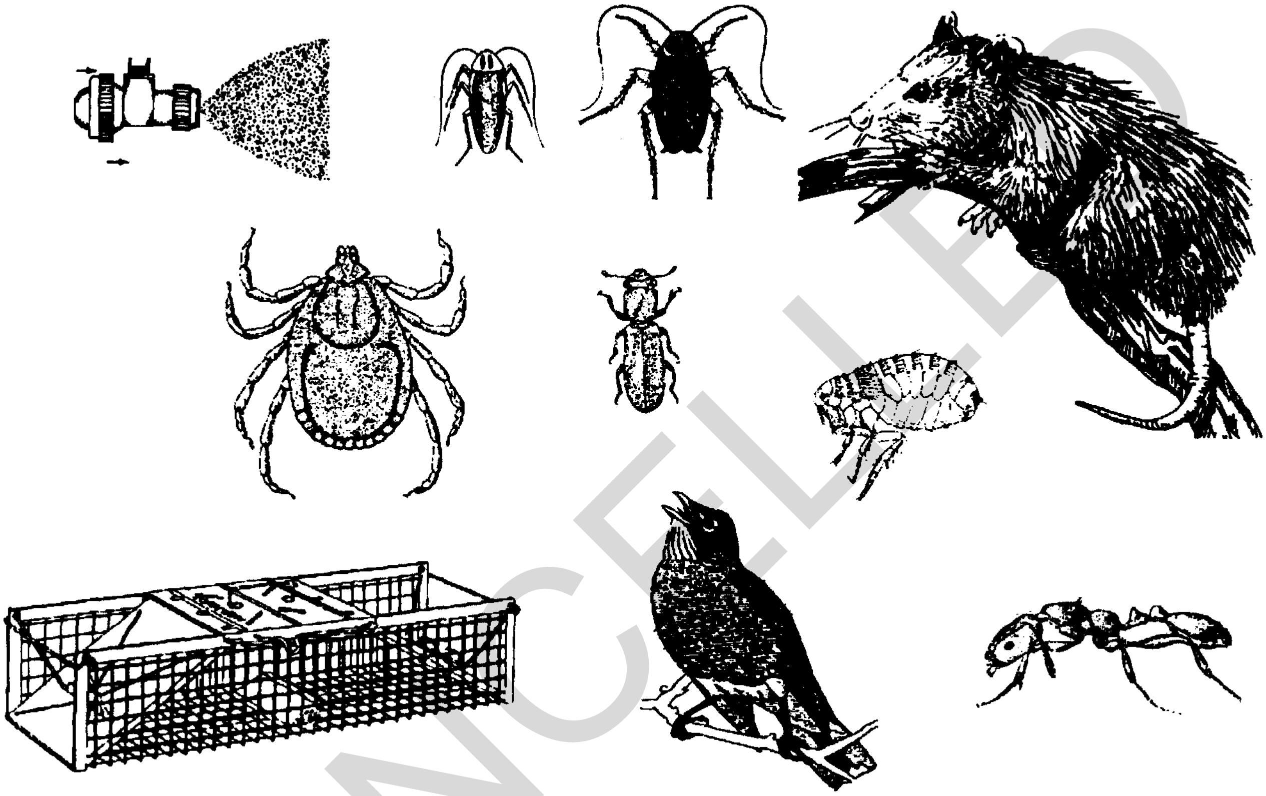
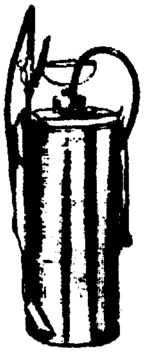
Naval Facilities Engineering Command
200 Stovall Street
Alexandria, Virginia 22332-2300



PEST CONTROL QUALITY ASSURANCE EVALUATOR TRAINING HANDBOOK



NAVFAC MO-315
OCTOBER 1991

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FOREWORD

This handbook is the text for a course for Pest Control Quality Assurance Evaluators (PCQAEs). Pest control contract inspection, on military installations, is complex and results can be misinterpreted. The heavy reliance on chemicals to control pests is a potential hazard to military installations and the people living and working on them. Consequently, pest control operations and pest control personnel are closely regulated by Federal and state laws which make the role of the PCQAE significant.

Completion of one of the military PCQAE courses for service contract surveillance is recommended prior to enrollment in this course to become familiar with the principles of contract administration, surveillance, and documentation. Completion of this course will qualify the QAE to perform pest control quality assurance evaluation. Thereafter, attendance at a triennial QAE pest control or recertification training course will be required.

This course is recognized and endorsed by the Armed Forces Pest Management Board for use by all of the military services in training pest control QAEs.

This publication cancels and supersedes **MO-315, Pest Control Quality Assurance Evaluation Training Handbook**, of September 1985. It has been reviewed in accordance with the Secretary of the Navy Instruction 5600.16A and is certified as an official publication of the Naval Facilities Engineering Command.

ERHamm

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ABSTRACT

This handbook is designed to prepare Quality Assurance Evaluators, with little or no experience in pest control, to effectively evaluate the performance of pest control contractors. This course provides background information on basic principles of pest control and an introduction to the major pest control functions that can be contracted for at military installations.

CHANGE CONTROL SHEET

Document all changes, page replacements, and pen and ink alterations posted in this manual.

AMENDMENT NUMBER	AMENDMENT DATE	POST DATE	POSTED BY (LAST NAME)

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INTRODUCTION

Most military installations have a requirement to control pests that may interfere with the installation's mission, personnel and protect material. The reliance on chemicals to control these pests presents a potential hazard to people and the environment. Consequently, pest control operations and pest control personnel are closely regulated by Federal and state laws. The Pest Control Quality Assurance Evaluator (PCQAE) is responsible for oversight of pest control contractors, who use these controls.

This handbook is designed to prepare PCQAEs, with little or no experience in pest control, to effectively evaluate the performance of pest control contractors.

This handbook emphasizes safety, environmental protection, and contractor oversight for desired pest control results. The handbook is divided into three sections:

1) A general section including the topics:

- pesticide laws and regulations
- pesticide labels and labelling
- vehicles and other equipment
- pesticide application techniques
- personal safety
- the environment
- records and reporting.

2) Section 2 covers specific pest groups. This phase will cover pest:

- biologies
- survey techniques
- various control options.

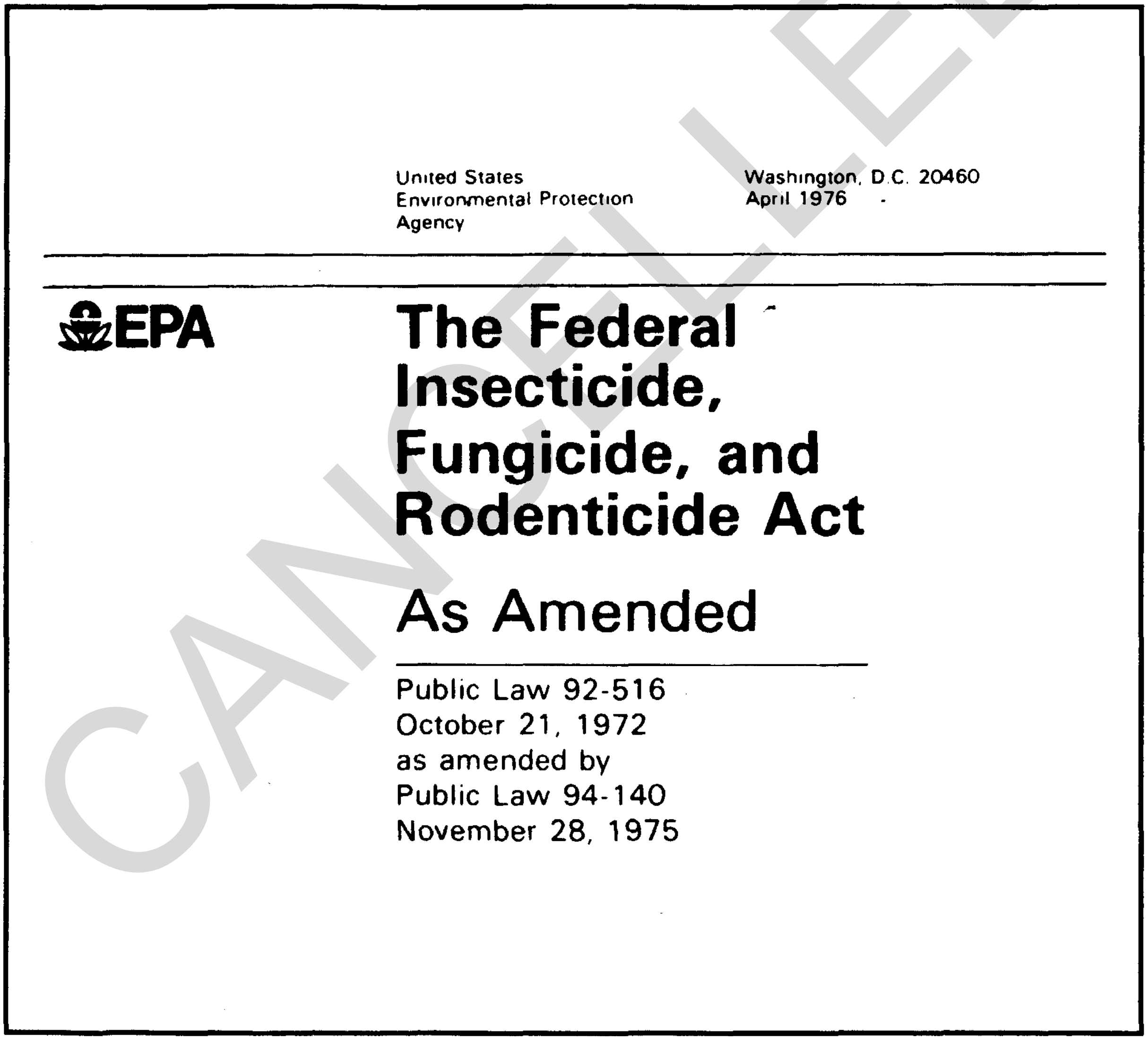
3) The third section is the development of the Pest Control Quality Assurance Plan. Three exercises for the development of parts of the plan are included. The purpose of this exercise is to apply information learned in sections 1 and 2.

CHAPTER 1. PESTICIDE LAWS AND REGULATIONS

Pesticides help increase production of food and fiber, and protect our health, structures and ornamental plants. The potential negative effects of pesticides on human health, wildlife and the environment has caused concern among many people and special interest groups. To help protect the public, the environment and the applicator, legislation regulates pesticide use. These laws try to balance the need for pesticide use and the need to protect public health and the environment.

1.1 FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (Figure 1-1), is the predominate law governing pesticide use.



United States
Environmental Protection
Agency

Washington, D.C. 20460
April 1976

EPA

The Federal Insecticide, Fungicide, and Rodenticide Act

As Amended

Public Law 92-516
October 21, 1972
as amended by
Public Law 94-140
November 28, 1975

Figure 1-1
The Federal Insecticide, Fungicide, and Rodenticide Act

A pesticide is defined in FIFRA as "any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pests, as well as any substance, or mixture of substances, intended for use as a plant regulator, defoliant, or desiccant." FIFRA is administered by the Environmental Protection Agency (EPA).

Provisions of the law include:

- all pesticides must be registered with the EPA
- all pesticides must be used only as directed on the label
- pesticide products must be classified as "general use" or "restricted use"
- persons who use restricted use pesticides must be certified as competent pesticide applicators or must be directly supervised by a certified applicator
- persons who do not obey the law will be subject to penalties (fines and jail terms)

The EPA administers these provisions by:

- registering all pesticides
- setting minimum standards of competency for certified pesticide applicators
- empowering states to administer FIFRA within their boundaries, and to develop their own plans, (EPA approved), for certifying pesticide applicators

FIFRA allows states and federal agencies to adopt pesticide use laws and regulations in addition to those identified in FIFRA providing that they are not specifically prohibited. It is DoD policy for contractors to comply with state pesticide laws and regulations. Most states have requirements for commercial applicators or companies to be licensed in the state. PCQAE's should maintain copies of current certification and licensing documents of contractors.

