



RESOURCES: BEST PRACTICES AND ALTERNATIVE APPROCHES TO PEST MANAGEMENT

STRUCTURAL IPM

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BACKGROUND

Structural integrated pest management (IPM) in urban environment involves the safe prevention, reduction or elimination of unwanted organisms. Pest control operators and facilities managers or owners face tough challenges in solving pest problems around public facilities, office complexes, hospitals, cafeterias, or other sensitive environments that can create real or perceived risks.

Traditionally, pest control consisted of the general application of one or more pesticides in indoor environments such as public office buildings, hospitals, correctional facilities, libraries, apartments as well as private residences. However, there has been a movement away from relying solely on pesticides to solve pest problems in response to public concerns over pesticide use, pesticide resistance, and the possibility that pesticide applications may contaminate the work environment and expose staff to pesticide residues.

It is important to recognize that pesticides (chemicals) regardless of rating as highly toxic or least toxic should not necessarily be the first choice for solving a pest problem. There are several pesticide reduction strategies available for use in indoor environments. IPM programs discourage unnecessary pesticide use and generic prescriptive pesticide treatments. Each IPM program is specifically designed to meet the individual needs of the area serviced.

Pest control providers and clients must agree on what IPM is and how it differs from non-IPM, calendar-scheduled, pesticide-intensive services. Also important to include in discussions are the benefits IPM can deliver, who is involved, what cooperation and participation is expected from all parties involved, how will everybody communicate, how records will be kept, how pesticides (if needed) will be selected, stored, and applied; and what notification procedures will be followed. Building occupants play a major role in sanitation. How will they be educated? How will occupants communicate any pest problems they observe? A designated pest management coordinator in the building can help coordinate information between occupants, decision-makers who make funding and contract decisions, and those who provide the pest control services. The success of an IPM program depends on the assistance and cooperation of the management and staff in each facility.

Structural Design, Sanitation, Housekeeping & Maintenance

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Pests are dependent upon biotic factors to provide them nourishment and moisture and abiotic factors to provide them harborage and ingress into buildings. The most important IPM practice to be used in and around structures is pest-problem **prevention**. Structural **design, sanitation, housekeeping** and **maintenance** are probably the most important aspects of prevention, a reduced risk pest management program. Through steps taken proactively during building planning, design, construction, and commissioning, resources for pests can be minimized, making the building less susceptible to pest infestation during its functional life cycle. **Regular inspections** for the presence of pests, pest entryways, sanitation breakdowns, or other changes in conditions that might affect pest management are

essential. Managing pests through prevention is usually less expensive than trying to control an established pest population.

Pest Management Consultation, Design Review and Program Support

The Building Construction Project Manager and the Architect/Engineer should consult Integrated Pest Management experts/consultants, during the early planning stages of any design project to ensure that the design addresses all areas relative to pest management. These design areas include:

- **Design Concept:** If the facility is to contain structural/design components that pose a potential or known pest problem, this should be considered as early as possible in the design phase.
- **Facility Fit-Out:** Some materials and equipment are undesirable or unacceptable from a pest prevention and control standpoint and should not be used.
- **Onsite Consultation:** Pest management staff can provide support during site visits and inspection during all phases of planning, design, construction, and renovation.
- **Pest Management Services Oversight:** All projects must maintain a pest surveillance and control program during all phases of construction. Ensure that the IPM Manager/consultant must review and approve all IPM services plans and inspect all pest management services delivered by construction contractor personnel to ensure efficacy and IPM program quality.

The following elements offer specific design suggestions that can greatly contribute to a successful IPM program. The Building Construction Project Managers, Architects and Engineers should incorporate these into the design as applicable.

Facility Design Elements

Several of the precepts of IPM work in concert with facility sustainability. Energy and water conservation can involve practices that make a facility less attractive to pests. Designing a facility for long-term use aids in pest management since durability and stability of the building infrastructure and systems make it less susceptible to pest ingress and infestation. Pest management and the pest management program function as part of the building, providing specialized services designed for each area of application. The closing of wall, floor, and ceiling penetrations, with the appropriate sealant, must be designed into all projects and performed during construction.

