fruit fly infestations.

Chemical Treatment: Space sprays are not recommended for fruit fly control since the potential for adverse occupant reaction to the pesticide usually exceeds any short-term benefit. However, in cases where very large numbers of fruit flies are severely disrupting operations, Adult flies can easily be killed with Bioganic Flying insect killer (Clove Oil) spray or aerosols labeled for use against "fruit fly" or "flying insects." However, these chemicals are a very short-term and very temporary solution. Unless you can access and clean the source of infestation, once the chemical dissipates, more fruit flies are likely to appear. Similarly, treating outdoor areas may produce mixed results particularly if you cannot identify the key areas that are infested with fruit flies. Rooms should be unoccupied during the treatment, all electronic equipment should be covered, and the space should be adequately ventilated. Regardless of how "safe" you consider any pesticide or insect control product, always read the label and follow directions and safety precautions.

Fungus Gnats

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Fungus gnats can be a serious a nuisance indoors in commercial buildings when adults emerge in large numbers from potted plants, flower vases or some other chronic source of moisture (and subsequent mold growth). They also feed on fungi and decaying plant material.



Adults are attracted to lights and are often first noticed at windows or light fixtures. The key to solving indoor fungus gnat problems is to find and eliminate the source, i.e., find the area(s) of excess moisture.

Outdoors: If the problem is seasonal, i.e., it declines or totally disappears in the fall/winter then, it is quite likely (but not always) the case that the source is outdoors. The most likely problem spots are landscaped and/or heavily mulched areas or low-lying areas in the yard that remain extremely damp.



Indoors: If the problem is relatively constant regardless of the time of year, then the source is more likely to be originating indoors or at least it is associated directly with the structure rather than an outside (landscaped) source.

- Potted plants and other types of interior-scape are often the culprits. Check plants to see if the soil is excessively wet. Drain any excess water from the dish below the pot. If the weather permits, move the plants outdoors or allow the soil to dry down (not to the point where plants wilt). You can also drench the soil as mentioned previously. Then, increase the interval between regular watering and the problem should abate.
- Check areas where moisture is commonly found: kitchens, bathrooms, utility rooms (e.g., a leak in the waterline to a clothes washer), as well as crawlspaces (more common in residential buildings).
- Check other areas where leaks may occur as a result of storm damage or poor maintenance, e.g., roofs and crawlspaces. This is particularly important on commercial buildings with **flat membrane-covered** (e.g., EPDM) roofs. A leak through a break in the membrane material can cause the underlying insulation to become wet and subsequently moldy - an ideal habitat for fungus gnats. Inspect the roof and ceiling below for signs of leaks.
- Try to determine what areas of the building have the highest numbers of gnats. Check window ledges, light fixtures, etc. Fungus gnats are mobile and are more likely to move towards a nearby source of light. Pest control companies use backlight traps (such as the one shown here) try to determine which areas are most heavily infested.
- Correcting a moisture problem and cleaning the area should eliminate the fungus gnats fairly quickly.



Chemical Treatment: Space sprays are not recommended for fungus gnat control since the potential for adverse occupant reaction to the pesticide usually exceeds any short-term benefit. However, in cases where very large numbers of fungus gnats are severely disrupting operations, Adult fungus gnats can easily be killed with Bioganic Flying insect killer (Clove Oil) spray or pyrethrins spray or aerosols labeled for use against "gnats" or "flying insects." However, these chemicals are

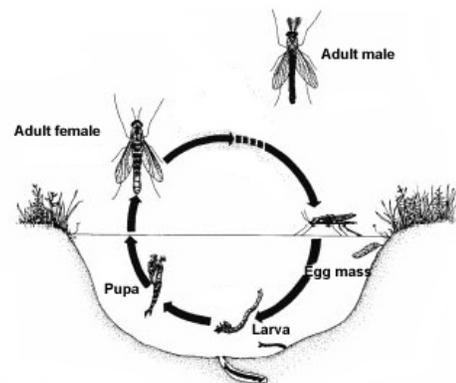
a very short-term and very temporary solution. Unless you can access and treat the source then, once the chemical dissipates, more gnats are likely to appear. Similarly, treating outdoor areas may produce mixed results particularly if you cannot identify the key areas that are infested with fungus gnats. Indoor plants or interiorscaping that is difficult to remove can be treated with a number of pesticides. Rooms should be unoccupied during the treatment, all electronic equipment should be covered, and the space should be adequately ventilated. Regardless of how "safe" you consider any pesticide or insect control product, always read the label and follow directions and safety precautions.

Non-Biting Aquatic Midges

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Non biting midges (Chironomids) are found in swift moving streams, deep and or slow moving flood drain, stagnant ditches, and in lakes and ponds that are rich in decomposing organic matter. They are often mistaken for mosquitoes. Many species look like mosquitoes and may form annoying swarms or clouds in the air but they do not bite. The difference is that female mosquitoes do bite; female midges do not.

The immature stages also develop in water in pools, containers, ponds, and clogged rain gutters, or in some cases, wet soil or seepage areas. Most feed on living or decaying plant matter and are an important part of aquatic food chains. Many species can survive in very stagnant or polluted water. The life cycle usually takes about 4 to 5 weeks. There may be several generations during the summer but these insects usually disappear with the onset of dry weather. Fortunately, problems are usually temporary and intermittent.



Most species of Chironomids midges are highly desirable organisms in aquatic habitats. Midges are an important food source for fish and predatory aquatic insects. Larvae "clean" the aquatic environment by consuming and recycling organic debris.

However, in urban environments where buildings are constructed adjacent to flood channels, creeks, lakes and ponds, adult midges often emerge in extremely large numbers, causing a variety of nuisance and other problems for people who reside within the flight range of these insects. Adults are weak flyers and may fly or are blown ashore where they congregate on vegetation, under porch alcoves and on walls of buildings. Swarms of adults may be so dense that they interfere with outdoor activities and stain walls, cars and other surfaces upon which they rest. Adults are attracted to lights and may accumulate in large numbers on window screens and around porch and streetlights and sometimes sucked

directly into the Air conditioning ducts, inside buildings with negative air pressure. The occurrence of midges promotes the growth of spiders whose unsightly webs may have to be removed frequently.

Long-term control requires trying to eliminate breeding sites, wet areas or standing water. Often, however, this is not practical. Water should not be treated with any insecticide in an attempt to control midges. The potential harm to the environment and wildlife is too great to justify an application for a temporary nuisance.

Control of Adult Midges: There are no good alternatives for control of the adults, other than some pressurized aerosol sprays containing pyrethrins. These are impractical for treating anything other than small areas. These products only kill insects that are directly hit by spray particles; there is no lasting or residual effect. More Midges will quickly enter the area after the spray has settled.

Human Health Concerns: Midges have not been implicated in the transmission of disease; however, due to their large numbers, they become nuisance. However, the presence of their dead bodies (insect particles) in the air conditioning ducts or over drop ceilings in office environments as noted in this case is cause of concern, since Chironomids contains potent inhalant allergens It should be considered when dealing with human respiratory allergy caused by arthropods.

Possible Solutions: Please note that some of the suggested solutions are beyond the scope of building/facility management expertise. For example: Nutrient reduction, Draw down of creek, and chemical & biological control in the creek. These are discussed in the overall framework of pest management strategies, so that all concerned groups understand their responsibilities and can work together to provide long-term solution to combat this challenge.

Recommendations to the Facility Management:

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- Consider alteration in the exterior lighting system away from wall, flooding the building from a distance. Consider replacing mercury vapor lamps on or near the building with high-pressure sodium vapor lamps to reduce night flying insects (midges, crickets etc.) attracted to the area.
- Trim the vegetation and consider altering the landscape in the affected areas by selecting less dense vegetation (drought tolerant, that requires less frequent watering). This will help to prevent attracting midges taking shelter during the daytime and later in the evening gaining entrance inside the building through fine cracks & crevices as well as through doors as and when opened.
- Check for condensate leak from the Air Conditioners and ensure that it is connected to a closed drainage system (not roof storm drains) to minimize puddle of water on the paved surfaces.

- Check and fix the gaps between the air intake duct/vent filters in the air conditioning units.
- Check to ensure that all Skylights (on roof) are airtight.
- Check and install air filters on the return air duct/vents. There is likelihood that midges may get sucked inside through these holes.
- Check and ensure to seal the gaps between the entrance doors.
- If building already has dead midges inside the HVAC then arrange for a deep cleaning/disinfecting air-conditioning ducts/vents. This is the most common problem as dead insects/and fragments blows through the HVAC vents into the staff offices and there is a considerable health impact from the allergens. If needed, relocate affected staff to other office areas, until problem is resolved.
- Check for air pressure (positive or negative) in the building. If negative then ensure to create positive air pressure through increased flow of air pumped into the structure.
- Installing air curtains on the key doors (frequently opened doors) will also help to minimize the insects gaining entrance inwards.
- Arrange with exterminator for indoor vacuuming and cleaning of dead or live crickets and exterior perimeter treatment (baiting only, no residual insecticide application).
- Arrange the schedule and communicate with the building occupants so that they are aware of the action plan and expected timeline to resolve such pest problem.
- Discuss the subject with authority responsible for water body maintenance and ask them to investigate the possibility of Biological control treatment of the water and surrounding vegetation.