1.1.1 The Label and Pesticide Use. The label is defined as "the written, printed, or graphic matter on, or attached to, the pesticide or device or any of its containers or wrappers." The label is a legal document. Pesticides may not be used in any manner not permitted by the label. Pesticides can be used only on the plants, animals or sites specified in the directions for use. Higher doses, higher concentrations, or more frequent applications are not allowed. Directions for use, safety, mixing, diluting, storage, and disposal as well as restrictions on personnel re-entry time must be followed. The label is covered in detail in Chapter 2.

In regards to the label, FIFRA allows:

- application of a pesticide at a dosage, concentration, or frequency less than listed on the label, unless otherwise specified
- application of a pesticide against any target pest not listed on the label if the application is to a crop, animal, or site that is listed, and if applied at the label rate, using the application method specified on the label. (Caution must be used when applying this principle to vertebrate pests. Check with the Command PMC before implementing control programs.)
- use of any equipment or method of application which is not prohibited by the label
- mixing a pesticide or pesticides with a fertilizer if the mixture is not prohibited by the label
- mixing two or more pesticides, if all the dosages are at or below the recommended rate

1.1.2 Classification and Registration of Pesticides.

Under FIFRA, a pesticide manufacturer, in order to sell a pesticide product, must register that product with the EPA. If the EPA agrees to register the product, it will issue a registration number which shall be prominently displayed on all pesticide labels for that product. EPA will register the pesticide in one of two categories:

- "General Use" if the pesticide is not likely to harm humans or the environment when applied in accordance with its label directions
- "Restricted Use" if the pesticide could cause human injury or environmental damage even when applied in accordance with its label directions. A restricted use pesticide can only be applied by:

(1) A certified applicator, or

(2) Under the direct supervision of a certified applicator. "Under the direct supervision of a certified applicator" may have many different definitions depending on the State. It may mean within line of sight, within 5 miles, within 5 minutes, or available by telephone for consultation.

1.1.3 Certification of Applicators. Persons who are not certified pesticide applicators may not use restricted use pesticides unless they are under the direct supervision of a certified applicator.

Certification requires training and testing for competency in the safe and effective handling and use of restricted use pesticides. The states or the EPA (where there is no state plan) conduct training and testing for certification of commercial applicators. A state may impose stricter standards than those required by FIFRA. EPA requires each state to maintain a program to assure that applicators have current certification. QAEs should check with the Command PMC to determine certification requirements for a state.

States may develop agreements (reciprocity) with adjoining states to allow a certified applicator from one state to apply restricted use pesticides in the reciprocal state. Usually, the commercial applicator or company must pay certification or business license fees in the reciprocal state. PCQAEs should check with their Command PMC to determine if an out-of-state certification is valid in another state.

Certified applicators are classified as private applicators or commercial applicators.

1.1.3.1 Private Applicators. Private applicators are persons who may use or supervise the use of restricted use pesticides in producing an agricultural commodity on property owned or rented by themselves or their employer, or on the property of another person with whom they trade services, but not for hire. Examples of private applicators are farmers, ranchers, orchardists, and florists. Private applicators are trained and/or tested in the safe use and handling of pesticides and pest control practices associated with agricultural operations. Certification as a private applicator is only appropriate for individuals applying pesticides to agricultural outleases on DoD administered land. All other applicators must be certified as commercial applicators.

1.1.3.2 Commercial Applicators. Commercial applicators are persons who apply pesticides for hire on property other than their own for a fee or salary. Such applicators are commercial pest controllers, or employees of commercial firms, or governmental agencies. Commercial applicators are trained and tested in the general areas of safe use and handling of pesticides, and then receive further training in one or more specific categories of application.

Many states require that all applications of pesticides (general or restricted use) by commercial applicators be made under the supervision of a certified applicator.

EPA CERTIFICATION CATEGORIES

(1) Agricultural pest control (plant or animal)
(2) Forest pest control
(3) Ornamental and turf pest control
(4) Seed treatment
(5) Aquatic pest control
(6) Right-of-way pest control
(7) Industrial, institutional, structural, and health related pest control
(8) Public health pest control

(9) Regulatory pest control
(10) Demonstration and research pest control
(11) Aerial application

The categories most frequently required for pest control operations on Navy activities are categories, 2, 3, 5, 6, 7, and 8.

Some states may have sub-categories. An example may be that category 7 is split into: (1) bird control, (2) fumigation, (3) rodent control, and (4) termite control. The PCQAE should consult with the Command PMC to determine which categories of certification are required for specific pest control functions in their particular contract.

The Department of Defense (DoD) has an EPA approved plan for certification of applicators of restricted-use pesticides, which enables the DoD to certify DoD personnel. The DoD plan involves three phases.

(1) enrollment in the correspondence course NPWTC-150 concurrent with

(2) one to two years on-the-job training

(3) completion of a 2 - 4 week formal training course at one of the Navy Disease Vector Ecology Control Centers (DVECC)

1.1.4 Penalties.

1.1.4.1 Civil. Civil penalties (maximum of $5,000) are assessed when an applicator unknowingly violates a pesticide label. An example would be application of a pesticide to a site that was not on the label but which the individual thought was.

1.1.4.2 Criminal. Criminal penalties (maximum of $25,000 and/or 1 year in jail) are assessed when an individual knowingly violates the label. An example would be the application of a pesticide inside a house when the applicator knows it is labelled only for outdoor use. Usually the higher penalties or higher jail terms are imposed for actions that result in death or serious injury or environmental insult.

1.2 OTHER REGULATIONS GOVERNING PESTICIDES.

1.2.1 Transportation of Pesticides. The transportation of pesticides across state lines is regulated by the Department of Transportation (DoT). Interstate transport of pesticides require that:

- Pesticides must be in original packages that meet DoT standards
- Vehicles must have a correct sign identifying cargo

- Manufacturers put the correct warning signs on each package
- Pesticides are never hauled in the same vehicle with food products
- Transporters must contact DoT after any pesticide accident when someone is killed or hospitalized or when damage exceeds $50,000
- DoT must be informed of all pesticide spills during shipment

1.2.2 **Aerial Application of Pesticides.** The aerial application of pesticides is also regulated by the Federal Aviation Administration (FAA). These regulations:

- provide for testing of a pilot's competency
- set standards for the safety of an aircraft
- require that aerially delivered pesticides be applied in accordance with all label directions

Any aerial application of pesticides on DoD administered land must be approved by a Command PMC who is certified in Category 11: Aerial Application. An Aerial Validation Statement must be approved in advance as required by DoD directive 4150.7.

1.2.3 **Worker Safety Regulations.** Worker Safety Regulations are governed by the Occupational Safety & Health Act. The Act is administered by the Occupational Safety and Health Administration (OSHA) in the Department of Labor (DoL). The Act requires that:

- Firms that employ 11 or more people must keep records of all work related deaths, injuries, and illnesses. A record must be made and maintained if an injury involves:

  (1) medical treatment
  (2) restriction of work or motion
  (3) transfer to another job

- Material Safety Data Sheets (MSDS) must be kept on file and be available to employees.

The Hazard Communication Standard, 29 CFR 1910.1200, requires that all materials containing or which are on the list of hazardous materials must be labelled as such.

These regulations require investigations of employee complaints that may be related to pesticide use, re-entry, or accidents.

1.2.4 Resource Conservation and Recovery Act (RCRA). RCRA provides regulations which are applicable to the disposal of pesticides and pesticide containers. Implementation and enforcement of the regulations is performed at the state level. State laws and regulations associated with RCRA are applicable on federal installations.

1.2.5 Clean Water Act and Safe Drinking Water Act. The Clean Water Act and the Safe Drinking Water Act are implemented and enforced at the state level. The regulations will affect dispersal, disposal and in some cases restrict or ban the use of certain pesticides. The PCQAE should be familiar with regulations concerning these federal laws. Questions should be directed to the Command PMC.

1.2.6 Migratory Bird Treaty Act. The Migratory Bird Treaty Act is a federal law. This law protects all birds except:

- Feral Pigeons
- English Sparrows (House Sparrows)
- European Starlings

1.2.7 Wildlife Laws. Many species of birds and mammals are protected by state or federal laws. Federally protected species may not be controlled without obtaining permits from the U.S. Fish and Wildlife Service. Generally, contractors must obtain permits for the control of state protected species from the state. State regulations will be reviewed by the Command PMC to determine their applicability to Naval facilities. All applications for permits for the control of protected species should be coordinated with the Command PMC.

1.2.8 Endangered Species Act. EPA is required by The Endangered Species Act to ensure that pesticide use does not adversely effect endangered species or their critical habitat. Pesticide labels will direct users to contact their local USDA Cooperative Extension Service to obtain bulletins prescribing proper use of the pesticide in that county. Failure to follow the bulletin directions may result in prosecution under FIFRA or The Endangered Species Act.

1.2.9 Toxic Substances Control Act. EPA can limit or prevent the manufacture, sale, or import of products that are determined to be hazardous to human health or the environment. Although this authority could be used to ban pesticides manufacture, it is generally reserved for consumer products with wide distribution.

CHAPTER 2. LABELS, LABELING, AND MATERIAL SAFETY DATA SHEET (MSDS)

When a manufacturer intends to sell a pesticide it must be registered with the Environmental Protection Agency (EPA). Therefore, each pesticide that is purchased contains a label which provides instructions for the use of that product. In addition to the label, the manufacturer must publish a Material Safety Data Sheet (MSDS) for that product.

2.1 THE LABEL. The label is the information printed on, or attached to the container of pesticide. The label:

- is a legal document of which all instructions must be followed
- places a product under state or federal authority to control it's sale, storage and disposal
- provides information on how to mix, apply, and dispose of the pesticide
- provides information on personal and environmental protection
- provides information which addresses spill, accident, or medical emergencies
- was, at the time of issue, reviewed and approved by the EPA and was accepted as being accurate and valid at the date of issue