Buildings must be designed and constructed to promote cleaning. This entails employing designs and materials that minimize gaps, voids, and inaccessible spaces. Construction materials must be durable and chosen for the proper application. Since the integrity of the building diminishes over time, gaps, holes, and voids can create areas where debris can accumulate and pests can harbor. Some of the components of facility design and construction that impact an effective pest prevention program are:

- Overall facility design and construction, including the materials and construction detailing and the equipment and construction processes used to build the facility.

Facility components and layout should minimize points of pest ingress and harborage and optimize accessibility for cleaning, sanitation, and pest inspection.

- Building integrity. Closing cracks, crevices, and voids; penetrations through floors, walls, and ceilings; surface protection; and treatment and finishes affect pest activity.
- Landscape design and management
- Lighting on the site and building exterior
- Shipping and receiving areas, including the loading dock and storage facilities
- Personnel entry points
- Solid waste management and removal
- Recycling activities
- Housekeeping and sanitation, throughout the surrounding building area and inside the facility
- Pest management service implemented during construction
- Staff support areas, including break rooms, locker rooms, and food preparation areas and equipment, as well as administrative and conference space
- Facility durability and sustainability: Over the life cycle of a facility, changes in the envelope, interior layout and equipment & facility use and program changes have a direct influence on pest activity in and around a facility

Architectural Design

Exterior architectural features, including the development of the facade and roofing design, must be evaluated with respect to their potential for the occurrence of pests. For example:

- Recessed windows, ledges, flat roofs, roof edges, columns, and so on can provide roosting spots for birds.
- Overhangs or sunshades can be nesting sites for wasps or birds.
- Runoff from the roof can attract and support pests around the building exterior.
- Entranceway overhangs can provide nesting sites for birds and stinging insects.
- Use of hollow metal construction materials, particularly in windows, are potential nesting sites for stinging insects.
- Exterior eating areas in gardens will attract pests.
- Roof vents and air intakes can be points of ingress for birds and insects.
- Facades that are recessed and wall-mounted lighting provide nesting sites for birds and stinging insects.
- Elevated planters can become harborage for rodents and accumulate debris and food trash.

These issues can create problems that will have an impact on the use of the building and ongoing maintenance and will be expensive to correct once the building is completed.

Landscape Design and Management

Landscape planting, for both aesthetic and functional needs, can impact the number and types of pests found around the exterior of the building as well as within the building envelope. For example, dense ground covers such as ivy provide cover and harborage for rodent pests. Some ornamental plants such as spirea are attractive to certain beetle species that can become a pest indoors. Mulch that is contact with exterior building perimeter can provide food for termites, and dense foundation plantings can reduce air circulation around buildings, harbor pests such as wasps, and obstruct pest management survey and control activities. Raised planters or garden beds can be nesting sites for rodents. An open perimeter boundary around the entire facility is recommended. This barrier should be wide enough to facilitate inspections around the building and should be constructed from materials that are durable, do not obstruct grass-cutting or maintenance activities, and prevent encroachment of grasses or weeds around the exterior of the building.

Lighting Design

Lights are attractive to insects and to some vertebrates. The type and placement of lights around and in a facility can impact the occurrences of pests and nuisance incidental invaders indoors. Wherever possible, locate lights away from the building, thereby attracting pests away from the building. Lights should not be placed directly over loading dock doors or personnel doors. Lights that are less attractive to insects, such as sodium vapor types, are recommended. The design of the light fixture and the installation of the fixture can provide pest harborage outside a building. Overhead lights with a flat upper surface can provide a nesting or roosting site for birds. The power conduit for the lights must be designed so that it does not provide roosting or nesting sites for nuisance birds.

Personnel Entry Doors Designs

Building doors should be fitted with sweeps and seals that effectively exclude insect and rodent pests. Automatic or self-actuated sweeps are not recommended. Brush-type sweeps, along with bristle material that covers the entire perimeter of the door, are preferred. Doors must be durable and cleanable.

Personnel Support Areas Designs

Personnel/staff support areas, such as break rooms, kitchenettes, locker rooms, showers, conference facilities, cafeterias, and vending facilities, must all be designed and constructed to meet the rigorous use to which they will be subjected. Recommendations include:

- Use commercial-grade cabinetry in all breaks rooms and kitchenettes.
- Install lockers on legs. Do not install lockers on a void base, and if possible, do not recess lockers inside walls. Use open-wire lockers wherever feasible.
- Size kitchens properly for expected use. Use commercial-grade, National Sanitation Foundation-approved kitchen equipment, installed to maximize cleaning, and provide adequate ventilation.
- Do not recess trash or recycling containers inside cabinets or walls.