Physical and Cultural:

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- Nutrient reduction: Reduction of aquatic midge populations can often be accomplished if the physical and chemical environmental factors that is responsible for development of nuisance populations are altered. Since dense larval populations usually occur in nutrient rich habitats, manipulating the nutrients that are introduced into aquatic systems by reducing run off from agricultural operations and urban environments may help to discourage the proliferation midges.
- Draw down of creek: Exposure of bottom mud by draining lakes and reservoir during winter months will kill over wintering midge larvae, reducing the size of the adult population emerging in spring. Understandably, this method may not be practical for all bodies of water.

- Diversion of adults: Many lakes and reservoirs that produce nuisance populations of midges have homes and businesses constructed along the shorelines. After emergence, midge adults are attracted to shoreline lights. High intensity white light has been found to be highly attractive to adults. Keep window blinds closed and porch light off during heavy emergence periods to help reduce the number of adults attracted to residences. Strategically placed high intensity white lights may divert midges away from populated areas.
- Electrocuting traps: Electrocuting traps will attract and kill large numbers of midge adults. It is doubtful that a single electrocuting trap could kill a sufficient number of midge adults to appreciably reduce nuisance populations. In addition, during heavy adult activity, the trap may malfunction as a result of becoming clogged with midge body fragments.

Biological:

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Midges are fed upon by a large variety of aquatic organisms, such as dragon fly nymphs, predaceous diving beetles and a variety of fish species. Where the diversity of predaceous animals is high, the density of midge larvae is usually held below nuisance population levels. Shallow, organically rich lakes, flood drainage and heavily polluted habitats such as sewage waste lagoons are inhabited by few predaceous species compared to bodies of water that receive less nutrient-rich input.

Predatory fish: Chironomids midges are a major component of the diet of many fish species. In particular, bottom-feeding fishes, such as catfish and carp, consume large numbers of midge larvae. However, the feeding of these fishes has, generally, not been shown to reduce adult midge populations below nuisance levels adjacent to habitats where there were large larval populations.

Biological larvicide: *Bacillus thuringiensis* var. *israelensis* (Bti), is registered for use against Chironomids midge larvae. Bti is toxic after being consumed by the larvae. Consequently, in waters of high organic content (which present a competing food source for the midges), Bti is only effective at high rates of application (at least 10 times the rates needed for mosquitoes), which limits the economic use of Bti to small habitats. To maximize the effectiveness of larvicide, applications should be properly timed. Accordingly, dredge samples of bottom mud should be collected, sieved, and the Chironomids larvae recovered and counted. Chemical treatments should be made when the number of larvae found equals or exceeds 200 per 6-inch square bottom sample. This treatment threshold is completely arbitrary. It is based on insecticide treatments made for the control of midge larvae in Florida and California. Without monitoring a midge population for one season, the relationship between numbers of immature midges in the bottom mud and consequent numbers of nuisance adults cannot be established.

Insect Growth Regulator: The insect growth regulator methoprene is also registered for use to control midges.

Stinging Arthropods: Yellow Jackets, Wasps, Hornets and Honey Bees

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Stinging pests (yellow jackets, hornets, wasps, and bees) are most active during the summer and early fall when nest populations can exceed 60,000 insects. These insects are most dangerous in the vicinity of their nests. A passer-by is viewed as a threat to the safety of their home and is often chased out of the area by a sting(s). Pest control programs for these pests are based on the unique encounters, situations and surrounding where as wide scale, pre-emptive pesticide applications on routine basis are neither available nor practical to mitigate these arthropods.

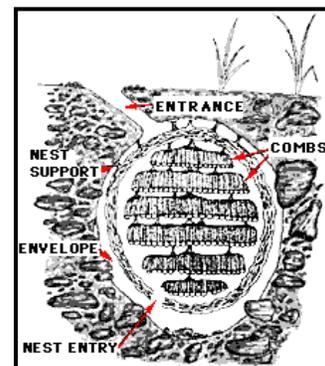


Misconception#1: Yellowjackets are making nests under the eaves on my house. Most of those insects are not Yellowjackets. Those are paper wasps. Paper wasps make a nest consisting of a single comb, typically under the eave of a house or in a protected cavity like a pot or other container. With paper wasps, you can always see the comb where the young are being raised, and the wasps tending to them. Yellowjackets typically make their nests underground or in cavities, there are many levels of comb and the nest is always covered with a paper envelope. There are one or two species in the local southern California mountains that do make aerial nests that can be under the eave of a house but again, it will be covered with a paper envelope and will be much larger than a paper wasp nest. Also, paper wasps have elongate bodies with a thin, wasp-like waist. Yellowjackets are stockier and the waist is not apparent.



Misconception#2: Those aren't wasps. Those are bees. Many people think Yellowjackets are not wasps because they do not have long thin bodies. Instead they think Yellowjackets are bees because of the similarity of the body form. Some people even refer to Yellowjackets as "meat bees" because of the similarity, which doesn't help sort out the confusion. Yellowjackets are indeed wasps. They seek out protein in the form of flesh like insects, carrion and unfortunately, our food.

Underground Yellowjacket Nests: Ground nesting German Yellowjackets will usually build underground nests, although some species will build their nests in hollow logs, trees, attics, between walls, or under eaves of structure. An underground yellowjacket nest is difficult to locate because the entrance is about the size of a nickel. It is important to note that a nest need not be on your property to cause a yellowjacket problem, since Yellowjackets can travel up to 1,000 feet (a distance of 3 football fields) from the nest to forage for food.



From August through October, when Yellowjackets have built up large populations, they seek food such as carbonated beverages, cider, juices, ripe fruits and vegetables, candy, ice cream, fish, ham, hamburgers, hot dogs at picnics and other outdoor events. Many are attracted in large numbers to garbage cans. Others fly in and out of nests built around buildings and areas where people live, work and play, causing fear and alarm.

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Santa Clara County's approach to Yellow jacket & Feral Honeybee control

Yellowjackets have been a pain for decades. Control methods used against Yellowjackets work with varying degrees of success, however, some insecticides have been removed from sale because of high mammalian toxicity, environmental concerns and other regulatory issues. There is no silver bullet that can rid your area of Yellowjackets.

Emergency situations for these insects can be checked through "Search & Destroy" action such as followed by fire departments and other emergency response groups. To respond in such emergency situations, four (4) reduced risk pesticides are in use at the Santa Clara County as follows:

- Victor Poison Free (Mint Oil, Sodium Lauryl Sulfate)
- Eco Exempt IC (Rosemary Oil)
- Eco PCO Jet (Eugonol Oil, Phenothyl Propionate)
- Eco Exempt D (Clove Oil, Phenothyl Propionate)

Many studies have been conducted to attract and control yellow jackets over relatively wide areas using insecticide baits. To date, baits have yielded limited success because yellow jackets are very selective in their food preferences, rejecting most prepared baits. At present control of yellow jacket in Santa Clara County Regional Parks is only limited to seasonal trapping using food & pheromone lures. Trapping using food & pheromone lures may help to control foraging yellow jackets at outside events (such as in



County Regional parks), if the traps are spaced correctly and sufficiently in advance of the event to allow wasps to establish foraging patterns at the lure/bait site. Santa Clara County Department of Parks is currently working on Yellowjacket abatement & intensive trapping project in collaboration with scientists from University of California, Riverside to find a solution (attractant bait) to this vexing problem.



Can we get rid of Yellowjackets by using the traps: Probably not! There will always be more Yellowjackets being produced in the nest to replace them as you kill off the foragers. The true method of control would be to eliminate the nest.

Couldn't we get rid of the Yellowjackets by finding the nest and killing it: In theory this is the best strategy. However, Yellowjackets forage for about 1 mile from their nest and therefore, if you wanted to get rid of all the Yellowjackets flying around your property, you would have to locate every nest within a 1 mile radius and eliminate it. In urban areas, this would mean searching around all your neighbor's homes. In natural areas, this would mean searching every tree trunk, rodent burrow, stream bank, pile of rocks and trash heap to see if there were Yellowjackets in there. This would be basically impossible.

Honeybees are beneficial insects, henceforth; no chemical is registered for its abatement. Beekeepers are often called to remove the feral honeybee colonies. Bees can be destroyed through [“Search & Destroy”](#) protocol as mentioned above, If a beekeeper cannot be located or if the swarm is in the high traffic area or any other emergency situation.

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Suggestions to those who work and recreate outdoors: The following information describes those harmful arthropods that are encountered during everyday activities. Information about their habits has been provided and should be helpful to people who work and recreate outdoors.