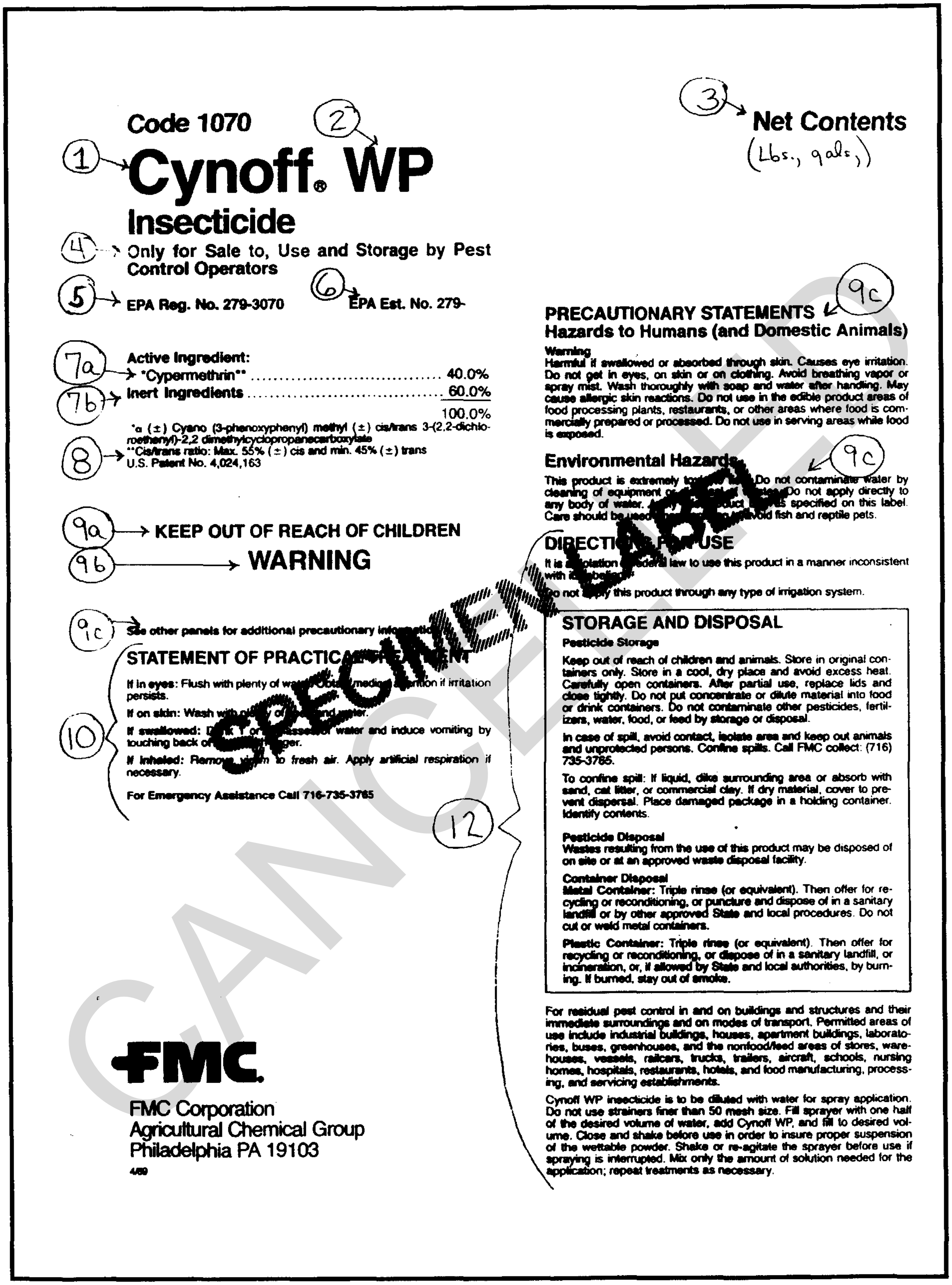
2.2 LABELING. Labeling is all information that is provided by a manufacturer about their pesticide product. Labeling, like the label, is a legal document. It's instructions must be followed. Labeling includes:

- the legal document which accompanies the pesticide container
- any supplemental information accompanying the product. This may include:
  - brochures
  - leaflets
  - other pertinent information provided by the manufacturer

2.3 PARTS OF THE LABEL.

2.3.1 **Brand Name.** (Figure 2-1,#1) Manufacturers may use different brand names for the same pesticide active ingredient. Most companies register each brand name as a trademark. The brand or trade name is the one used in advertising. The brand name is shown plainly on the front panel of the label. Companies may use similar names to designate pesticides with different active ingredients. For example:

- Tersan^{R} LSR = zinc and maneb
- Tersan^{R} SP = chloroneb



Code 1070 (2)

(1) Cynoff® WP

Insecticide

(4) Only for Sale to, Use and Storage by Pest Control Operators

(5) EPA Reg. No. 279-3070 (6) EPA Est. No. 279-

(3) Net Contents

(Lbs., gals,)

Active Ingredient:

(7a) *Cypermethrin**	40.0%
(7b) Inert Ingredients	60.0%
	100.0%

*α (±) Cyano (3-phenoxyphenyl) methyl (±) cis/trans 3-(2,2-dichloroethenyl)-2,2 dimethylcyclopropanecarboxylate

(8) **Cis/trans ratio: Max. 55% (±) cis and min. 45% (±) trans

U.S. Patent No. 4,024,163

(9a) KEEP OUT OF REACH OF CHILDREN

(9b) WARNING

(9c) S[illegible]e other panels for additional precautionary info[illegible]

(10)

STATEMENT OF PRACTICA[illegible]ENT

If in eyes: Flush with plenty of wa[illegible] Obt[illegible] medic[illegible] [illegible]ntion if irritation persists.

If on skin: Wash with [illegible] of [illegible] and water.

If swallowed: D[illegible]k 1 or [illegible]asses of water and induce vomiting by touching back of [illegible]ger.

If inhaled: Remov[illegible] to fresh air. Apply artificial respiration if necessary.

For Emergency Assistance Call 716-735-3785

FMC

FMC Corporation
Agricultural Chemical Group
Philadelphia PA 19103

4/89

PRECAUTIONARY STATEMENTS (9c)

Hazards to Humans (and Domestic Animals)

Warning

Harmful if swallowed or absorbed through skin. Causes eye irritation. Do not get in eyes, on skin or on clothing. Avoid breathing vapor or spray mist. Wash thoroughly with soap and water after handling. May cause allergic skin reactions. Do not use in the edible product areas of food processing plants, restaurants, or other areas where food is commercially prepared or processed. Do not use in serving areas while food is exposed.

Environmental Hazards (9c)

This product is extremely to[illegible] Do not contaminate water by cleaning of equipment o[illegible]. Do not apply directly to any body of water. [illegible]duct [illegible]s specified on this label. Care should be used [illegible] avoid fish and reptile pets.

(12)

DIRECTI[illegible] USE

It is a[illegible]olation [illegible]ederal law to use this product in a manner inconsistent with i[illegible]beling.

[illegible]o not [illegible]ly this product through any type of irrigation system.

STORAGE AND DISPOSAL

Pesticide Storage

Keep out of reach of children and animals. Store in original containers only. Store in a cool, dry place and avoid excess heat. Carefully open containers. After partial use, replace lids and close tightly. Do not put concentrate or dilute material into food or drink containers. Do not contaminate other pesticides, fertilizers, water, food, or feed by storage or disposal.

In case of spill, avoid contact, isolate area and keep out animals and unprotected persons. Confine spills. Call FMC collect: (716) 735-3785.

To confine spill: If liquid, dike surrounding area or absorb with sand, cat litter, or commercial clay. If dry material, cover to prevent dispersal. Place damaged package in a holding container. Identify contents.

Pesticide Disposal

Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

Container Disposal

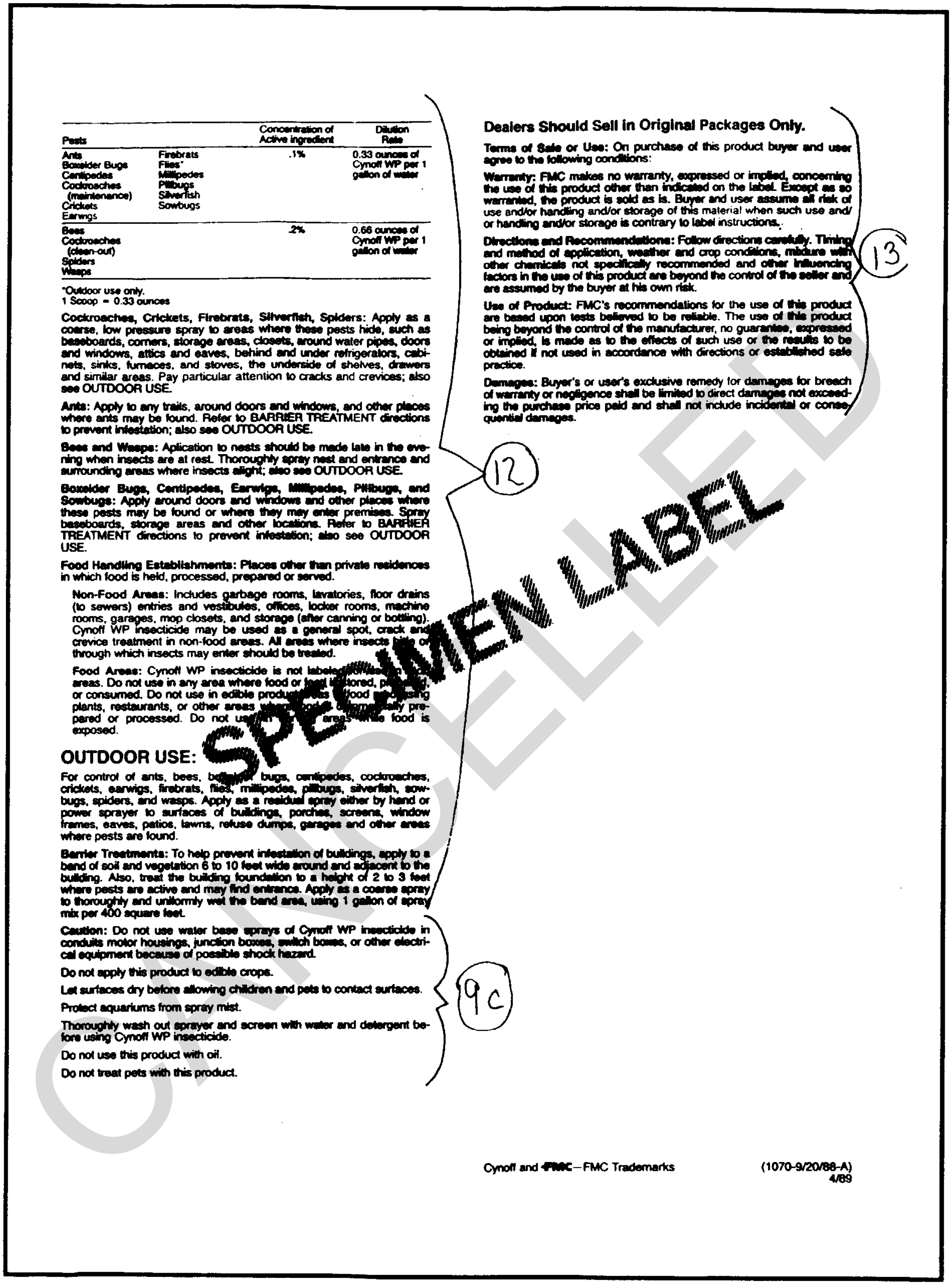
Metal Container: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill or by other approved State and local procedures. Do not cut or weld metal containers.

Plastic Container: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or dispose of in a sanitary landfill, or incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

For residual pest control in and on buildings and structures and their immediate surroundings and on modes of transport. Permitted areas of use include industrial buildings, houses, apartment buildings, laboratories, buses, greenhouses, and the nonfood/feed areas of stores, warehouses, vessels, railcars, trucks, trailers, aircraft, schools, nursing homes, hospitals, restaurants, hotels, and food manufacturing, processing, and servicing establishments.

Cynoff WP insecticide is to be diluted with water for spray application. Do not use strainers finer than 50 mesh size. Fill sprayer with one half of the desired volume of water, add Cynoff WP, and fill to desired volume. Close and shake before use in order to insure proper suspension of the wettable powder. Shake or re-agitate the sprayer before use if spraying is interrupted. Mix only the amount of solution needed for the application; repeat treatments as necessary.

Figure 2-1
Sample Pesticide Label



Pests		Concentration of Active ingredient	Dilution Rate
Ants Boxelder Bugs Centipedes Cockroaches (maintenance) Crickets Earwigs	Firebrats Flies* Millipedes Pillbugs Silverfish Sowbugs	.1%	0.33 ounces of Cynoff WP per 1 gallon of water
Bees Cockroaches (clean-out) Spiders Wasps		.2%	0.66 ounces of Cynoff WP per 1 gallon of water

*Outdoor use only.
1 Scoop = 0.33 ounces

Cockroaches, Crickets, Firebrats, Silverfish, Spiders: Apply as a coarse, low pressure spray to areas where these pests hide, such as baseboards, corners, storage areas, closets, around water pipes, doors and windows, attics and eaves, behind and under refrigerators, cabinets, sinks, furnaces, and stoves, the underside of shelves, drawers and similar areas. Pay particular attention to cracks and crevices; also see OUTDOOR USE.