- Specify durable, highly cleanable finishes that can be sanitized with strong detergents and cleaning products in all vending areas.
- Lockers and locker rooms must be thoroughly caulked and sealed.
- Pay attention to the placement and design of outside eating areas for building staff to minimize attraction of pests into the facility and facilitate waste removal.

Sanitation and housekeeping are the primary issues in all personnel support areas. These areas receive extensive use, often 7 days per week. Areas not adequately designed can become cluttered and dirty, be a source of pests and odors, and present health and housekeeping problems.

Janitorial Supply Storage Closets & Slop sinks Designs

Proper sanitation is critical to effective pest management in all buildings. All buildings must be equipped with appropriately sized housekeeping closets located throughout the facility to adequately serve its needs. Appropriate construction materials help to promote cleaning and sanitation. Improper installation during the fitting-out phase of the building will create long-term obstacles to good sanitation and potentially foster rodent and insect infestation problems.

Shipping and Receiving, Including the Loading Dock and Storage Facilities Designs

The loading dock is the central point of activity in a building. Most goods and supplies enter or leave through this area. Solid waste is often containerized at the loading dock. According to the amount and duration of activity, the loading can be a point of pest ingress for the following reasons:

- Doors often remain open for extended periods of time.
- Solid waste and recyclables, which are attractive to pests, are containerized and stored at the dock.
- Outside air can be pulled into negative buildings along with pests.
- Proper cleaning and sanitation are often difficult to achieve.
- Because of heavy industrial use of this area, maintenance issues can contribute to pest problems.

The loading dock should provide a buffer between the exterior and the interior of the building. Air screens, specialty doors, plastic strip doors, and electric insect light traps should be used to create a positive barrier to pests.

The loading dock should be considered an extension of the building interior. The materials used to construct the dock should provide durability, ease of cleaning, pest exclusion, and accessibility for pest management services. In addition, the loading dock should have adequate space and lighting for proper marshalling, inspection, and cleaning of materials received and shipped from the building. Solid waste containers should not be stationed directly in front of overhead doors. Clean deliveries and deliveries of food should not be comingled with waste and “dirty” areas of the dock.

Solid Waste Management, Removal, and Recycling

Management of solid waste and recyclables impacts building design and construction in three ways.

- Temporary storage of materials inside the laboratory
- Marshalling and disposing of waste materials through the building
- Containment and removal of waste from outside the building

Any area designated to hold waste material must be durable, cleanable, and constructed to minimize gaps and voids since they obstruct cleaning efforts and can become a reservoir for spills, debris, and pests. Solid waste containment equipment must be sited to minimize attraction of pests into the facility and to maximize cleaning and sanitation.

IPM Services during Construction

IPM services for the control of pests become critical and more important at construction sites during all phases of construction. Pest control services especially rodent control must be included construction plan.

Maintaining Structural Integrity

IPM programs change with the building and the use of the building. Despite these efforts, pest problems can develop within a building as it ages or is expanded or modified. Doors do not seal properly, gaps form around slabs, landscaping changes, equipment is removed, and new equipment is installed. The feasibility of effective, long-term pest management is often influenced by the flexibility and adaptability of a building to new or expanded use. Good structural sanitation, housekeeping and regular maintenance, under these circumstances become essential to manage urban pests.

Closing holes, gaps, and voids is important to long-term prevention of pests. Wall-mounted equipment and fixtures must be sealed when installed. The intent of this sealing is twofold. First, to deny pests, particularly insects, points of ingress and harborage sites in the building. Rodents can be prevented from entering a building by performing thorough sealing of the building envelope. Mice can move through a hole 6 mm or larger (size of dime), and rats can get through a space 12 mm or larger (size of quarter). Second, to help promote sanitation and housekeeping by making areas easier to routinely clean and minimize the extent that spills may soil or contaminate an area. Caulking and sealing must be applied to all components of a facility, including but not limited to the following elements: building envelope, plumbing, and electrical and the installation of equipment, furnishings, and amenities in the fitting out of the building.