Outdoor Events: The most effective measures for keeping yellow jackets intrusion to minimum are:

- ☑ Stay away from areas where insects congregate, including gardens and hedges, around fruit trees, and near garbage cans, picnic grounds and other areas that attract insects.
- ☑ Bees, hornets and other flying insects are attracted to bright colors and floral patterns. So during picnic season, dress in white, khaki and other light solids, covering as much of your body as possible during late summer and early fall when insects are at their peak. And avoid loose-fitting clothing. Insects can become trapped in filmy garments.
- ☑ Insects are attracted to smells, so avoid wearing perfume, colognes or other fragrances, including suntan lotion, cosmetics, hair spray and even deodorant, when around these bugs. And wear shoes rather than sandals outdoors to avoid contact with fire ants or low-flying bees, hornets or yellow jackets.
- ☑ If you leave your car's windows open, check before getting in to make sure there are no flying insects inside. Running the air conditioner with the windows closed while driving can help prevent on-the-road stings.
- ☑ Keep all food and beverage in covered containers. When dining outdoors, keep food covered until you're ready to eat, and clean up afterward.
- ☑ Frequently clean the outside surfaces of beverage and food service equipment.
- ☑ Clean up spills as they occur, whenever possible.



☑ Use covered waste containers; thoroughly wash waste containers daily; replace plastic liner bags at least daily or as they become full.

☑ Treat inside surfaces of trash containers with an effective yellow jacket repellent, where permissible.

☑ Keep trash containers away from serving and eating areas.

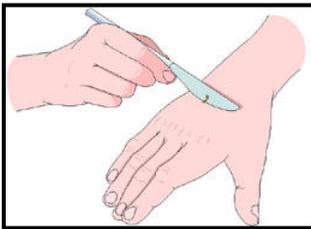
☑ Avoid wearing fragrant personal grooming products to outdoor events if they have caused bad experience in the past. Insect repellents work well for biting, non-venomous insects, but not against angry stinging insects.

☑ If you encounter the insects, slowly back away. Don't swat at them, flail your arms or make sudden movements that could trigger an attack.

☑ Install strong fans (if permissible), to blow across areas to keep yellow jackets away.

☑ If you know you are allergic to insect venom, wear a Medic-Alert or other type of medical identification.

☑ **Scrape out the stinger** If a honeybee stings you, the best way to avoid additional pain is to scrape out the stinger with a credit card or a long fingernail or a dull table knife. If you try to pull it out, you'll squeeze the venom sac and accidentally release more venom. But scraping it out leaves the venom sac undisturbed. Place the edge of a dull table knife firmly against your skin next to the embedded stinger. Applying constant firm pressure, scrape the knife across your skin surface and the stinger.



This removes the stinger without injecting more venom, which is what happens when you remove the stinger with tweezers or your fingers.

☑ To ease the pain of a sting, take a pain reliever such as acetaminophen, ibuprofen or aspirin. However, children never should be given aspirin because of the risk of Reye's syndrome, a rare, but life-threatening illness. You also could make a paste by mixing water and meat tenderizer and applying it directly to the bite. Insect venom is protein-based, so meat tenderizer breaks down the protein and stops the pain. However, you must use a brand that contains papain, the active venom-busting ingredient.

☑ In case of emergency call your local poison control center at Santa Clara Valley Medical Center Regional Poison Center 750 South Bascom Ave, Suite 310 San Jose, CA 95128; (408) 299-5112; (800) 662-9886



Miscellaneous Crawling Arthropod Pests

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Sealing entry points and vacuuming are the best way to control crawling arthropods. Tight seals around windows, doors, utility access holes, and weather-stripping will usually reduce crawling insects. Residual insecticides sprayed on surfaces near potential entry points may be effective; microencapsulated formulations should be considered.

Spiders

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Spiders have a well-established but largely undeserved reputation as being dangerous to the health of people and their pets. In truth, spiders are extremely beneficial because they prey on many insects that we consider being true pests in our homes and gardens. Not all spiders build webs to snare their prey.

How dangerous are spiders? Encounters between people and spiders are

usually accidental and bites are a response by the spider when its web or nest is disturbed. Most spiders produce venom therefore, they could be considered "poisonous". For the most part, spider bites are insignificant. However, just as bee and wasp stings



Brown Recluse Bite

may trigger allergic reactions in some people,

the same can be true for spider bites. Young children, the elderly and hypersensitive individuals are more likely to react more strongly to a spider bite. The two best-known poisonous spiders found here are the black widow spider and the brown recluse.



Black Widow



Brown Recluse

Tips on Avoiding Spider Bites: Follow these suggestions to reduce the chances of being bitten:

- Always check for spiders before sticking your bare hand(s) into dark corners or areas.
- Always wear work gloves when handling boxes, firewood, lumber and other items that have been stored/stacked undisturbed for some time.
- Vigorously shake clothing and shoes that have been left undisturbed for some time to dislodge any spiders and inspected before wearing.

If you think either a black widow spider or brown recluse has bitten you, carefully apply ice or a cold pack to the bite and seek medical assistance. If you can catch the culprit spider, bring it along for positive identification.

Control of Spiders Outdoors: Spiders are beneficial and control many insects that feed on the flowers, shrubs and other plants in our gardens and natural areas. Spraying for spiders in these areas



may actually increase the number of pests by killing off other natural enemies as well. Web-building spiders are most likely to show up in areas where insects are abundant, e.g., wood piles, around porch lights, windows or water sources (such as water spigots). Knocking down these webs with a broom or burst of water from a garden hose is adequate for "control". Outdoor pesticide applications for spiders are largely unnecessary and should be avoided. On occasion, you will find spiders on objects or in areas that have been left undisturbed; this can include sandboxes or even children's toys. Check these items periodically for signs of spiders.

Control of Spiders Indoors: Finding spiders indoors usually means that there is an ample supply of insects and other "spider food" in the area. Any real attempts to get rid of spiders should focus on eliminating these insects. The long-term solution includes non-chemical measures:

- Sanitation - reducing or eliminating conditions that attract insects, e.g., high moisture and ready access to food of some sort.
- Exclusion -find the entry points used by both insects and spiders and seal or close these areas.

There are a number of short-term solutions to spider infestations, as well. Knocking down and removing webbing, or mechanically removing/killing the spiders should be sufficient. Vacuum the areas along baseboards, in corners and under furniture. Clean bookshelves periodically.

Crickets

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Field Crickets & Ground Crickets over winter as eggs or nymphs in moist, firm soil. Field crickets usually invade buildings late in the summer when fresh vegetation becomes scarce. They become structural pests in late summer and early fall when they move out of fields and into buildings. They are largely active at night and readily attracted to lights, can fly and are often found around dumpsters. They occur in lawns, underneath shrubbery and wooded areas. Large swarms may invade well-lighted areas covering streets and the sides of buildings black with crickets. Outbreaks occur when rainfall follows a period of drought or area surrounding the structures is irrigated. These insects commonly invade basements and crawl spaces, seeking dark, cool, moist areas. They are harmless to humans but may be annoying, particularly at night. They feed on organic matter and sometimes damage woolen, silk and cotton clothing and other fabrics.



Sanitation: Sanitation is the most important means of eliminating nuisance crickets. Keep all areas in and around buildings free of moisture, dense vegetation and weeds (1 foot band next to foundation). Mow lawns, cut weeds,

and clean up garbage collection areas. Remove harborage sites such as piles of bricks, stones, rotting wood or mulch and other debris. Avoid any kind of on ground storage around/near by the structure. Raise garbage cans off the ground if practical. Trash and dumpsters should be placed as far from the building as possible. Crickets are attracted to food in these areas. Crickets may be troublesome at trash dumps, grassy roadsides, pasture fields and wooded areas (breeding sites) before entering structures. Crickets can be killed with a fly swatter, collected by vacuum cleaner or broom and dustpan and discarded, if a few are present.

Exclusion & Physical Alterations: Exclusion is an important factor as well as light discipline. Make sure that all windows and doors are tight fitting with proper screening in place. Caulk and seal all cracks and crevices, especially near the ground level at windows and doorways. Avoid bright mercury vapor lights in entryways and along structure perimeters since crickets will be attracted from far distances. Convert to sodium vapor yellow lights (less attractive to insects) instead of white, neon or mercury vapor lights.

Centipedes & Millipedes: Most species of centipedes are harmless. To avoid contact with centipedes, two physical control methods are recommended: general cleanup of debris to eliminate their hiding places, and maintenance of close-fitting doors and screening.

Termites

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Termites damage wooden structures and incidental wood in steel and concrete buildings, such as trim or molding, paneling, furring strips, or door and window frames. Files, stacked books, or any other cellulose material, such as fiberboard sheathing or insulation panels, may also be attacked. Most termite problems in large office buildings involve subterranean colonies that persist for years on buried scrap wood and constantly explore upwards for new sources of food. These colonies are often a nuisance because of the periodic emergence of large numbers of winged "swarmers" that find their way into occupied space. Swarming termites should be controlled with a vacuum cleaner. A space spray may be unavoidable in rare circumstances. All comments describing ant swarming apply to swarming termites as well.

Baiting for Termites: Discussion items for this topic should include: Termite Species, Bait products, on going monitoring

Spot Injection and Sealing: In masonry buildings with minor termite damage or localized swarming, satisfactory control can often be accomplished with pressurized injection of insecticide directly into the wood, or into the crevices from which the swarmers are emerging. If possible, the crevices should then be caulked or otherwise sealed.

Drilling, Trenching and Fumigation: Subterranean termite problems that cannot be solved with spot injection and sealing must be treated with far more extensive insecticide application. Standard techniques involve pumping the chemical into holes drilled through the building's slab and/or into the soil around the building's foundation. In warm climates, severe infestations of certain types of termites that live in dry wood above ground (including furniture) may have to be controlled with fumigation. These types of termite treatment require specialized contractor expertise and are beyond the scope of this chapter. Consult the County IPM Manager for additional information.