Ants: Apply to any trails, around doors and windows, and other places where ants may be found. Refer to BARRIER TREATMENT directions to prevent infestation; also see OUTDOOR USE.

Bees and Wasps: Aplication to nests should be made late in the evening when insects are at rest. Thoroughly spray nest and entrance and surrounding areas where insects alight; also see OUTDOOR USE.

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Boxelder Bugs, Centipedes, Earwigs, Millipedes, Pillbugs, and Sowbugs: Apply around doors and windows and other places where these pests may be found or where they may enter premises. Spray baseboards, storage areas and other locations. Refer to BARRIER TREATMENT directions to prevent infestation; also see OUTDOOR USE.

Food Handling Establishments: Places other than private residences in which food is held, processed, prepared or served.

Non-Food Areas: Includes garbage rooms, lavatories, floor drains (to sewers) entries and vestibules, offices, locker rooms, machine rooms, garages, mop closets, and storage (after canning or bottling). Cynoff WP insecticide may be used as a general spot, crack and crevice treatment in non-food areas. All areas where insects hide or through which insects may enter should be treated.

Food Areas: Cynoff WP insecticide is not labeled for use in food areas. Do not use in any area where food or feed is stored, prepared, or consumed. Do not use in edible product areas of food processing plants, restaurants, or other areas where food is commercially prepared or processed. Do not use in food areas while food is exposed.

OUTDOOR USE:

For control of ants, bees, boxelder bugs, centipedes, cockroaches, crickets, earwigs, firebrats, flies, millipedes, pillbugs, silverfish, sowbugs, spiders, and wasps. Apply as a residual spray either by hand or power sprayer to surfaces of buildings, porches, screens, window frames, eaves, patios, lawns, refuse dumps, garages and other areas where pests are found.

Barrier Treatments: To help prevent infestation of buildings, apply to a band of soil and vegetation 6 to 10 feet wide around and adjacent to the building. Also, treat the building foundation to a height of 2 to 3 feet where pests are active and may find entrance. Apply as a coarse spray to thoroughly and uniformly wet the band area, using 1 gallon of spray mix per 400 square feet.

Caution: Do not use water base sprays of Cynoff WP insecticide in conduits motor housings, junction boxes, switch boxes, or other electrical equipment because of possible shock hazard.

Do not apply this product to edible crops.

Let surfaces dry before allowing children and pets to contact surfaces.

Protect aquariums from spray mist.

Thoroughly wash out sprayer and screen with water and detergent before using Cynoff WP insecticide.

Do not use this product with oil.

Do not treat pets with this product.

9c

Dealers Should Sell in Original Packages Only.

Terms of Sale or Use: On purchase of this product buyer and user agree to the following conditions:

Warranty: FMC makes no warranty, expressed or implied, concerning the use of this product other than indicated on the label. Except as so warranted, the product is sold as is. Buyer and user assume all risk of use and/or handling and/or storage of this material when such use and/or handling and/or storage is contrary to label instructions.

Directions and Recommendations: Follow directions carefully. Timing and method of application, weather and crop conditions, mixture with other chemicals not specifically recommended and other influencing factors in the use of this product are beyond the control of the seller and are assumed by the buyer at his own risk.

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Use of Product: FMC's recommendations for the use of this product are based upon tests believed to be reliable. The use of this product being beyond the control of the manufacturer, no guarantee, expressed or implied, is made as to the effects of such use or the results to be obtained if not used in accordance with directions or established safe practice.

Damages: Buyer's or user's exclusive remedy for damages for breach of warranty or negligence shall be limited to direct damages not exceeding the purchase price paid and shall not include incidental or consequential damages.

Cynoff and FMC—FMC Trademarks

(1070-9/20/88-A)
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Figure 2-1 (Con't)
Sample Pesticide Label

- Tersan^{R} 1991 = benomyl
- Tersan^{R} = thiram

The brand name may not be a reliable method of identifying the active ingredient of the pesticide.

2.3.2 Type of Pesticide. The type of pesticide, or the intended use of the pesticide must be listed on the label. The term is usually printed in proximity to the brand name. Examples are:

- insecticide
- rodenticide
- herbicide
- fungicide
- nematicide

2.3.3 Formulation. (Figure 2-1,#2) The type of formulation is noted on the label. Sometimes an acronym or abbreviation of the formulation type is used as part of the brand name. Examples are:

- Malathion 93EC: a 93% emulsifiable concentrate
- Dursban 4E: a four(4) pound/gallon emulsifiable concentrate formulation
- Ficam WP: a wettable powder formulation

2.3.4 Net Contents. (Figure 2-1,#3) The label must list the total amount of material in the container.

2.3.5 Ingredient Statement. The ingredient statement is a list of what is in the product (Figure 2-1,#7a,#7b). It is written so that the ingredients, and their amount (in percent) are easily seen. The ingredient list must use official chemical and/or common names.

2.3.5.1 Active Ingredient (AI). The active ingredient or ingredients are that part or parts of the pesticide which will kill pests or prevent damage by them. These ingredients are listed by percent (%) (Figure 2-1,#7a) of the overall weight of the package. If more than one AI is in the package, they will be listed in descending order of quantity.

Common Name. (Figure 2-1,#7a) The AI may be given a common name because of the complexity of the chemical name. Common names must be officially accepted by EPA. They are a valid way of identifying the active ingredient(s). For example, diazinon is the common name of a widely used insecticide.

Chemical Name. (Figure 2-1,#8) This is the scientific name of the active ingredient(s). The scientific name will always be given. Generally it is listed in the ingredients section of the label. For example, the chemical name of diazinon is 0,0-Diethyl 0-(2-isopropyl-6- methyl-4-pyrimidinyl) phosphorothioate.

Pesticide selection according to official common name or chemical name will ensure use of the exact active ingredient.

2.3.5.2 Inert Ingredients. (Figure 2-1,#7b) Inert ingredients are the inactive (non-killing) part of a pesticide formulation. The inert ingredients will not destroy or prevent damage by a pest if used by itself. There may be many inert ingredients used in the formulation of a pesticide. However, current FIFRA regulations state that only the total percentage (%) of the inert ingredients must be listed. Currently there is legislative action which may change this to a complete listing (including %) of all inert ingredients.

Common inert ingredients are solvents, emulsifiers, perfumes, and diluents. These items may be necessary for the proper formulation or dispersal of the pesticide. They may provide some other quality such as odor masking.

2.3.6 Use Classification. Depending on the potential hazard of the pesticide to personnel and the environment, it may be classified by the EPA as either a **restricted use** or a **general use** pesticide.

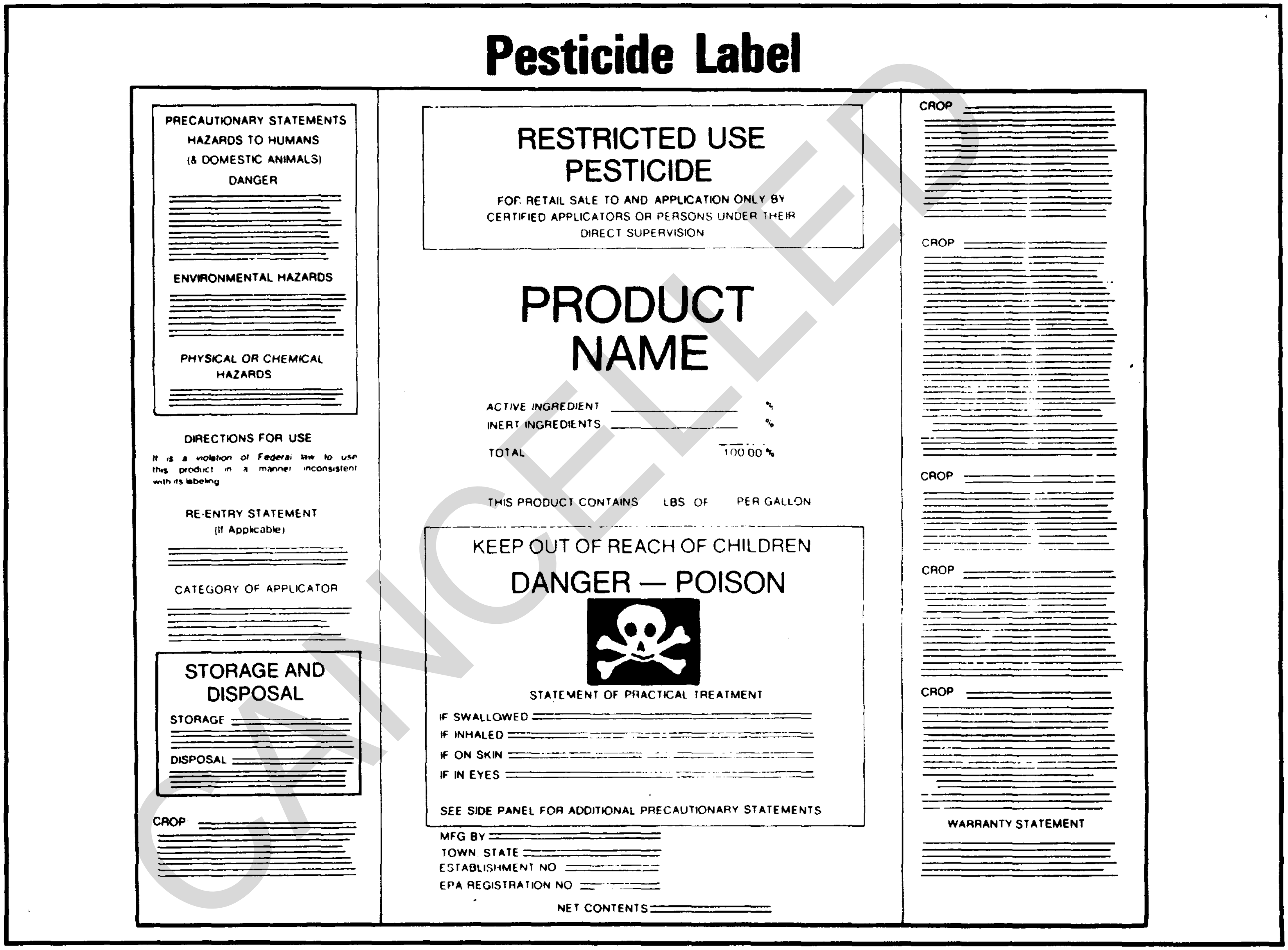
2.3.6.1 Restricted Use. (Figure 2-2). If a pesticide is "restricted use" the following statement will be displayed in a prominent place, generally at the top of the front panel of the label.

RESTRICTED USE PESTICIDE
For retail sale and use only by certified applicators or persons under their direct supervision, and only for those uses covered by the applicator's certification

2.3.6.2 General Use. Since the pesticide Cynoff WP (Figure 2-1) is not classified as restricted use, it is general use. However, on this label, the manufacturer has stated that this product is only for sale to, use and storage by pest control operators.