Caulking and sealing are not replacements for good design and construction. It is more desirable not to design and construct gaps, voids, and recesses than it is to seal them after construction. Extensive sealing will add to the long-term operation and maintenance cost of a facility since sealants often must be removed and reapplied numerous times to maintain integrity over time. Specialized areas or areas designed for unique functions will have additional caulking and sealing requirements.

Role of IPM Service Provider, Facility Management and Building Occupant

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IPM programs are proactive in preventing pest problems, not reactive to an infestation. Pest control operators, many working under contract for a set monthly or annual fee, can cut costs by applying pesticides only when needed. Alternatives to pesticides, such as exclusion or sanitation, can sometimes provide permanent solutions to otherwise chronic problems, reducing complaints and callbacks.

While the pest management professional will be able to perform some preventive measures, the primary responsibility will lie with facility management and its departments. Facility managers should consider the long-term benefits of pest prevention, which is simpler than the correction of these problems. From a pest management standpoint, facility managers should ensure to eliminate unsanitary conditions, poor housekeeping or maintenance issues that provide food, water, harborage, or concealed routes of movement for pests and pathogens. Structural sanitation & habitat modification are very simple to achieve when done in time. Also remember, physical and mechanical tactics often become less practical (or less economical) when they are used on a large scale. An early intervention through these means is helpful. **“A Stitch in Time Saves Nine”**. Improvements in facility design and construction can significantly assist with maintaining good sanitation, housekeeping, and pest prevention. IPM must be a continuing program an integral part of overall structural maintenance in order to manage the environment where pests live and to meet future pest management needs.

Structural projects should be designed such that pest management professionals can and should assist facility personnel in performing regular inspections and providing feedback on both sanitation and building maintenance. The Pest Managers & Facility Coordinators should expect and consider that the **initial inspection** would take much more time to complete. The timing and frequency of inspections should be agreed on upfront. Communication with and education of the customer in this regard can build a strong, trusting relationship. Departmental coordination should be provided through designated department IPM coordinators and or facility managers. Facility personnel/building occupant education should include **in-house training seminars** (covering awareness & asking their cooperation towards building sanitation, housekeeping & maintenance) and **site surveys** that explain their role in reducing conditions conducive to pest infestation within the facility. The Santa Clara County IPM Program and Orkin Exterminating Company have jointly produced an educational video titled **“Sanitation, Housekeeping & Maintenance – Role of Facility Managers and Building Occupants in preventing pest problems”**. This video is available in VHS & DVD format with a nominal reproduction, shipping & handling charges. For more details contact Naresh Duggal, SCC County IPM Manager at 408-299-5159. A comprehensive **“IPM Guidance Manual Facility Managers and Building Occupants”** also accompanies the video.

Santa Clara County's Structural IPM Project Components

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The Santa Clara County has 200 (two hundred) plus buildings sites under this project representing office complexes, hospitals, clinics, correctional facilities, libraries, animal shelters and private residences. The County IPM Manager manages the structural IPM project with the help of 6 (six) designated Department IPM coordinators who facilitate services with 200 (two hundred) plus facility managers. The County has hired a professional pest management contractor to provide regular facility inspections and necessary treatments as needed. We plan to include the following components during the design, construction & renovation phases as well as operational elements implemented after a facility is occupied:

- **Facility Design**: Pest problems often can be prevented by the architect/engineer (A/E) taking a proactive approach to designing facilities that do not contribute to the harborage of pests. The County IPM Coordinator plans to work with Capital Improvement Project Managers to address the same. The Project Managers and design team should involve the IPM Section early during the planning and design process for any project to obtain input on proposed designs from the pest management perspective.
- **Sanitation/Structural Repairs**: Proper sanitation, as well as reduction of clutter and pest harborage and performing small repairs that exclude pests, has a significant impact on keeping pests out of buildings. Facility operations & environmental services staff is responsible to provide such services. Plans are underway to provide building occupant sanitation, housekeeping & maintenance awareness training through "Train the Trainer" Project.
- **Monitoring**: Monitoring is the regular surveillance of an area using traps, visual inspections, and interviews with staff. Surveys are conducted to determine whether a pest problem exists, the location and size of the pest infestation, and conditions that may contribute to pest problems.
- **Communication**: Staff cooperation in correcting conditions that contribute to pest problems is essential to the success of an IPM program.
- **Record Keeping**: Monitoring data on pest numbers and observations on housekeeping and structural or surrounding landscape deficiencies are recorded in a logbook in each facility and discussed with facility manager.
- **Pest Control Without Pesticides**: IPM practices such as pest exclusion, trapping, screening, and caulking are effective, long-term methods of pest prevention. Non-pesticide pest control practices can be effective and applied with a high degree of safety.
- **Pest Control With Pesticides**: Pesticides are a small part of an IPM program and are applied using the safest, most effective methods of application, and only where needed.