Moisture Control: Discussion items for this topic should include: primary sources of structural moisture, soil contact, roof leaks, water flow off roof, wood seepage, prevailing rain, poor grade, plumbing leaks, condensation.

Electro-Gun: Discussion items for this topic should include: primarily for localized infestations of drywood termites and other wood-destroying pests.

Cold Treatments: Discussion items for this topic should include: various liquid nitrogen systems, again primarily for localized infestations.

Heat Treatments: Based upon the principle that insects in any stage cannot survive if the temperature is raised to 155 degrees Fahrenheit. Possibly more appropriate as a separate section, since heat treatment may have broad application.

Sand Barriers: Basaltic sand particles that are carefully screened so that the particles are too large for termites to remove and too small for them to get between are an effective barrier to termites. These barriers should be at least four inches thick and treated with a long-lasting herbicide to prevent root penetration. Additionally, buildings protected by this method must be inspected periodically to ensure that termites have not "tubed" over the top of the barrier. The technique and the aggregate material are currently available in Hawaii.

Stainless Steel Screening: Stainless steel screening buried in the soil effectively prevents termite movement. It is a relatively expensive control but has the distinction of not introducing toxic materials into the soil.

Nematodes: Not recommended for protection against termites.

Protecting Wood: Wood decomposes as the result of decay fungi feeding on it and is subject to damage from termites and other insects feeding on or burrowing through it. Simply preventing decay helps prevent insect damage because most insects are attracted to wood that has been softened by decay. Treating wood with preservatives prevents these problems from occurring in wood structures and buildings and is a subject most commonly addressed in the design process. Good design and construction practices for wood protection include:

- Protecting wood from absorbing moisture from the soil
- Protecting joints and end grains from water entry
- Promoting rapid run-off of rainwater with roof overhangs and drip edges
- Supplying adequate ventilation for crawl spaces, attics and other places where water condenses on wood surfaces and
- Protecting finishes on all exposed wood

The Wood Protection Council of the National Institute of Building Sciences (NIBS) has developed an extensive document on wood protection - Guidelines for Protecting Wood from Decay and Termites. For more information, contact Wood Protection Council, National Institute of Building Sciences, 1201 L Street NW, Washington, DC 20055; (202) 289-7800. Detailed information on various aspects of wood protection is also available from a number of trade associations and government agencies:

- American Plywood Association, P.O. Box 11700, Tacoma, WA 98411; (206) 565-6600.
- American Wood-Preservers' Association, P.O. Box 286, Woodstock, MD 21163-0286; (410) 465-3169.
- California Redwood Association, 405 Enfrente Drive, Suite 200, Novato, CA 94949; (415) 382-0662.
- Cedar Shake and Shingle Bureau, 515 116th Avenue NE, Suite 275, Bellevue, WA 98004; (206) 455-1323.
- National Forest Products Association, 1250 Connecticut Avenue NW, Washington, DC 20036; (202) 463-2700.
- National Wood Window and Door Association, 1400 East Touhy Avenue, #G-54, Des Plaines, IL 60018; (708) 299-5200.
- Southern Forest Products Association, Box 52468, New Orleans, LA 70152; (504) 443-4464.
- Western Wood Products Association, 522 SW 5th Avenue, Yeon Bldg., Portland, OR 97204-2122; (503) 224-3930.

"Paper Mites" and "Cable Mites"

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Complaints about bites and rashes for which a cause cannot be found are often attributed to these fictitious pests. Pin prick-like biting sensations, usually on exposed skin and often producing inflammations that resemble insect bites, can be a persistent problem in some offices. Occupants tend to blame these "bites" on some sort of pest infestation, typically fleas (which are extremely rare in office buildings) or "paper mites" (which do not exist). Although mites are extremely small, they are usually detectable with the unaided eye or samples can be collected and checked by a physician. In the case of scabies and straw itch mites, the rash or bites that these mites leave allows them to be readily identified as the cause of the problem. Cable and paper mites are often used as reasons to justify pesticide treatments in buildings. Pesticide applications made without first identifying a target pest (and target application site) are usually ineffective. More importantly, repeated and widespread pesticide applications are potentially hazardous to the building occupants.

"Paper mites" are generally a cleaning or indoor air pollution problem rather than a pest problem. Only rarely are the specific culprits in "paper mite" cases positively determined, although there are often strong suspects. Shards of fiber glass insulation (such as from batting above drop ceilings), particles from both newly installed as well as worn carpet and carpet pads, and paper dust from separating forms and computer printouts along tear-lines are some of the most common proven causes of pin prick-like irritations. The dry air of many workplaces not only makes skin more sensitive to these tiny splinters, it increases the static electricity that is responsible for the particles "jumping" onto exposed skin (sometimes the static-charged bits are mistaken for living bugs). Any activity that stirs up accumulated dust, such as office renovation or the purging of old files, often leads to a "paper mite" outbreak. In cases where there is no obvious explanation, or multiple factors are suspected, an industrial hygienist may be called in to investigate.

The Role of Facility Management: The most common mistake of management in "paper mite" situations is to automatically request a pesticide treatment and thereby become liable in the event occupants experience adverse reactions to the chemical. The cause of a problem should be identified before resorting to pesticide sprays.

The second most common mistake is for supervisors to dismiss the complaints of biting as total fabrications. Although there are cases where people imagine they are being attacked by unseen parasites, most bite-like sensations in offices involve a genuine source of skin irritation. The circumstances can be further complicated, since health care professionals unfamiliar with the "paper mite syndrome" frequently misdiagnose the resulting welts as insect bites. Others

may believe that microscopic dust mites are involved. These are real organisms but cause respiratory distress rather than bites. Finally, it is normal for the coworkers of a person complaining about "paper mites" to develop a heightened sensitivity to their own skin irritations, often simply through the power of suggestion. Management must treat all concerned with sympathy and respect, but emphasize that pesticide treatment cannot be undertaken without positive confirmation that a pest problem exists. If no insects or mites can be found, consider other possible causes as explained above such as allergies or sensitivities to chemicals or dusts, or changes in your indoor environment (e.g., changes in humidity).

Inspection: An inspection of the affected area should be carried out by a pest control professional who understands that pests may not be involved. Usually when real parasites are present, they are abundant and readily seen. The most common types in office buildings are mites coming from bird nests or from concealed infestations of rodents. Occasionally fleas living on guard or Seeing Eye dogs will bite people who work in the vicinity. If a thorough investigation fails to produce any specimens, a non-pest cause is probably responsible. Nevertheless, it is standard procedure to monitor the area with sticky traps. In addition, occupants should be instructed to capture anything they suspect is biting them on a piece of clear adhesive tape. The County IPM Manager will assist in identifying such samples submitted. Even a single parasite specimen is justification for pesticide treatment. However, the captured items are typically bits of debris or tiny, harmless insects that are commonly present in buildings.

Inspection for Airborne Particles: When it is reasonably certain that there are no biting insects in the affected space, the pest control program is no longer involved.

Remedial Action: It is not unusual for a pesticide application to bring temporary relief to occupants with a "paper mite" problem. Part of the relief may be psychological, though sprays do settle irritating particles and decrease static electricity. Although it is unethical and sometimes illegal for pesticides to be used in this fashion, the same results can be obtained by legitimate means. A program of frequent damp cleaning, including carpet washing with water only, is often an effective short-term response while efforts are made to identify and eliminate the source of the irritation. Cleaning by vacuuming rather than wiping is not recommended; unless the vacuum is equipped with a HEPA filter, more dust may become airborne. Use of humidifiers or air purifiers can be of tremendous benefit if the affected space is not too extensive. It may be worthwhile for some employees to seek the advice of a dermatologist or other medical specialist, since techniques such as the use of moisturizers and the avoidance of harsh soaps are frequently prescribed to minimize irritation problems.

WEED MANAGEMENT

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ECOLOGICAL LANDSCAPING, PLANT HEALTH CARE AND HEALTHY LAWN CARE

The transition from chemical to organic landscaping requires a willingness to learn about and accept the gradual processes of nature. In many cases, the overuse and misuse of chemicals has resulted in unhealthy, highly pest-susceptible lawns & Landscapes. If this is the case, it may take some time to break the cycle of chemical dependency and establish a healthy and resilient system. Patience and ecological awareness are essential.

The Facility Management should promote and encourage the lawn and landscape professional to be open to an organic approach creating ecologically sustainable urban landscapes. Fundamental changes in strategic landscape planning and budgeting are necessary to move into this direction.

[Ecological Landscaping](#)

Ecological landscaping involves preserving native vegetation, landscaping with new native plants, shrubs, and trees, and, if desired, adding non-invasive ornamentals that complement and do not out-compete the native vegetation. By achieving a harmonious mix of practical and user-friendly plantings, you will have an attractive, low maintenance yard that restores, protects, and enhances the surrounding environment by blending seamlessly and naturally with it. Plants and animals will thrive in the neighborhood and act in harmony with surrounding natural lands. To achieve that, means our landscape service providers will require to carefully selecting the plants to suit our particular microclimate as well as the overall zone. You will achieve a thriving and self-sustainable landscape. To understand more about environment friendly landscape management visit the website: [Natural Lawn & Garden Care](#), by City of Seattle Public Works.