2.3.7 Signal Words and Symbols. (Figure 2-1,#9a,#9b) Every label contains a signal word which indicates the toxicity of the pesticide (Figure 2-3). The signal word must be prominently displayed. It will be accompanied by the statement:

"Keep Out of Reach of Children"



Pesticide Label

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS
(& DOMESTIC ANIMALS)
DANGER

ENVIRONMENTAL HAZARDS

PHYSICAL OR CHEMICAL HAZARDS

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling

RE-ENTRY STATEMENT
(If Applicable)

CATEGORY OF APPLICATOR

STORAGE AND DISPOSAL

STORAGE

DISPOSAL

CROP

RESTRICTED USE PESTICIDE

FOR RETAIL SALE TO AND APPLICATION ONLY BY CERTIFIED APPLICATORS OR PERSONS UNDER THEIR DIRECT SUPERVISION

PRODUCT NAME

ACTIVE INGREDIENT ________ %
INERT INGREDIENTS ________ %
TOTAL 100.00 %

THIS PRODUCT CONTAINS LBS OF PER GALLON

KEEP OUT OF REACH OF CHILDREN

DANGER — POISON

STATEMENT OF PRACTICAL TREATMENT

IF SWALLOWED
IF INHALED
IF ON SKIN
IF IN EYES

SEE SIDE PANEL FOR ADDITIONAL PRECAUTIONARY STATEMENTS

MFG BY
TOWN, STATE
ESTABLISHMENT NO
EPA REGISTRATION NO

NET CONTENTS

CROP

CROP

CROP

CROP

CROP

WARRANTY STATEMENT

Figure 2-2
Sample Restricted Use Pesticide Label

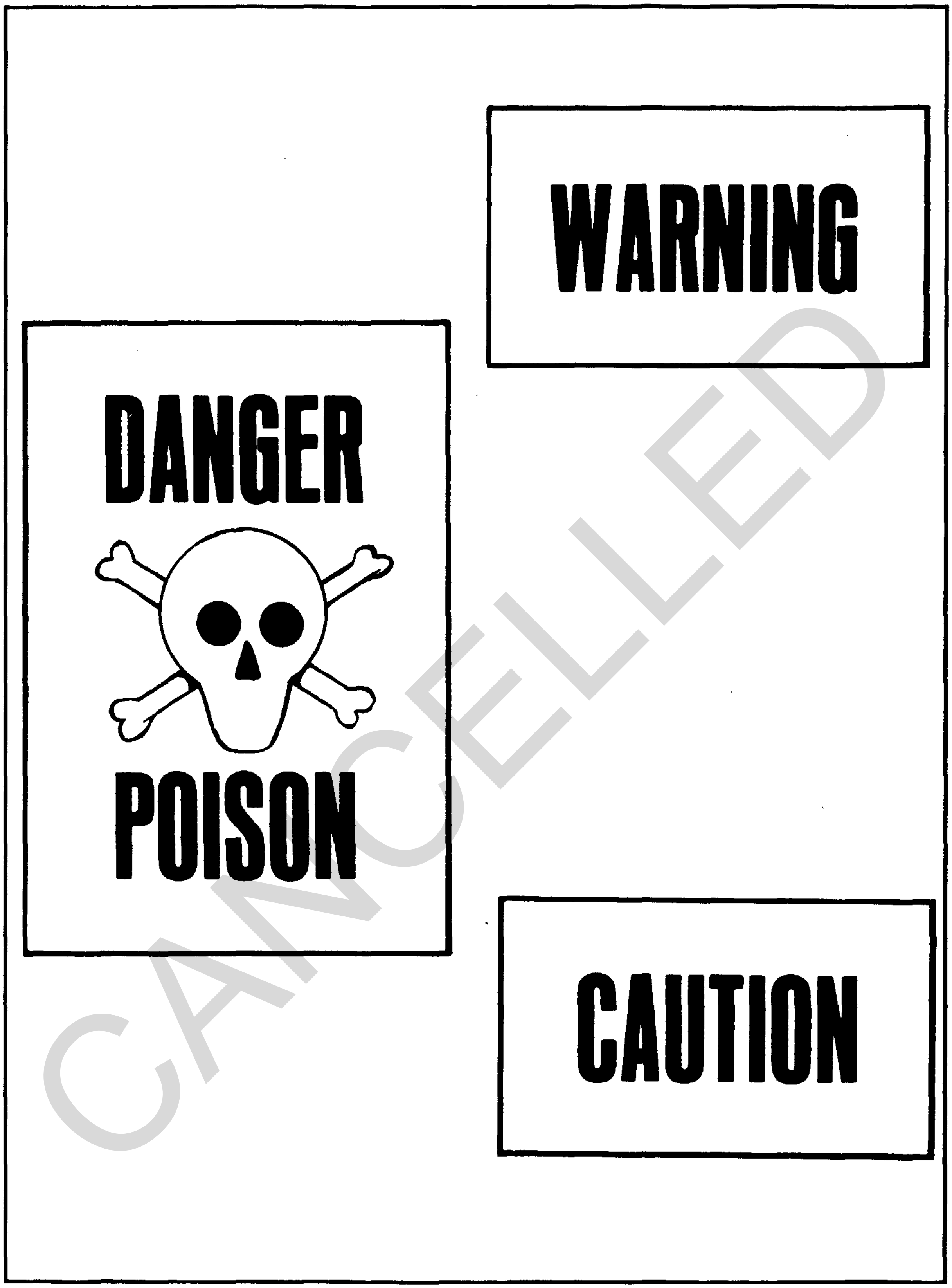


Figure 2-3
Signal Words

which must appear on every pesticide label.

2.3.7.1 "Danger": (Figure 2-2) This signal word indicates the pesticide is highly corrosive or highly toxic. Highly corrosive materials pose a severe eye or skin burning hazard.

Pesticides which are highly toxic pose a significant hazard when absorbed through the skin, ingested, or inhaled. These materials will also be marked "POISON" in large red letters, plus will have the skull and cross/bones symbol. Highly toxic pesticides have an oral LD_{50} (lethal dose required to kill 50% of a test poplulation) of 0 - 50 mg of pesticide per kg of body weight. A taste to a teaspoonful taken by mouth would kill an average sized adult.

2.3.7.2 "Warning": (Figure 2-1,#9b) Warning as the signal word indicates that the pesticide is moderately toxic, with an oral LD_{50} of 50 - 500 mg/kg. As little as a teaspoonful to a ounce by mouth could kill an average sized adult.

2.3.7.3 "Caution": This signal word indicates that the product is slightly toxic, with an oral LD_{50} of 500 mg/kg - 5000 mg/kg. An ounce to over a pint taken by mouth would be required to kill an average sized adult.

2.3.8 EPA Registration and EPA Establishment Numbers. (Figure 2-1,#5,#6) The Environmental Protection Agency registration number (example: EPA Reg. No. 279-3070) indicates that the pesticide label has been approved by the Federal government. States with special local needs may register a product. Registration would be as, EPA SLN No. VA-554432. SLN indicates "special local need", and VA indicates registration for use in Virginia.

The establishment number (EPA Est. 279-) identifies the manufacturing facility that produced the product.

2.3.9 Precautionary Statements. (Figure 2-1,#9c) All pesticide labels contain statements to alert applicators and others who may be exposed to the pesticide. Sometimes these statements are listed under the heading, "Hazards to Humans and Domestic Animals". This specific label refers to "additional panels". The following are examples of precautionary statements:

2.3.9.1 Route of Entry Statements. This precautionary statement generally follows the signal word, or is referred to immediately following the signal word. This statement indicates the possible routes of entry (mouth, skin, lungs, etc.) which require protection. Many pesticides are hazardous through a number of routes, therefore the PCQAE should read the label thoroughly for his own protection as well as others. Examples of route of entry statements are:

- fatal if swallowed
- poisonous if inhaled
- harmful if swallowed
- may be harmful if inhaled
- extremely hazardous by skin contact

2.3.9.2 Specific Action Statements. These usually follow the route of entry statements, and recommend specific action to be taken to prevent accidental poisoning. These actions are directly related to the toxicity (signal word) of the pesticides, and the routes of entry to be protected. Examples of action statements are:

- do not breath vapors or spray mist
- do not get on skin or clothing
- avoid contact with skin or clothing
- avoid getting in eyes
- do not use in serving areas while food is exposed

2.3.9.3 Protective Clothing and Equipment Statements. The protective clothing and equipment that a label requires will vary. Many labels will carry no statement at all, however the lack of a statement does not rule out the requirement for protection. The best way to determine if protective clothing is needed is to note the signal word, the route of entry statements, and the precautionary statements. Follow the recommendations for protective clothing and equipment indicated on the label.

Some labels do not require long sleeved shirts, long legged trousers, and gloves. However, PCQAE's should wear these when inspecting operations in progress. Some labels may list the need for respirators and indicate the type of respirator to be worn.

2.3.9.4 Physical or Chemical Hazard Statements. Some pesticides contain active or inert ingredients which may ignite or corrode. Statements which may appear on the label are:

- Flammable - Do not use or store near heat or open flame.
- Corrosive - Store only in corrosion resistant tank

2.3.9.5 Re-entry Statement. Some pesticides contain a re-entry precaution. This statement will tell how much time must pass before people or animals can reenter a treated area without protective clothing and equipment. Re-entry times are set by the EPA or by State regulatory agencies.

Sometimes state re-entry times will not be listed on the label, however it is the responsibility of the applicator to determine if one has been set. The PCQAE should obtain the state established re-entry times. The Command Pest Management Consultant (PMC) may be of assistance.

Ignoring re-entry intervals is ILLEGAL.

Minimum suggested protective clothing for early re-entry for outdoor treatments are:

- long sleeved shirt
- coveralls or long legged trousers
- hat
- non-absorbent shoes
- gloves

For early re-entry in enclosed areas, a respirator, gas mask, or Self-Contained Breathing Apparatus (SCBA) may be necessary.

The re-entry statement may be under the heading "Reentry", or listed following "Note:", "Important", or "General Information".

If no re-entry statement appears on the label and no interval has been set by your State, then Navy policy states that the spray must be dry or the dust settled before re-entry is permitted.

2.3.9.6 Environmental Hazard Statements. (Figure 2-1,#9c) If used improperly, pesticides may be harmful to the environment. Watch for special warning statements concerning such hazards. Hazard statements are not always located in the same place on the label. Environmental hazard statements may be listed after "Note:" or "Important:". You should search the label for such statements.

In particular, restricted use pesticides may pose a serious threat to our environment. Examples of environmental hazard statements are:

- this product is highly toxic to bees
- this product is toxic to fish
- this product is toxic to birds and other wildlife
- do not apply when runoff is likely to occur
- do not apply when weather conditions favor drift from the target area

2.3.9.7 Endangered Species Statements. Some pesticides may be determined by the EPA to pose risks to endangered species or their critical habitats. The pesticide label will direct the user to contact the local USDA Cooperative Extension Service office to obtain a bulletin for the county in which the pesticide is to be applied. These bulletins are considered labeling. Failure to follow the instructions on the bulletin is a violation of both FIFRA and the Endangered Species Act.

2.3.9.8 Other Precautionary Statements. These statements include other precautions to take while handling the product. Some examples are:

- do not contaminate food
- remove and wash contaminated clothing before reuse
- wash after handling and before eating or smoking
- do not allow domestic animals or children into treated areas

2.3.9.9 Hidden Precautionary Statements. [(Figure 2-1,(con't)#9c] Since labeling structure can vary, some precautionary statements will not be listed or referred to directly after the signal words. This particular label has segregated the outdoor use instructions and precautionary statements from the indoor use instructions. This is a good example of why it is essential to **read the entire label.**

2.3.10 Statement of Practical Treatment. (Figure 2-1,#10) These statements indicate the appropriate first aid treatments in case of poisoning. Examples are:

- in case of contact with skin, wash immediately with plenty of soap and water
- in case of contact with eyes, flush with water for 15 minutes and get medical attention
- if swallowed, drink large quantities of milk, egg white, or water
- do not induce vomiting
- if swallowed induce vomiting

All "DANGER" and some "WARNING" and "CAUTION" labels contain a note to physicians describing appropriate medical procedures for poisoning emergencies and may identify an antidote.