- **Program Evaluation**: Monitoring data and observations are periodically summarized and reviewed to evaluate program effectiveness.
- **Safety**: IPM significantly reduces the use of pesticides and encourages the use of more permanent non-pesticide control practices. This practice helps minimize the potential of exposure to pesticides to County staff and visitors.
- **Quality Assurance**: Technical oversight provides an objective, ongoing evaluation of program activities and effectiveness. The service contractor's Quality Assurance Manager (Entomologist/Sanitarian) provides periodic oversight on problem sites through field inspections, occupant education and possible solutions. The County IPM Manager also conducts periodic quality control inspections to address the same.

Laws & Regulations

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- [California Structural Pest Control Board](#)
 - California Business and Professions Code Division 3. Professions and Vocations Generally: [Chapter 14](#) (Structural Pest Control Operators) and [Chapter 14.5](#) (Structural Fumigation Enforcement Program)
 - [TITLE 16. Professional And Vocational Regulations Division 19. Structural Pest Control Board](#)
 - [Structural Pest Control Licensing](#)
- [California State Pesticide Laws](#) - Food and Agricultural Code, Divisions 6 (Pest Control Operations), 7(Pest Control Dealer), and 13 (Bee Management & Honey Production)
- California Department of Pesticide Regulation – [California Code of Regulations, Title 3. Food and Agriculture, Division 6. Pesticides and Pest Control Operations](#)
- California Department of Pesticide Regulation – [Pesticide Licensing & Certification Program](#)
- [California Healthy Schools Act of 2000](#) (AB2260) – relates to School IPM
- California [Ground Water Protection](#) – Recently enacted regulation

There are several other agencies in California that has variety of interests & roles in pesticide applications or pest control operations. To get more information click Legislative/Policy Framework channel.

Structural Pest Management General Guides & Training Resources

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 denotes "Editor's Choice" recommendation.