[Benefits of Ecological landscaping...](#)

- Helps to conserve water
- Provides habitat for birds and other animals
- Increases porous surfaces for rainwater infiltration
- Creates functional and attractive landscapes
- Requires little or no chemicals (pesticides, synthetic pesticides), fewer fossil fuels and less energy for maintenance
- Helps to improve human and environmental health

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Landscape Designs

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The following document is adopted from IPM Access website, a not for profit IPM Practitioner Association. For more information on the subject follow the attached web-link – [IPM Access](#)

A. The Design / Maintenance Interface

The design of a landscape has a direct influence on the type and intensity of work that is required for its proper maintenance. Unfortunately, maintenance of the landscape is often assumed or overlooked during the planning and design phase of a project and therefore little consideration is given to ensuring the landscape can be maintained using cost-effective and environmentally sound maintenance practices.

A lack of maintenance considerations in the design of a landscape commonly results in a site that is more maintenance intensive (i.e., costly) than necessary and/or appropriate for its purpose, and one that requires the routine use of practices that are undesirable (e.g., extensive pesticide use, intensive pruning of plants that grow too large for the spaces they occupy).

When applying integrated pest management (IPM) to a landscape that has not been designed with its maintenance requirements in mind, it is frequently necessary to implement site modifications to reduce or eliminate costly and undesirable maintenance practices. The nature, extent, and expense of such modifications depend on the initial design of the landscape. Although the costs of site modifications are recoverable through the long-term maintenance savings they provide, they do add to the front-end expense of implementing IPM.

Costly and undesirable maintenance practices and the need for site modifications can be minimized or avoided by including maintenance considerations and the use of IPM throughout the planning and design phase of a landscape development project. On such sites the cost of implementing IPM is reduced. Thoughtful landscape design also enhances the quality of a site by freeing maintenance resources for application to high priority work that is often deferred.

The term “design/maintenance interface” refers to the relationship between the design of a landscape and its maintenance requirements. The extent and quality of this relationship and the benefits it produces are determined by the degree to which maintenance considerations (including the application of IPM) are included in the planting and design stage of a landscape project.

B. Key Considerations for Low Maintenance, IPM-based Landscape Designs

It is essential that designers have a thorough understanding of situations and designs that cause maintenance problems, and those that make a landscape easier to maintain. Important considerations for designing a low-maintenance, minimum pesticide use landscape include: proper plant selection and planting design; adequate treatment of the interface between different elements of the design (e. g., where shrub beds, buildings, trees, etc., meet turf); use of geo-

textiles for weed control, surface stabilization, and material separation; configuration and placement of features; specification and detailing of materials and features; and good construction practices.

In most cases, designing for low-maintenance and utilization of IPM is quite straight forward, the same principles generally apply from site to site, and their application will not significantly increase the design and construction expenses of a project (particularly when life-cycle costs and benefits are considered). In a general sense, it is important that the designer think not only about good aesthetic design and proper construction, but also in terms of maintaining the final product with cost-effective and environmentally sound practices.

An understanding of these design considerations, presented in the following discussions, will provide a basic framework for planning landscapes that are both attractive and easy to maintain with minimal use of pesticides. For the most part, these design concepts offer general ways of avoiding problems that commonly arise in maintaining urban landscapes. Many of the details of these principles (e.g., use of materials, configuration) can be executed in a wide variety of ways. For example, mowing strips might be concrete or brick, while tree wells can be any shape desired (e.g., diamond-shaped is useful for facilitating mowing). As long as the basic concepts are well understood, designers are encouraged to exercise creativity in finding new ways of applying them.

1. Plant Selection and Planting Design

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Plant selection and planting design are obviously important to the overall success of any landscape design. Plants must, of course, be selected and arranged so the species are compatible and suitable for their specific function, whether this is for aesthetics, screening, shading, etc.; but plants should also be chosen and placed with maintenance considerations in mind.

Pest Tolerance

An understanding of the level of tolerance of specific plants to local insect pests and diseases is critical in designing a landscape that minimizes the use of pesticides. Selecting plants that are susceptible to pest problems will increase the potential need for pest control practices and the likelihood of regular applications of pesticides. On the other hand, selecting plants that are resistant to pest problems will decrease the potential need for pest control treatments, including the use of pesticides.

Planting Design

Planting design is a broad term that refers primarily to the selection and arrangement of plants to serve one or more purposes. When minimizing maintenance requirements and pesticide use are included in the objectives of landscape design, emphasis should be placed on

- 1.) Matching plants to their site conditions,

- 2.) Choosing plants that have few cultural and physical maintenance requirements both generally and in the specific context of the design,
- 3.) Choosing plants that are tolerant of local pests, and
- 4.) Situating plants to facilitate maintenance treatments.

How well a plant will do under particular site conditions is largely determined by its cultural requirements. Because microclimatic conditions often vary within a site regardless of its size (e. g., differences in exposure to sunlight between the north and south sides of even a small building), it is always important when selecting and placing plants to consider factors such as soil type, moisture conditions, and exposure to sun and wind. Plants unsuited to their site conditions will not be healthy and vigorous and therefore require added maintenance treatments to help them grow and/or prevent their loss.

Proper placement of plants also includes consideration of their mature size in relation to their proximity to other site features (e.g., trees with a 50' mature height should not be planted beneath power lines that are only 30' off the ground; a vigorous, spreading shrub should not be planted too near a sidewalk or entrance). Plants that are too large for their space must be pruned regularly, adding to their routine maintenance requirements and resulting in poor plant form and often poor health (which reduces the aesthetic quality of the landscape).

Design approach is also an important factor influencing maintenance requirements. Landscape designs can range from formal to naturalistic, and from simple to complex. Large monoculture plantings are more susceptible to insect and disease problems, and infestations are likely to be more severe than in the case of mixed, multi-species plantings.

Likewise, due to the uniformity of texture, color, and overall appearance of monocultures, insignificant levels of "damage" (e.g., minor insect pest/disease impacts) are more noticeable and therefore less acceptable than if such damage were present in a more diverse, informal design. Also, while replacement plants are highly visible in a fairly mature, formal design with little plant diversity, new plants may be hardly noticed in a multi-species, mixed design. In addition, an informal, naturalistic design approach has the potential to require less general maintenance (e.g., pruning, weeding) by virtue of the nature of the design approach as described above.

[2. Treatment of the Interface between Different Elements of the Design](#)

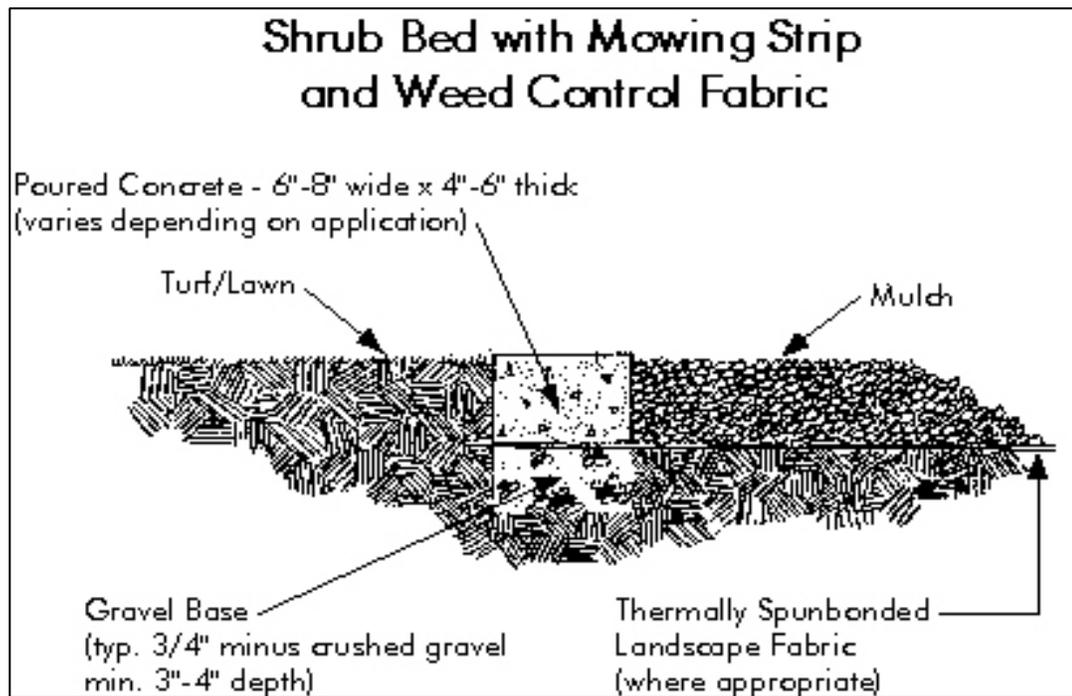
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The interface of different design elements (e.g., where a turf area meets a shrub bed) is often inadequately considered. As a result, maintenance problems are common in these areas and they often require repeated manual, mechanical,

and/or chemical treatments. However, the need for such practices can be avoided through thoughtful landscape design.