2.3.11 Name and Address of Manufacturer. (Figure 2-1) The manufacturer's name and address must be on the label.

2.3.12 Directions for Use. (Figure 2-1) The instructions will tell you:

- pests which can be controlled (pests not on the label may be controlled if the application is to a site indicated on the label)
- crop, animal or site to be protected by the product

- mixing instructions
- the proper equipment to be used
- maximum application rate
- permissible application methods
- compatibility with other frequently used products
- phytotoxicity and other possible injury or staining problems
- where the material should be applied
- when it should be applied

2.3.13 **Storage and Disposal.** (Figure 2-1) Pesticide labels address storage and disposal requirements. State and local laws vary considerably, so specific local instructions usually are not included. The applicator and the PCQAE should be aware of local requirements. Typical statements are:

- not for storage in or around the home
- store away from fertilizers, or insecticides, or fungicides, or seeds, etc.
- store at temperatures above 32°F (O°C)
- do not re-use container
- do not contaminate water, food, or feed by storage or disposal

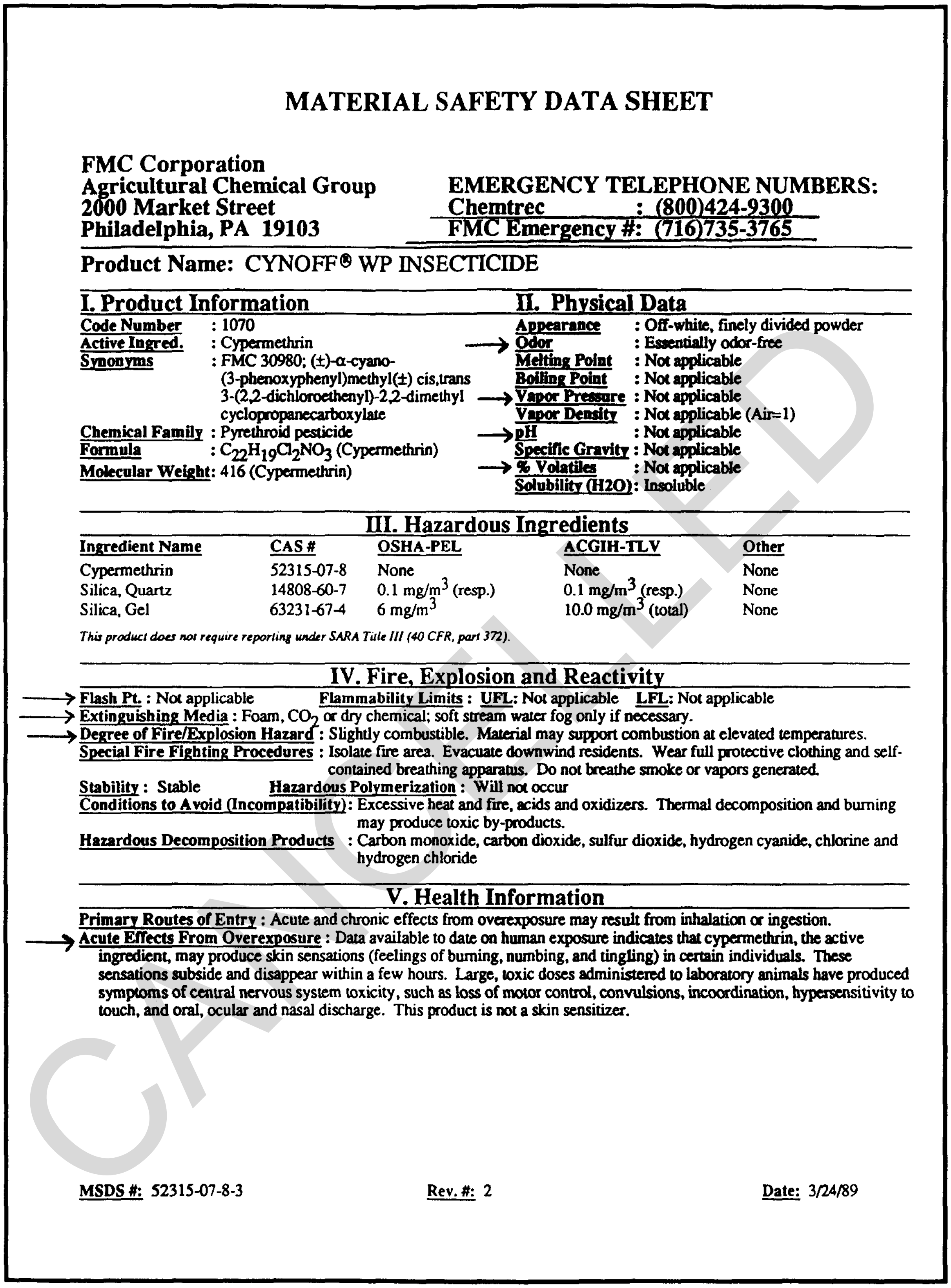
These statements may appear in a special section titled "Storage and Disposal" or under the headings "Important", "Note", or "General Instructions".

REMEMBER: READ THE ENTIRE LABEL. IT IS THE LAW.

2.4 MATERIAL SAFETY DATA SHEETS (MSDS).

Hazard Communication Standard 29 CFR 1910.1200, (OSHA Employee Right-To-Know Requirements) requires the publication of an accurate and complete MSDS by the manufacturer. The MSDS, while not part of labeling, must be provided. The MSDS contains valuable information which may not be found in the label.

- **Product Information.** (Figure 2-4,I) The Active Ingredient (AI), any synonyms for the active ingredient, and the chemical family to which the AI belongs are presented here.
- **Physical Data.** (Figure 2-4,II) Significant information such as odor, vapor pressure, pH, and % volatiles are provided in this section.
- **Hazardous Ingredients.** (Figure 2-4,III) Information on the AI and any hazardous inert ingredients are listed here.



MATERIAL SAFETY DATA SHEET

FMC Corporation
Agricultural Chemical Group
2000 Market Street
Philadelphia, PA 19103

EMERGENCY TELEPHONE NUMBERS:
Chemtrec : (800)424-9300
FMC Emergency #: (716)735-3765

Product Name: CYNOFF® WP INSECTICIDE

I. Product Information

Code Number : 1070
Active Ingred. : Cypermethrin
Synonyms : FMC 30980; (±)-α-cyano-(3-phenoxyphenyl)methyl(±) cis,trans 3-(2,2-dichloroethenyl)-2,2-dimethyl cyclopropanecarboxylate
Chemical Family : Pyrethroid pesticide
Formula : $C_{22}H_{19}Cl_2NO_3$ (Cypermethrin)
Molecular Weight: 416 (Cypermethrin)

II. Physical Data

Appearance : Off-white, finely divided powder
→ **Odor** : Essentially odor-free
Melting Point : Not applicable
Boiling Point : Not applicable
→ **Vapor Pressure** : Not applicable
Vapor Density : Not applicable (Air=1)
→ **pH** : Not applicable
Specific Gravity : Not applicable
→ **% Volatiles** : Not applicable
Solubility (H2O): Insoluble

III. Hazardous Ingredients

Ingredient Name	CAS #	OSHA-PEL	ACGIH-TLV	Other
Cypermethrin	52315-07-8	None	None	None
Silica, Quartz	14808-60-7	0.1 mg/m^3 (resp.)	0.1 mg/m^3 (resp.)	None
Silica, Gel	63231-67-4	6 mg/m^3	10.0 mg/m^3 (total)	None

This product does not require reporting under SARA Title III (40 CFR, part 372).

IV. Fire, Explosion and Reactivity

→ **Flash Pt.** : Not applicable **Flammability Limits** : **UFL**: Not applicable **LFL**: Not applicable
→ **Extinguishing Media** : Foam, CO_2 or dry chemical; soft stream water fog only if necessary.
→ **Degree of Fire/Explosion Hazard** : Slightly combustible. Material may support combustion at elevated temperatures.
Special Fire Fighting Procedures : Isolate fire area. Evacuate downwind residents. Wear full protective clothing and self-contained breathing apparatus. Do not breathe smoke or vapors generated.
Stability : Stable **Hazardous Polymerization** : Will not occur
Conditions to Avoid (Incompatibility): Excessive heat and fire, acids and oxidizers. Thermal decomposition and burning may produce toxic by-products.
Hazardous Decomposition Products : Carbon monoxide, carbon dioxide, sulfur dioxide, hydrogen cyanide, chlorine and hydrogen chloride

V. Health Information

Primary Routes of Entry : Acute and chronic effects from overexposure may result from inhalation or ingestion.

→ **Acute Effects From Overexposure** : Data available to date on human exposure indicates that cypermethrin, the active ingredient, may produce skin sensations (feelings of burning, numbing, and tingling) in certain individuals. These sensations subside and disappear within a few hours. Large, toxic doses administered to laboratory animals have produced symptoms of central nervous system toxicity, such as loss of motor control, convulsions, incoordination, hypersensitivity to touch, and oral, ocular and nasal discharge. This product is not a skin sensitizer.

MSDS #: 52315-07-8-3 **Rev. #:** 2 **Date:** 3/24/89

Figure 2-4
Sample MSDS

MATERIAL SAFETY DATA SHEET

Product Name: CYNOFF® WP INSECTICIDE

V. Health Information (cont.)

Chronic Effects From Overexposure : In studies with laboratory animals, cypermethrin did not cause reproductive toxicity, teratogenicity, or neurotoxicity in laboratory animals or carcinogenicity in male and female rats and male mice. Cypermethrin caused an increased incidence of benign lung tumors in female mice at 1600 ppm in the diet. The EPA concluded on a weight of evidence approach that cypermethrin presents a low oncogenic potential to female mice at this dose level (approximately 228 mg/kg/day). Liver enlargement is often noted in laboratory animals ingesting large doses of cypermethrin during their life span. An overall lack of genotoxicity has been demonstrated in tests of mutagenicity, DNA damage, and chromosome aberrations. This product contain > 0.1% crystalline silica. Chronic effects attributed to crystalline silica are silicosis and other lung disorders. IARC (1987) indicates that there is sufficient evidence for carcinogenicity of crystalline silica in experimental animals, and limited evidence for carcinogenicity in humans.

Medical Conditions Aggravated by Exposure : None presently known

Carcinogenicity : **NTP** : No **IARC** : Yes (crystalline silica) **OSHA** : No

VI. Emergency and First Aid Procedures

Eyes : Wash eyes with plenty of water. Obtain medical attention if irritation occurs and persists.

Skin : Wash with plenty of soap and water.

Inhalation : Remove to fresh air. Apply artificial respiration if necessary.

Ingestion : Call a physician or poison control center. Drink 1 or 2 glasses of water, and induce vomiting by touching back of throat with finger or by giving syrup of ipecac, followed by 1-2 glasses of water. Do not administer milk, cream or other substances containing vegetable or animal fats, which enhance absorption of cypermethrin. Do not induce vomiting or give anything by mouth to an unconscious person.

Note to Physician : Cypermethrin may produce a burning or tingling sensation on contact with tender skin areas such as the face. This "pyrethroid reaction" is a reversible reaction which lasts up to 12 hours. Ordinary skin salves have been found useful in reducing skin discomfort.

VII. Employee Protective Requirements

Ventilation : Thoroughly ventilate all transport vehicles prior to unloading. Store in a well-ventilated area. Use local exhaust at all process locations to control employee exposure.

Work Clothing : For normal handling, wear long-sleeved uniform or coveralls and head covering. For larger exposures as in the case of spills, wear full body cover barrier suit such as a rubber rain suit.

Eye Protection : For dust exposure, wear chemical protective goggles. Emergency eyewash fountain should be located nearby.

Respiratory Prot. : For dust exposure, wear a full-face or half-face air-purifying respirator which is NIOSH/MSHA approved for pesticides. Respirator selection is based on airborne concentration.

Gloves : Wear chemical protective gloves made of neoprene. Inspect regularly for leaks.

VIII. Storage, Spill, and Waste Disposal Procedures

Storage and Handling : Store in a cool, dry, well-ventilated place. Avoid excess heat. Store in original containers only. Keep out of reach of children and animals. Do not contaminate other pesticides, fertilizers, water, food or feed by storage or disposal. Wash exposed skin surfaces before smoking, drinking or eating. Shower at the end of each work day. Launder all clothing before reuse.