- [A Creative Approach to Yellow Jacket & Wasp IPM](#) – PT Quarterly Volume 21 April 2002; Whitmire Microgen Company
- [Academic Programs in Entomology](#) – University of Minnesota
- [Alternatives in Insect Pest Management: Biological and Biorational Approaches](#) – North Central Region Extension Publication #401 - Focuses on microbial and botanical insecticides, beneficial insects, attractants and traps.
- [American Insects: A Handbook of the Insects of America North of Mexico, 2nd Edition](#)
- [Beasts Bgone- A Practitioners Guide to IPM in Buildings](#) - This manual provides an overview of different ways to solve animal problems in and around buildings.
- [Bee Colony Removal from Structures](#) – HGIC 2507 Clemson University
- [BeeKeeping](#) – County of Santa Clara Ordinance No. NS-300.705, § 3, 1-14-03)
- [Cockroach Control Manual](#) – University of Nebraska-Lincoln
- [Common Sense Pest Control](#)– Least-Toxic Solutions for Your Home, Garden, Pets and Community. 1991. Olkowski, W., S. Daar, and H. Olkowski, Taunton Press. Newtown, CT. 715 pp
- [Controlling Cockroaches the Better, Least-Toxic Way](#)– Canada Mortgage and Housing Corporation
- [Directory of Least-Toxic Pest Control Products](#): The IPM Practitioner, Bio-Integral Resource Center (BIRC); Publications of Bio Integral Resource Center provide several least toxic strategies.
- [Engineering for Food Safety and Sanitation](#) 2nd Edition - by Thomas J. Imholte
- [Entomophobia/Delusionary Parasitosis and Illusionary Parasitosis](#) - This article titled "Insects in Psychiatry" was produced by Dr Phillip Weinstein of the University of Otago and originally appeared in the Digest of Cultural Entomology
- [Facility Manager's IPM Guidance Manual](#) – A comprehensive guide accompanied with a video available in VHS or DVD format. For more details call Santa Clara County's IPM Manager at 408-299-5159
- [Food Processing Sanitation/Hygiene](#) and [Food Safety for Warehousing & Sanitation](#) – Correspondence Courses by American Institute of Baking - AIB's world renowned Food Safety department guides you through many important subjects, such as, regulations, pest control, microbiology, and quality assurance.
- [Handbook of Household and Structural Insect Pests](#) – Entomological Society of America
- [How to Manage Pests of Homes, Structures, People, and Pets](#) – UC IPM Online Statewide IPM Program; An excellent source of information for pest monitoring techniques, pesticides, and non-pesticide alternatives for managing pests around the home; pest are categorized as follows: Wood-destroying pests; Food, fabric, and nuisance pests; Pests that sting, bite, or injure; Vertebrate pests
- [Insect Pests of Home Stored Food](#) – Food Pest E-37, Department of Entomology, Purdue University
- [Integrated Fly Management](#) – Actron Inc.
- [Integrated Pest Management – A selected bibliography for collections care](#)– Wendy Jessup and Associates, Inc., Falls Church, Virginia
- [Integrated Pest Management in Housing](#) - by Sam Bryks, Manager Environmental Health Services, Toronto Community Housing Corporation. A uniquely insightful

online guide to IPM from the perspective of housing management, by a leading practitioner.

- [IPM for Other Sensitive Environments](#) – IPM Institute of North America
- [IPM for Schools](#) University of Florida
- [IPM Kit for Building Managers](#) – Massachusetts Department of Food and Agriculture
- [IPM Manual for Structural Pests](#) - British Columbia Ministry of Water, Land and Air Protection
- [IPM Standards for Schools](#) – IPM Institute of North America
- [Managing Health Hazards associated with Bird and Bat Excrement](#)– USAEHA TG
- [Managing Pests in Schools](#) – California Department of Pesticide Regulations
- [NPCA Field Guide to Structural Pests](#): This is a one-of-a-kind 800-page reference source that includes detailed information on nearly 200 different structural pests: ants, bees, cockroaches, flies, spiders, termites and more. Illustrated with nearly 1,000 color photos and drawings and supplied with quick reference tabs and a ruler. The Field Guide includes detailed information on how to recognize each pest, its biology and control. National Pest Management Assoc.; Smith, E.H and Whitman, R.C. 1083 pp. - a must for pest control professionals.
- [NPMA Urban IPM Handbook](#): National Pest Management Association
- [Pest Control Technology online](#) store sells number of books on various pest control subjects.
- [Pest Management in New York State Hospitals](#) – Office of Attorney General of New York State
- [Pest Management without harm-Hospitals](#) - Beyond Pesticides
- [Physicians Guide to Arthropods of Medical Importance](#) ISBN 0-8493-1387-2
- [Prescription Treatment University](#)– offers the pest management industry professionals the training and education they need to succeed in the future. It offers interactive, web based training featuring an extensive curriculum of courses, student counseling for pest related issues, insect museum, library, research center, and much more. [Continuing Education Units \(CEUs\)](#) are available for many of PTU classes in several states - Whitmire Microgen
- [Rodent & Bird Control in Farm Buildings](#) – Canada Plan Service – Information on this site is helpful for modular buildings/sheds in the yards and regional parks
- [Rodent Control– A Practical Guide for Pest Management Professionals](#) – by Robert M. Corrigan. This book is a great reference. It addresses rodent pest issues for a wide range of industrial and residential environments.
- [Rodent Exclusion Techniques – A Training Guide for National Park Employees](#) by National Park Service Public Health Program – Information on this site is helpful for Facility/Building Managers to understand rodent proofing buildings
- [Structural IPM Manual](#) – Ministry of Environment, Land & Parks, British Columbia, Canada
- [The Internet Center for Wildlife Damage Management](#) – University of Nebraska-Lincoln
- [The Mallis Handbook of Pest Control](#) – 9th Edition ISBN 1890561001 - An industry standard in education for more than 55 years, is the leading reference source in the

structural pest control industry. It is a scientific guide and practical aid for the biology, behavior and control of structural pests. The 1,400-page publication, often referred to as "The Bible of the Industry," provides pest control operators with the information needed to deliver effective, environmentally conscious pest management services in today's competitive business climate.