Mowing Strips/Under-layment

The term "mowing strip" refers to a hard surface (e. g., concrete, brick) installed along the interface between a turf area and another landscape feature such as a shrub bed or a building wall). "Under-layment" refers to the use of a hard surface under a landscape feature (e.g., a concrete pad

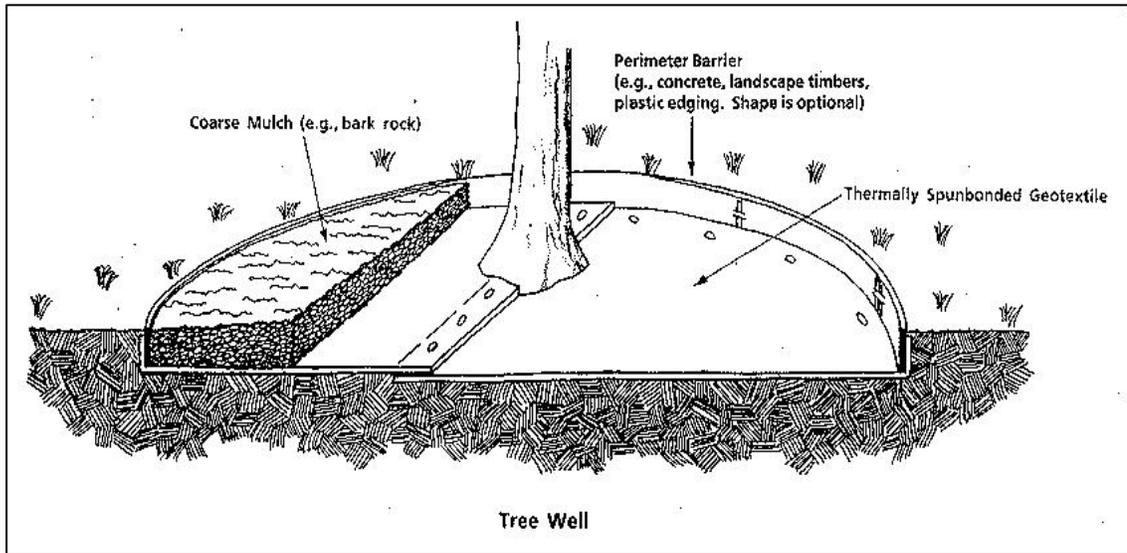


or strip under and/or around benches, tables, signs, bicycle racks, fence-lines).

In the case of walls, fence-lines, tables, benches, etc., mowing strips and under-layment eliminate the need to spray or trim the grass and/or weeds that grow where mowers cannot reach. When placed along the interface between shrub beds and turf areas, mowing strips serve as a barrier to underground rhizomes, and they also reduce the need for edging treatments. This translates into less need for herbicides as well as significantly less labor required for routine maintenance needs, regardless of the method chosen (i.e., weed trimmers, herbicide). See the [discussion of life-cycle costing](#) for general information about how increased capital costs in building or retrofitting features such as mowing strips and under-layment into the landscape can not only be recovered but actually save considerable resources over the life of the facility while also decreasing the routine need for pesticides.

Tree Wells

A tree well is a mulched area around the base of a tree (or a group of trees). Usually tree wells are found on turf areas, but they also are used around trees growing in paved areas.



Tree wells are primarily used to eliminate damage from mowers and weed eaters that are used for trimming the grass or weeds that develop at the base of trees. However, tree wells also provide additional benefits. These include improved plant health and development (not only as a result of reduced damage to the tree, but also from reduced competition presented by grass and weeds that grow around the base of trees and from reduced soil compaction caused by mowing equipment); and reduced requirements for controlling the growth of weeds and turf around the base of trees.

To aid in their maintenance, tree wells can be constructed using specific techniques and materials. These include:

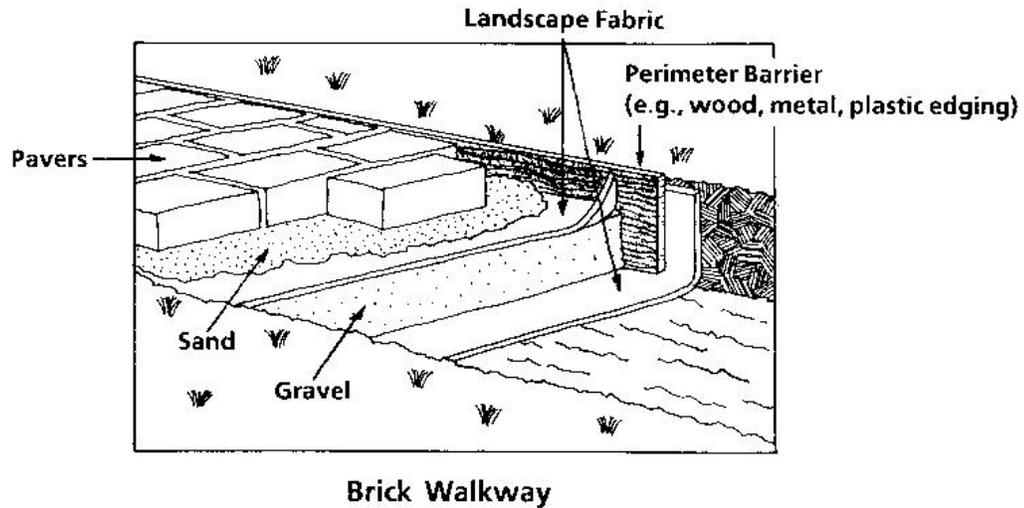
- 1.) A geo-textile weed barrier (see discussion on geo-textiles),
- 2.) A perimeter barrier (e. g., concrete, landscape timbers, metal or plastic edging) around the tree well, and
- 3.) 2"-4" of mulch on top of the weed barrier

If desired, ornamental plants (e.g., annual or perennial flowers; small shrubs) can be added to tree wells to improve their aesthetic quality.

Walkways

Weeds are a common problem where materials with many joints (e.g., pavers) or gravel are used for walkways, rather than those materials with a more continuous surface (e.g., concrete). Installing edging (e. g., metal, treated wood) along the sides of paths constructed with these materials can reduce the encroachment of weeds into the walkway. This will help

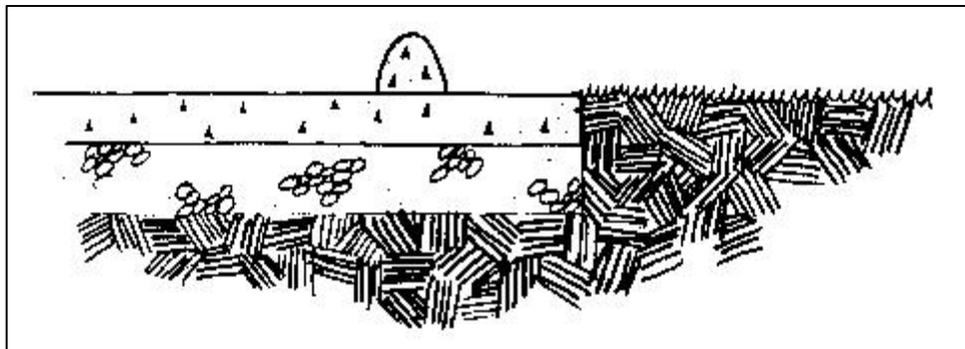
minimize weed control treatment needs and help maintain the aesthetic quality of the walkway.



The use of edging also provides support for the edge of the pathway and reduces its deterioration by physical wear and tear (from people and/or equipment) and damaging weeds (e.g., horsetail, morning-glory).

Pavement Edges

Curbing can be placed along the edges of paved areas (e.g., parking lots, driveways) that interface with turf and other planted areas to prevent vehicle damage to ornamental plants (e.g., shrubs, flowers, turf) and to the edge of the pavement.