Spill or Leak : Isolate and post spill area. Wear prescribed protective clothing and equipment. Keep out animals and unprotected persons. Keep material out of streams and sewers. Large spills should be covered to prevent dispersal. Vacuum or shovel wastes into an approved drum. To decontaminate spill area, tools and equipment, wash with a suitable solution (i.e., organic solvent, detergent, bleach or caustic), and add the solution to the drums of wastes already collected. Label drums for contents. Dispose of drummed wastes, including decontamination solution, according to the method outlined below under "Waste Disposal".

Waste Disposal : Open dumping or burning of this material or its packaging is prohibited. An acceptable method of disposal is to burn in an incinerator in accordance with all local, state and federal environmental laws, rules, standards and regulations. Because acceptable methods of disposal may vary by location, and because regulatory requirements may change, the appropriate regulatory agencies should be contacted prior to disposal. Metal containers which held these materials may be cleaned by being triple-rinsed, and recycled, with the rinsate being incinerated.

IX. Shipping Description

DOT : Not regulated. Insecticide, Agricultural, Dry.

UN : Not regulated. Insecticide, Agricultural, Dry.

This document has been prepared to meet the employee right-to-know requirements of the OSHA Hazard Communication Standard, 29 CFR 1910.1200. The information contained herein is for the material as packaged.

MSDS #: 52315-07-8-3 **Rev. #:** 2 **Date:** 3/24/89

Cynoff and FMC - FMC Trademarks

Figure 2-4 (Con't)
Sample MSDS

- **Fire, Explosion and Reactivity.** (Figure 2-4,IV) Valuable information such as flash point, extinguishing media, any special fire fighting procedures and hazardous decomposition products are provided here.
- **Health Information.** (Figure 2-4,V) This section will provide additional health related information which may not be found on the label.
- **Emergency and First Aid Procedures.** (Figure 2-4,VI) Additional information which may not be found on the label will be stated here.
- **Employee Protective Requirements.** (Figure 2-4,VII) This is valuable information to personnel applying the pesticide. The information in this section will probably be more complete than the information found on the label.
- **Storage, Spill and Waste Disposal Procedures.** (Figure 2-4,VIII) Know these procedures thoroughly. Make sure that the contractor knows them as well. More on spills will be provided in Chapter 7.

CHAPTER 3. VEHICLE SAFETY AND SECURITY

Transportation of pesticides pose a risk of accidents and spills that are potentially hazardous to humans and the environment. Therefore, vehicle safety and security shall be considered a priority item on military installations.

A variety of laws and regulations have been designed to reduce the risk of accidents. Vehicle requirements in pest control contracts are designed to supplement these laws and regulations. The purpose is to prevent or decrease the number and severity of pesticide mishaps.

The PCQAE should note any vehicular discrepancies and bring them to the attention of the contracting officer. The contractor will be notified for appropriate action. When human health or the environment is threatened due to an unsafe vehicular operation, the PCQAE may stop the operation. The PCQAE should then notify the contracting officer for appropriate action.

3.1 LAWS. The QAE should be aware of state and local laws and regulations concerning pest control vehicles and transportation of hazardous materials. These may involve vehicle registration, licensing, or inspection requirements. Equipment that is associated with the vehicle should be examined. Examples are power sprayers and pesticide holding tanks.

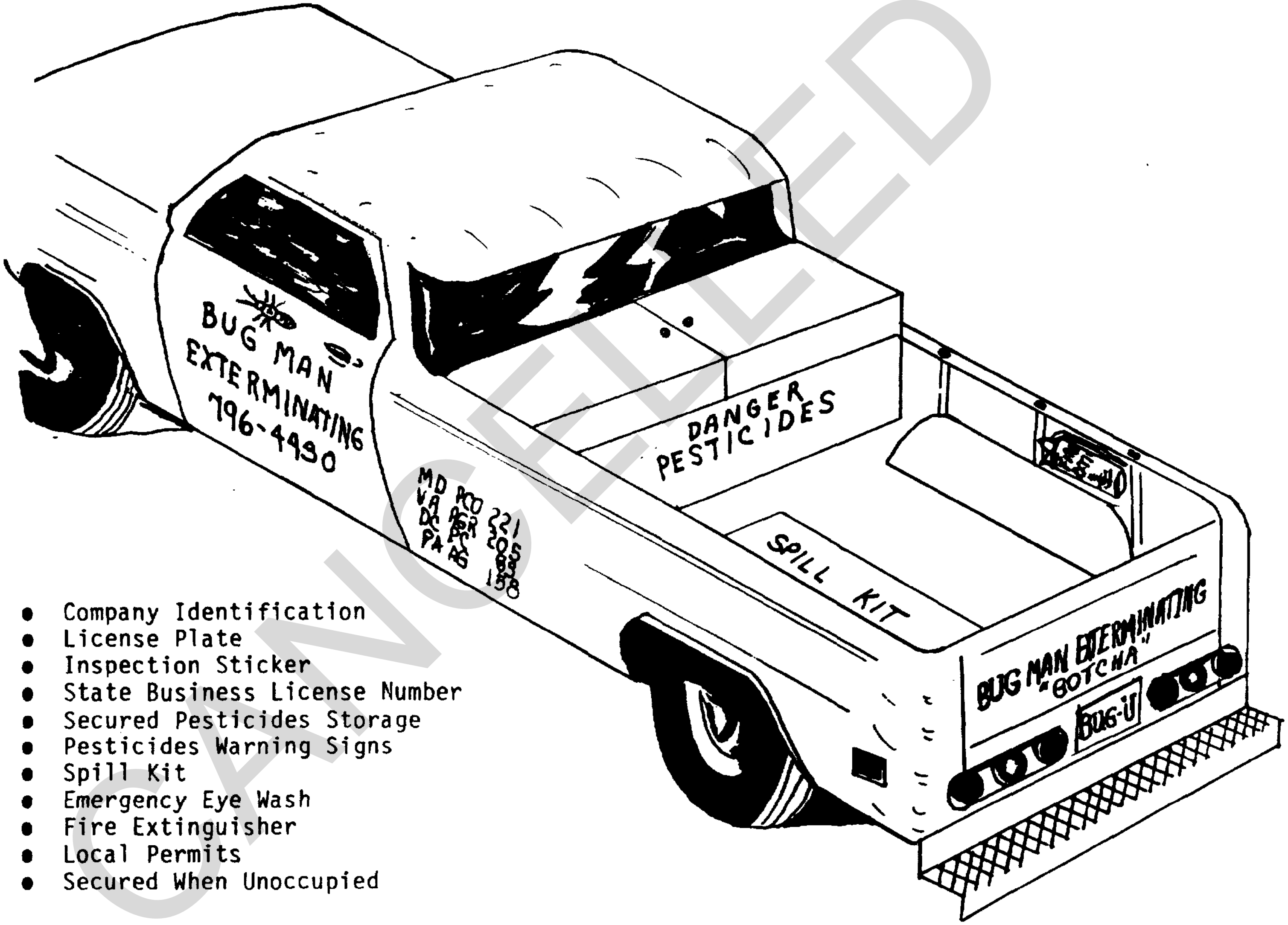
The QAE should also be aware of the requirements for any special identification or markings to be displayed on the vehicle (Figure 3-1). Company trade name, company phone number, and business license may be required. Some states may require that hazard or warning placards be posted on the vehicles. Some states may also require that a list of hazardous materials be posted.

3.2 SAFETY

3.2.1 Federal and State Requirements. The PCQAE should be aware of any Occupational Safety and Health Administration (OSHA) or Department of Transportation (DoT) requirements for pest control vehicles. Check with your activity environmental coordinator or Command PMC for pest control vehicle safety requirements.

States may have additional requirements. Most states require vehicles to undergo periodic safety inspections. State or local jurisdictions may prohibit the transport of pesticides or equipment in vans or in pick-up truck cabs to reduce exposure to pesticide fumes. There may also be requirements for protective equipment on pumps, chain drives, pulleys etc.

3.2.2 Security. Vehicles must be secured against unauthorized access or be occupied by the contractor at all times while on a military installation. PCQAE's should



- Company Identification
- License Plate
- Inspection Sticker
- State Business License Number
- Secured Pesticides Storage
- Pesticides Warning Signs
- Spill Kit
- Emergency Eye Wash
- Fire Extinguisher
- Local Permits
- Secured When Unoccupied

Figure 3-1
Vehicle Check

ensure that unattended pest control vehicles are secured at all times. All pesticides carried on vehicles shall be secured in locked compartments at all times on the installation. All equipment shall be secured to prevent theft and accidental poisoning.

3.2.3 Appearance. Vehicles should be maintained with a clean and orderly appearance, free from observable pesticide spills, residues, or build-up. All tanks, hoses, pumps, control valves, and gauges should be free of visible deterioration and should not leak. Vehicles should not be cleaned or washed on government property unless specified in the contract.

3.3 SAFETY EQUIPMENT.

Safety equipment shall be available on the contractor's vehicles as stated in the contract. Safety equipment includes, but is not limited to:

3.3.1 Emergency Eyewash. Contractor's vehicles must be equipped with an emergency eyewash station. Naval Regulations require 0.4 gal/min flow for 15 minutes time. Consult with your industrial hygiene office for specific station requirements.

3.3.2 Fire Extinguisher. The installation fire department will determine the fire extinguisher requirements. The PCQAE should ensure that the specification and installation requirements are the same, and assure contractor compliance.

3.3.3 Spill Kit. The spill kit must contain essential items for pesticide containment and clean-up. The spill kit must be capable of controlling a spill of the largest container of pesticide carried on the vehicle. Spill kit contents are described in the Armed Forces Pest Management Board's Technical Information Memorandum (TIM) No. 15. A basic spill kit should contain:

- shovel
- broom
- liquid absorbent such as kitty litter, sand, clay, or charcoal
- heavy ply polyethylene bags with ties or other leak-proof containers
- blank labels for identifying spilled material
- personal protective equipment such as neoprene gloves
- non-vented goggles
- respirator

A supply of several gallons of clean water and some liquid detergent are useful for personal decontamination. The pest control operator should be trained to contain, secure, and clean-up a spill. Be certain that the contractor and his employees know the procedures.

3.3.4 **First Aid Kit.** Each of the contractor's vehicles should have a general first aid kit. Although it may not be required, its ready access is a good practice.

CHAPTER 4. THE PEST MANAGEMENT PLAN AND THE ROLE OF THE PEST MANAGEMENT CONSULTANT

The Department of the Navy is a steward to 3.9 million acres of land at 278 shore installations. Pest management at these shore installations should:

a. Prevent biological organisms from adversely affecting military operations and missions;

b. Safeguard human health and morale by controlling pests that transmit diseases, annoy personnel, or represent a hazard to public health or safety;

c. Maintain and extend the service life of facilities, structures and material by preventing economic pest damage;

d. Enhance environmental quality through the protection of desirable natural resources;

e. Ensure that pesticides are used safely and consistently with label directions;

f. Minimize the use of pesticides in situations where nonchemical control alternatives are available and cost effective;

g. Comply with quarantine laws and regulations as related to protecting plants, animals and human health; and

h. Comply with laws and regulations concerning pesticide storage, application, and disposal of hazardous wastes.

Pest management operations in the Navy can be performed in-house or via contract. Pesticide use is primarily governed by Federal laws discussed in Chapter 1, Pesticide Laws and Regulations.

4.1 DOD AND NAVY POLICY: DoD and Navy policy on conducting pest management programs are outlined as follows:

> Department of Defense Directives (DoDD) for pest management programs establish policies and requirements for activity pest control programs. DoD components are required to establish and maintain efficient, effective, safe and environmentally sound pest management programs under the direction of professional pest management personnel. Activities are required to have a pest management plan.

> Naval Instructions (OPNAVINST) require all shore activities to develop pest management plans which are reviewed by pest management professionals.
>
> Naval Instructions also require that contract pest control services be evaluated by Quality Assurance Evaluator personnel specifically trained in pest control technology.

PCQAEs should have copies of, and become familiar with, current DoD Directives and Naval Instructions, and all other pertinent regulations.