- [Truman's Scientific Guide to Pest Control Operations](#), 6th Edition; Bennett, G. W., J.M. Owens and R.M. Corrigan. Purdue University/Advanstar Communications, West Lafayette, IN. 494 pp. Excellent Source of Pest Management Information - a must for pest control professionals.
- [U.S. Navy Shipboard Pest Control Manual](#) – Navy Disease Vector Ecology and Control Center
- [Urban Entomology](#)– by Walter Ebeling - Excellent Source of Pest Urban Entomology & Pest Management Information On Line! This electronic text is provided to the educational community and the public as a resource on information pertaining to the types of pests, which may be found in the urban environment and home. - A must for pest control professionals.
- [Urban Integrated Pest Management: A Guide for Commercial Applicators](#). Prepared for US EPA by DUAL & Associates, Inc. (703) 527-3500.
- [The Bad Bug Book](#) - The Center for Food Safety and Applied Nutrition has prepared a handbook on food borne pathogenic microorganisms ([bacteria](#), [viruses](#) and [parasites](#)) and [natural toxins](#). It brings together in one place information from the Food & Drug Administration, the Centers for Disease Control & Prevention, the USDA Food Safety Inspection Service, and the National Institutes of Health.
- [Building Maintenance Checklist](#) – US EPA
- Termite Control:
 - [Alternative Control Strategies for Termites](#) by Vernard R. Lewis
 - [Biological Control of Eastern subterranean termite *Reticulitermes flavipes* \(Kollar\) \(Isoptera: Rhinotermitidae\) by the Fungal Entomopathogen *Metarhizium anisopliae*](#) by Barry H. Strack
 - [Dry Wood Termite Management Guidelines](#) – University of California IPM Online
 - [Evaluation of Dog-Assisted Searches and Electronic Odor Devices for Detecting the Western Subterranean Termite \(Isoptera: Rhinotermitidae\)](#) by Vernard R. Lewis, Calvin F. Fouche and Richard L. LeMaster
 - [Evaluation of six techniques for control of the western drywood termite \(Isoptera: Kalotermitidae\) in structures](#) by Vernard R. Lewis and Michael I. Haerty
 - [Field Comparison of Sand or Insecticide Barriers for Control of *Reticulitermes* spp. \(Isoptera: Rhinotermitidae\) Infestations in Homes in Northern California](#) by Vernard R. Lewis, Michael I. Haverty, Douglas S. Carver, and Calvin Fouche
 - [Long Awaited Non-Chemical Alternatives to Drywood Termite Control Study](#) Completed by Vernard R. Lewis and Michael Haverty
 - [Simulated Field Evaluation of Six Techniques for Controlling the Drywood Termite *Incisitermes minor* \(Isoptera: Kalotermitidae\) in Residences](#) by Vernard R. Lewis and Michael Haverty

- Solid Wood Products: [Detection of Termites with Acoustic Emissions](#) by Richard L Lemaster, Frank C Beall, Vernard R. Lewis
- [Structural Fumigation Using Sulfuryl Fluoride: DowElanco's Vikane™ Gas Fumigant](#) – US EPA
- [Subterranean Termite Control Manual](#) - University of Nebraska-Lincoln
- [Termite Control Methods](#) – Urban Entomology Program, University of Toronto
- [Termites Management Guidelines](#) – University of California IPM Online

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- [Arthropod ID FMC](#)
 - [California Plant Pest Diagnostic Laboratory](#)
 - [Household & Structural Pest ID](#)
 - [Insect ID Online for Entomologists](#)
 - [Pest Bird ID](#)
 - [Pest ID at PestWeb](#) – requires user registration
 - [Purdue Plant & Pest Diagnostic Laboratory](#)
 - [Key to Common Household Ants](#) – UC Statewide IPM Online
-