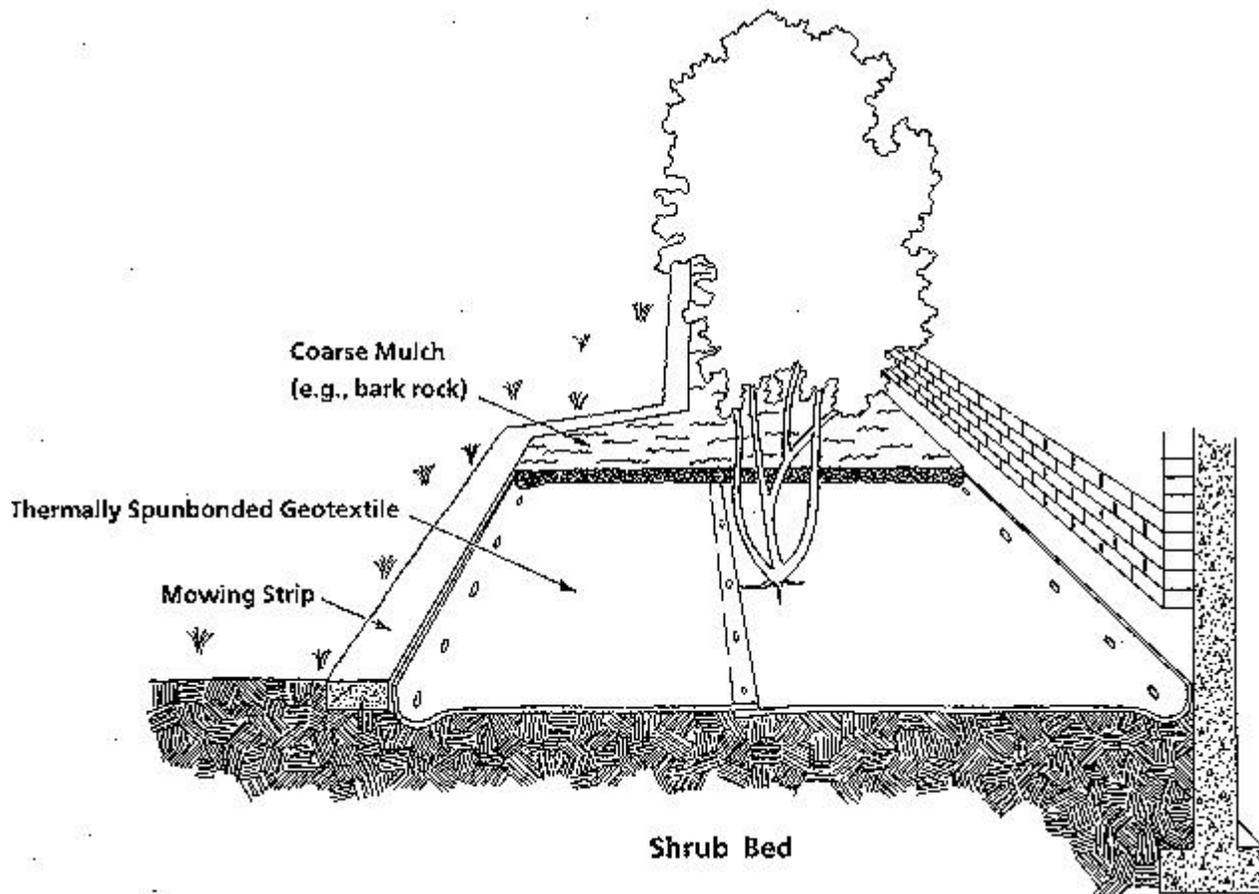


Where pavement is adjacent to turf, it is important that curbs be placed 6"-10" from the edge of the pavement to create a mowing strip.

3. Use of Geo-textiles for Weed Control, Material Separation, and Surface Stabilization

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Geo-textiles (landscape fabric) can play a valuable role in designing low-maintenance landscapes that require only minimal or no use of herbicides. They can be used for weed control, material separation, and stabilization purposes. Since geo-textiles are usually included "within" a complex feature (e.g., under a layer of mulch and around ornamental plantings in a shrub bed), it is highly preferable that they are installed during the initial construction of the feature. However, they can also be retrofitted to many landscape features. Geo-textiles can provide significant benefits by reducing maintenance requirements and the need for herbicide use for weed control when installed in shrub beds, tree wells, playgrounds, storage yards, underneath dry-laid pavers, etc. Proper material selection and installation procedures are important to ensure the effectiveness of geo-textiles.



Thermally spun-bonded fabrics are much more effective than woven or needle punched geo-textiles in preventing fine roots from penetrating the fabric. Heavier

weight fabrics should be used for sites that do not have frequent maintenance intervals. When installing geo-textiles, potentially damaging objects (i.e., large angular rocks; pointed sticks) should be removed from the site and the soil should be graded so the fabric will lay smooth and flat on the ground. Where potentially difficult to control weeds are abundant, an herbicide may be desirable or necessary to prevent weeds from growing to and through seams and edges from below. In some settings, a shallow trench (3"-4") around the perimeter of the installation site is helpful to hold the edges in place and keep them from becoming exposed. Seams should be overlapped 6"-8" and the fabric should be tightly fitted around any objects. Where fabrics may become exposed and subjected to vandalism they should be pinned firmly to the ground, especially around the perimeter. The fabric should then be covered with 3"-4" of coarse mulch with few or no "fines" to create an inhospitable environment for weed development. Because ultraviolet light is damaging to most geo-textiles, fabrics should always be adequately covered. When installed properly, geo-textiles will last indefinitely.

A disadvantage of using geo-textiles in shrub beds, tree wells, and other ornamental plantings is that the soil under the fabric becomes relatively inaccessible, making it difficult and time consuming to add amendments for soil improvement. However, this problem can be alleviated by adequately preparing the soil before the fabric is installed. ([See drawing showing landscape fabric in a shrub bed.](#))

Geo-textiles can also be used to stabilize surfaces by preventing uneven settling, which is a common problem with pavers and asphalt (i.e., when a load is applied to a single point, such as a footstep, the fabric helps distribute the load).

In addition, geo-textiles are frequently placed between layers of different materials to prevent their mixing (e.g., in walkways made with pavers, under gravel in electrical substation interiors).

4. Configuration and Placement of Features

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The placement and configuration of the elements of a landscape also influence its maintenance requirements. For example, it is a good practice to locate sidewalks according to "desire lines", which are preferred pedestrian access routes based on convenience of traveling from one location to another. Without appropriate placement of sidewalks, people will develop damaging and unsightly paths across turf areas and through ornamental plantings such as shrub beds.

On areas of turf, features such as shrub beds, trees, and other objects should not be placed too close together nor too near the edge of the turf so that they create spaces that are too narrow for efficient mowing with the appropriately sized piece of equipment for the scale of the task (i.e., this may only be a couple feet for a small area mowed by a walk-behind mower but may be several feet for a large area where gang mowers are used). Likewise, features on turf areas should include mowing strips or under-layment, or be placed in a mulched "well" to facilitate mowing.

Regarding configuration, landscapes should be designed to allow for the access and aid the maneuverability of maintenance equipment (e.g., acute angles should be avoided in turf areas; wide angles, gentle, sweeping curves, and straight lines are much easier to mow).

5. Specification and Detailing of Materials and Features

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Many different types of materials are available for landscape designs. To minimize maintenance requirements, the most durable and least problematic materials are the obvious choice. While such materials can be more expensive, their positive impact on reducing maintenance needs will make their purchase cost-effective (i.e., life-cycle costing).

The same general principle is also true for detailing dimensions and construction techniques. For example, concrete sidewalks should have a well-prepared sub-grade, be sufficiently thick, adequately reinforced, and have properly designed and constructed expansion/contraction joints to prevent cracking or other damage. Also, when specifying mulch, use a 2"-4" deep layer of coarse material with few or no "fines" - it is substantially better for weed control than a shallow layer of fine mulch.

6. Good Construction Practices

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Good construction practices provide protection for existing plants, turf areas, and other features that are included in the new design and they preserve topsoil and soil structure in areas that will be graded.

Limits of construction should be clearly shown on construction documents and areas that need protection should be fenced off before work begins. Likewise, heavy construction equipment should not be allowed any closer than 10'-15' outside the drip line of trees that are to remain, nor should this space be used for storage of materials, tools, or equipment.

Where grading is necessary, topsoil should be removed and stockpiled for later use where plants are added to the landscape. When preservation of topsoil is not a specific priority, this valuable resource is often mixed with or completely covered by subsoil, buildings, roads, parking lots, etc.

The above mentioned document is adopted from IPM Access website, a not for profit IPM Practitioner Association. For more information on the subject follow the attached web-link – [IPM Access](#)

Healthy Lawn Care

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Lawns and turf areas are an important subset of developed landscapes that demand specific attention regarding IPM implementation. Lawns are used for a variety of purposes. Lawn maintenance can significantly affect the environment in a negative way if not carried out with attention to proper environmental practices. The intended use of a lawn or turf area will determine many of the maintenance specifics. Healthy lawns can resist disease, pests and drought damage and can out-compete most weeds without reliance on chemicals. Properly maintained lawns also require less supplemental irrigation.

Some lawns are non-irrigated or minimally irrigated and brown out in the summer. Where it is possible, irrigate deeply once each summer month; this will help keep the crowns of the desired grasses alive. Continue mowing throughout the summer months to reduce the quantity of weed seeds produced. Turf that is heavily used should be irrigated, if possible, to avoid serious degradation. Improving cultural practices such as fertilizing, over seeding, and aerating can make a lawn more drought resistant.

Assess the condition of the lawn or turf. Look for turf density, turf species present, percent weed cover, and color. Determine previous maintenance schedule and assess effectiveness. Consider whether acceptable results can be achieved at lower maintenance levels or significant improvements can be realized through minor program adjustments. The following areas should be addressed:

- Soil testing and results
- Mowing and edging
- Irrigating
- Fertilizing
- Hand weeding
- Pesticide application
- Aerating
- De-thatching
- Over seeding

Organic Lawn Care

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Organic lawn care is not rocket science...it's basically soil science. The goal throughout the Simple Steps process is to create a **microbe and nutrient-rich healthy soil system** in which to develop deep-rooted, dense turf that competes successfully with weeds, and is low-maintenance, drought, insect and disease-tolerant and beautiful!

While the market demand for an organic approach to lawn and landscape services is growing at a rapid rate, professionals actually trained and/or

experienced in organic lawn and land care in your local area may still be scarce. In some cases, however, the consumer needs to direct the transition from a chemical program to an organic approach- not an easy task for most people, although there is plenty of material available to turn to for help.

It's not hard to have a healthy lawn that's also healthy for people, pets, and wildlife. "A vigorously growing turf resists pest damage and weed invasion," according to the University of California's integrated pest management program. Other lawn experts agree! When you focus on soil building, mowing, and watering, your lawn will grow vigorously. You'll have few insect, diseases, or weed problems, and pesticides will be unnecessary.

[Simple steps in Lawn & Landscape Maintenance](#)

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The facility manager should incorporate the following simple steps in Lawn & Landscape maintenance activities. For more information, standards and specifications refer to [The UC Guide to Health Lawns](#) by University of California; [Sustainable Landscape Series](#) by University of Minnesota; [IPM Based Landscape Designs](#) by efn.org and [Xeriscape](#) by Colorado State University. For specific pest management issues related to lawn & landscapes refer to [How to manager pests in landscapes, garden and turf](#) by University of California.

[Building a Microbe and Nutrient Rich Health Soil System](#)

Fertilize Naturally: The guiding principle of organic lawn care is to nourish the soil. Grass grows best in a biologically active soil where soil organisms like earthworms recycle plant material so that nutrients are slowly released in the root zone of the grass. Probably the most important soil-building technique for lawns is fertilization.

Nourish your soil with natural and organic products such as finished compost, well-aged manure, grass clippings and/or slow-release organic fertilizers. Organic fertilizers, including compost, release nutrients slowly, are less likely to run off into streams, and support microorganisms that increase soil fertility and fight lawn diseases. In this way, it differs fundamentally from chemical lawn care, which focuses on feeding the grass.

Top-dress with Compost: Nourish soil by sprinkling finished compost over your lawn. Grass clippings and compost can be applied in small amounts throughout the growing season but slow-release organic fertilizers are best applied in late summer - early fall. An early spring application is also acceptable. Finished compost has an earthy odor, spongy texture and rich-brown color. It contributes a wide range of both macro and micronutrients, which are released

Recycle Grass Clippings: Instead of collecting and putting clippings out for garbage, leave them on lawn. Grass clippings are the perfect fertilizer for lawns. They are free, convenient, chalk full of nutrients and organic matter and able to boost soil fertility by up to 30 per cent. They also return moisture to your soil and shade it from the drying rays of the sun.

slowly over a long period of time. It also contributes microorganisms, which help

decompose thatch and other organic matter. Unlike quick-release chemical fertilizers, these natural and organic products will not burn grass or contaminate ground and surface water.

You need to apply fertilizer in the right amounts and at the right time. Most lawn care experts recommend fertilizing lawns three or four times per year. The optimal dates, amounts, and nutrients for your lawn vary depending on local climate, soil, and the type of grass growing in lawn. For more information & advice contact the County IPM Manager or ask the University of California Extension-Santa Clara County.

Aerate: Aeration is the most overlooked and yet the most necessary lawn operation one can perform to build healthy soil. The benefits of lawn aeration include better soil oxygen levels, increased water and nutrient penetration, less irrigation runoff from slopes, reduced disease levels, and better rooting of turf plants.

Aeration removes cores of soil from your lawn and is used when your lawn has become compacted. Aeration relieves compaction and cultivates the

Aerate Lawn: A sign that your lawn needs to be aerated is that water puddles or runs off instead of soaking in. Aeration should be done in the spring after rain or irrigation has softened the soil. Your goal is to remove soil cores between 3 and 4 inches deep and about 6 inches apart. Leave the cores on lawn to break down, and leave the holes unfilled.

soil. It is best done in the spring or fall prior to fertilization. Aeration increases air and water penetration and movement in the soil. You can ensure continual, natural and free aeration by attracting and protecting earthworms in soil.

Remove Excess Thatch: Thatch is the partially decomposed grass stem, roots, and leaves found between the green part of a lawn and the surface of the soil. If your lawn has about 1/2 inch of thatch, it helps reduce soil compaction and prevents some weeds seeds from germinating. A thicker thatch layer can be a problem because grass roots grow in the thatch instead of the soil and make your lawn less tolerant of drought.

Thatch problems are caused by excessive fertilizing and watering, infrequent mowing, and frequent pesticide use.

For smaller areas using a thatching rake can reduce thatch. Simply pull it across the lawn and discard the debris. For larger areas, a vertical mower (dethatcher) is required. It should be run across the lawn, and then a second run perpendicular to the first. Later rake up the debris and dispose of it.

Spring and fall are the best times to remove thatch in California.

Over-seed: Lawn is comprised of millions of individual grass plants. Like any other living thing, these plants eventually die. It is important to over-seed once every year to keep your lawn thick and healthy. A dense lawn will crowd out weeds like dandelions and crabgrass that crop up in bare or thinly covered patches. Choose [grass varieties](#) that suit the light, moisture and soil conditions.

Over-seeding is also a great way to introduce hardy, pest-resistant and low-maintenance grass varieties such as endophytic perennial ryegrasses and fine fescues into lawn. A lawn with diverse grass types is better able to deal with and recover

from stresses such as droughts, pest outbreaks, diseases and traffic. For best timing to over-seed refer to

Mow High: Mowing is one of the most important aspects of organic lawn care. The simple practice of mowing high contributes enormously to the health of a lawn. Taller turf also shades the soil more than shorter turf thereby helping to keep soil cool and moist.

For each grass species, there is a range of optimal mowing heights. Mowing your lawn at the high end of this range allows the grass to develop a deeper root system and tolerate drought, heat, shade, disease, and pests. Recommended mowing heights are 3 inches for tall fescue, 2 1/2 inches for perennial ryegrass, and 1 inch for bent grass.

To have a high quality lawn you need to mow frequently when the grass is growing fast. You want to remove no more than 1/3 of the length of the grass blades so the grass is not stressed. For example, a perennial ryegrass lawn should be mowed when it gets to be about 3 3/4 inches tall with the mower set to mow at 2 1/2 inches. Weekly, or even more frequent mowing may be necessary when your lawn grows quickly.

Mow High: Experts recommend at least 3 inches because it shades out sun-loving weeds and encourages good root development.

The One-Third Rule: A general rule is to never cut off more than one third of the blade at once. Cutting off more than one third of the blade may cause the grass plant to go into shock as a huge portion of its food factory is eliminated. It will also result in longer clippings that take longer to decompose and may suffocate some grass plants. If grass is overgrown, mow twice; first at a high setting and then at a lower one.

Sharpen the Mower Blade: Once a Year Another way to ensure grass remains healthy and strong is to cut it with a sharp blade. Dull blades tear and stress grass blades, thereby increasing the potential for disease and infestations. It works best if you mow frequently, when the grass is dry, and with sharp mower blades. Sharp blades cut cleaner and easier and leave lawn healthier and better looking. Mulching mowers have an extra blade that finely chops and distributes the clippings, but you can use a regular lawn mower for grass cycling just by removing the bag.

Water Wisely: The facility managers should ensure that all landscape sites undergo annual irrigation water-audit and irrigation systems are fully operational, in good repairs, set on auto configurations/ programmable to suite the seasonal needs. If possible, opt for drip-irrigation systems over the sprinkler systems. A lawn requires no more than one inch of water a week. Sometimes, rain will provide lawn with all the water it requires. At other times, irrigation is required. As a general rule, water deeply once a week during the early morning or early evening. Watering during the late evening is not recommended because cooler temperatures and sitting water invite disease. Frequent, light watering produces a shallow-rooted lawn. Over watering leaches grass nutrients, promotes certain

weeds, and causes oxygen starvation of grass roots. This means that it's important to give your lawn the right amount of water.

There are three ways to tell if your lawn needs water. If your lawn is dark green and doesn't spring back when you walk on it, it needs watering. Or, dig a small hole and look at the soil. If the top two inches are dry, it's time to water. You can also push a six-inch screwdriver into the lawn. If it goes in easily, the soil is still wet. If it takes effort, then it's time to water. If a lush lawn is not your priority, you can water less often.

When you water your lawn, you want to avoid runoff. More frequent, shorter irrigations may be necessary if you have clay soil.

[Right-of-Way Weed Control Tools & Techniques:](#)

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Information to follow soon:

- [Flail Mowers](#)
 - [Weed Whip](#)
 - [Hydro-Seeding](#)
 - [Hydro-Mulching](#)
 - [Rubber Mulch](#)
 - [Weed Fabric](#)
 - [Solarization](#)
 - [Use of Weed Flamers, Torches, Radiant Heat](#)
 - [Reduced Risk Herbicides – Matran Pro \(Clove Oil\)](#)
 - [Conventional Herbicides – RoundUP, Turflon Ester](#)
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References

Pest Management at Construction Site: Most of the above-mentioned text is adapted (tailored to suite the needs of this informational/resource guide) from an article "[Rodent Control at Construction Site](#)" by Bruce Colvin, published in PCT Online (pct.com). He can be reached at bcolvin@pctonline.com.

Landscape Designs: document adopted from IPM Access website, a not for profit IPM Practitioner Association. For more information on the subject follow the attached web-link – [IPM Access](#)

[Integrated Pest Management – Business Practices](#) - U.S. General Service Administration

[How to Manage Pests](#) – University of California Statewide IPM Program Online

Disclaimer

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