4.2 PEST MANAGEMENT PLANS. All military installations which have more than 0.5 man-years of pest management requirements are required to develop and maintain a pest management plan. The pest management plan must be reviewed and approved by the appropriate Command PMC. Environmental considerations, health and safety, and program administration are a few of the major headings in a pest management plan. An example of an outline for an installation pest management plan is shown in Figure 4-1. Consult DoD Directives and Naval Instructions for more specific information on the development and maintenance of pest management plans. Your Command PMC can be of assistance.

4.3 THE PCQAE AND THE PEST MANAGEMENT PLAN. The pest management plan should be used as a guide for pest control requirements that need to be incorporated into the contract. The pest management plan should also be used as a guide for contract administration.

Information concerning pest control programs, health and safety issues, and environmental considerations should be discussed with the contractor. Any information concerning the installation's personnel resources (such as in-house work loads, etc.) should not be disclosed to the Contractor.

The PCQAE should be familiar with the following sections of the plan:

4.3.1 Pest Control Requirements. The PCQAE must be familiar with the pest control contract requirements for the installation. Information included in this section pertain to pest problems and strategies for control. Some of the historical information such as service frequency, treatment sites and treatment methods can provide insight as to what the contractor may do.

4.3.2 Other Program Requirements. Natural resource departments and agricultural out-lease programs may have contracts for pest control which include pesticide applications. These contracts should be inspected by a qualified pest control PCQAE.

INSTALLATION PEST MANAGEMENT PLAN (OUTLINE)

I. Executive Summary

II. Introduction
  A. Objective of Plan
  B. Plan Maintenance
  C. Activity description as it relates to pest management function

III. Coordination (list offices or personnel impacting on installation program: includes pest management chain of command)

IV. Program Administration
  A. Job Orders
  B. Contracts
  C. Inter-Service Support Agreements in Effect
  D. Outlease contracts (if pesticides are to be used)
  (coordinate with natural resources management program)
  E. Resources (Current and proposed)
    1. Funding
    2. Staffing
    3. Materials - Pesticides and Equipment
    4. Facilities
  F. Reports and Records (DD Form 6250/2 and 6250/3) (Covered in Chapter 10)
  G. Training Status of Applicator and QAE personnel

V. Public Laws and Regulations Affecting Installation Pesticide Application

VI. Pest Management Plan for Services Provided to Other Commands
  A. On Activity
  B. Off Installation

VII. Environmental Considerations
  A. Environmentally Sensitive Areas (list if not included on workload definition sheets) (coordinate with Natural Resources Management Program)
  B. Protected Species (if affected by pest control operations) (coordinate with Natural Resources Management Program)
  C. Pollution Abatement Projects in progress
  D. Quarantines in force

VIII. Health and Safety (coordinated with Medical Dept./PMC)
  A. Requirements
  B. Hazards
    1. Pest Control Personnel
    2. Public
  C. Shop Inventory
  D. Civil Engineering Support Equipment Inventory (vehicles and 5421 family equipment items)

IV. Pest Control Programs
  A. General Household and Nuisance Pests
  B. Structural Pests
  C. Weed Control
  D. Stored Product Pests
  E. Health-Related Pests (coordinate with Medical PMC)
  F. Pests of Ornamental Plants and Turf
  G. Miscellaneous Pests

Figure 4-1
Installation Pest Management Plan (Outline)

4.3.3 Records and Reporting. Contracts should require the Contractor to complete NAVFAC FORMs 6250/2/3 for all pest control operations. Generally the contract will call for the reports to be filled out within 24 hours of an operation and submitted on a timely basis.

The PCQAE may have to assist the contractor in filling the form out correctly until the contractors are capable of doing it themselves. Reviewing prior reports will help the contractor learn how to fill the forms out correctly. The PCQAE should review contractor reports to see that they are accurate and complete.

Chapter 10 deals with records and reporting.

4.3.4 Health and Safety. The PCQAE should be familiar with installation health and safety requirements. The pest control work being done may be potentially hazardous to humans, non-target organisms and the environment. The PCQAE must be aware that she(he) is responsible for surveillance of contractor safety procedures. Chapter 8 addresses personal safety considerations.

4.3.5 Environmental Considerations. The PCQAE is responsible for surveillance of contractor operations which may adversely affect the environment. The contractor should take into consideration:

- local wildlife
- threatened or endangered species
- sensitive habitats
- the land in general

The contractor should develop and implement:

- spill prevention procedures
- spill containment programs
- sensitive areas awareness programs

4.4 THE COMMAND PEST MANAGEMENT CONSULTANT (PMC). The NAVFACENGCOM Applied Biology program provides technical support for pest management, wood protection, and related functions. The Command Pest Management Consultants (Command PMC) at the Engineering Field Divisions provide these services directly to Navy and Marine Corps installations.

Command PMCs can assist installations by:
- developing, reviewing, and approving pest control contracts
- developing quality standards, MADRs, and QA plans
- providing telephone assistance
- trouble shooting specific problems on-site

- performing pest management program reviews
- providing pest management training

The Bureau of Medicine and Surgery (BUMED) also employs pest management consultants. These consultants can provide installations with guidance on disease vector survey and control, pesticide safety, and health monitoring. BUMED consultants are also responsible for providing guidance on shipboard pest control.

4.4.1 Contract Review and Approval. All contracts which include pest management requirements are required to be submitted to the Command PMC before advertisement for review and approval. Command PMCs can provide recommendations to help the activity develop and administer a good pest control contract.

4.4.2 Performance Work Statement Development. A good contract has a strong Performance Work Statement (PWS). The Command PMC can provide assistance in the development of contract specifications.

4.4.3 Quality Standards and Maximum Allowable Defect Rate (MADR). The Command PMC can assist installations when writing contract quality standards. The Command PMC can provide expertise when developing contract MADRs. MADRs are covered in Chapter 20.

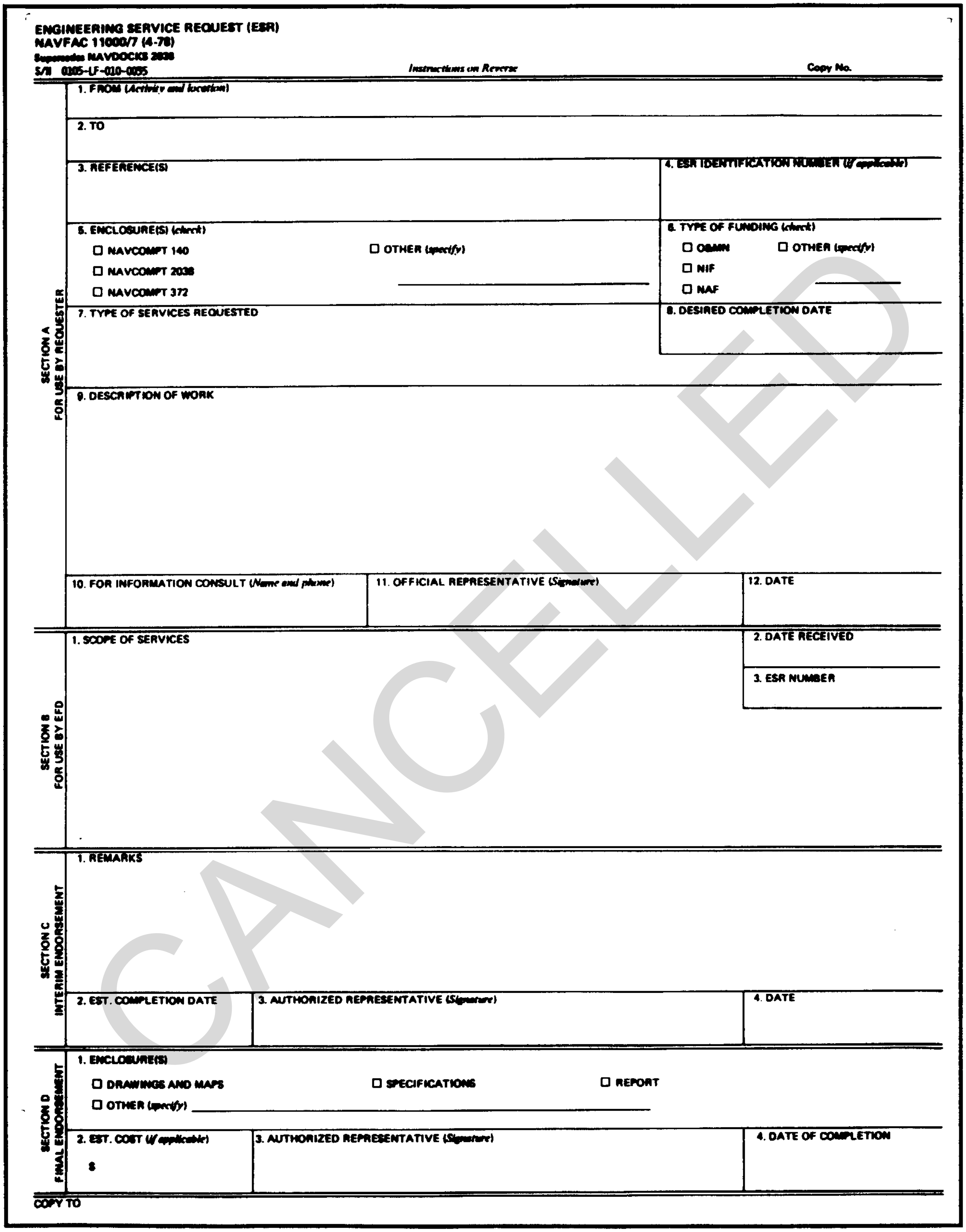
4.4.4 Quality Assurance Plan Development. The Command PMC can assist in developing quality assurance plans. Chapter 20 covers Quality Assurance Plans.

4.4.5 Technical Expertise. Command PMCs are available to discuss problems that may arise in a pest management program. Telephone consultations are a primary duty of Command PMCs. QAEs should contact their Command PMCs when assistance is needed.

4.4.5.1 Engineering Service Requests. Serious problems may require the presence of a Command PMC on-site. Engineering Service Requests (ESRs) can be used to request expertise for:

- specific pest problems
- wood protection program development
- pest control contract development
- spill management and disposal program development

Figures 4-2 (form) and 4-3 (instructions for filling out the form) show a sample ESR form.



ENGINEERING SERVICE REQUEST (ESR)
NAVFAC 11000/7 (4-78)
Supersedes NAVDOCKS 2038
S/N 0105-LF-010-0055

Instructions on Reverse

Copy No.

SECTION A
FOR USE BY REQUESTER

1. FROM (*Activity and location*)

2. TO

3. REFERENCE(S)

4. ESR IDENTIFICATION NUMBER (*if applicable*)

5. ENCLOSURE(S) (*check*)
☐ NAVCOMPT 140
☐ NAVCOMPT 2038
☐ NAVCOMPT 372
☐ OTHER (*specify*) ______________________

6. TYPE OF FUNDING (*check*)
☐ O&MN
☐ NIF
☐ NAF
☐ OTHER (*specify*) ________

7. TYPE OF SERVICES REQUESTED

8. DESIRED COMPLETION DATE

9. DESCRIPTION OF WORK

10. FOR INFORMATION CONSULT (*Name and phone*)

11. OFFICIAL REPRESENTATIVE (*Signature*)

12. DATE

SECTION B
FOR USE BY EFD

1. SCOPE OF SERVICES

2. DATE RECEIVED

3. ESR NUMBER

SECTION C
INTERIM ENDORSEMENT

1. REMARKS

2. EST. COMPLETION DATE

3. AUTHORIZED REPRESENTATIVE (*Signature*)

4. DATE

SECTION D
FINAL ENDORSEMENT

1. ENCLOSURE(S)
☐ DRAWINGS AND MAPS
☐ SPECIFICATIONS
☐ REPORT
☐ OTHER (*specify*) ______________________

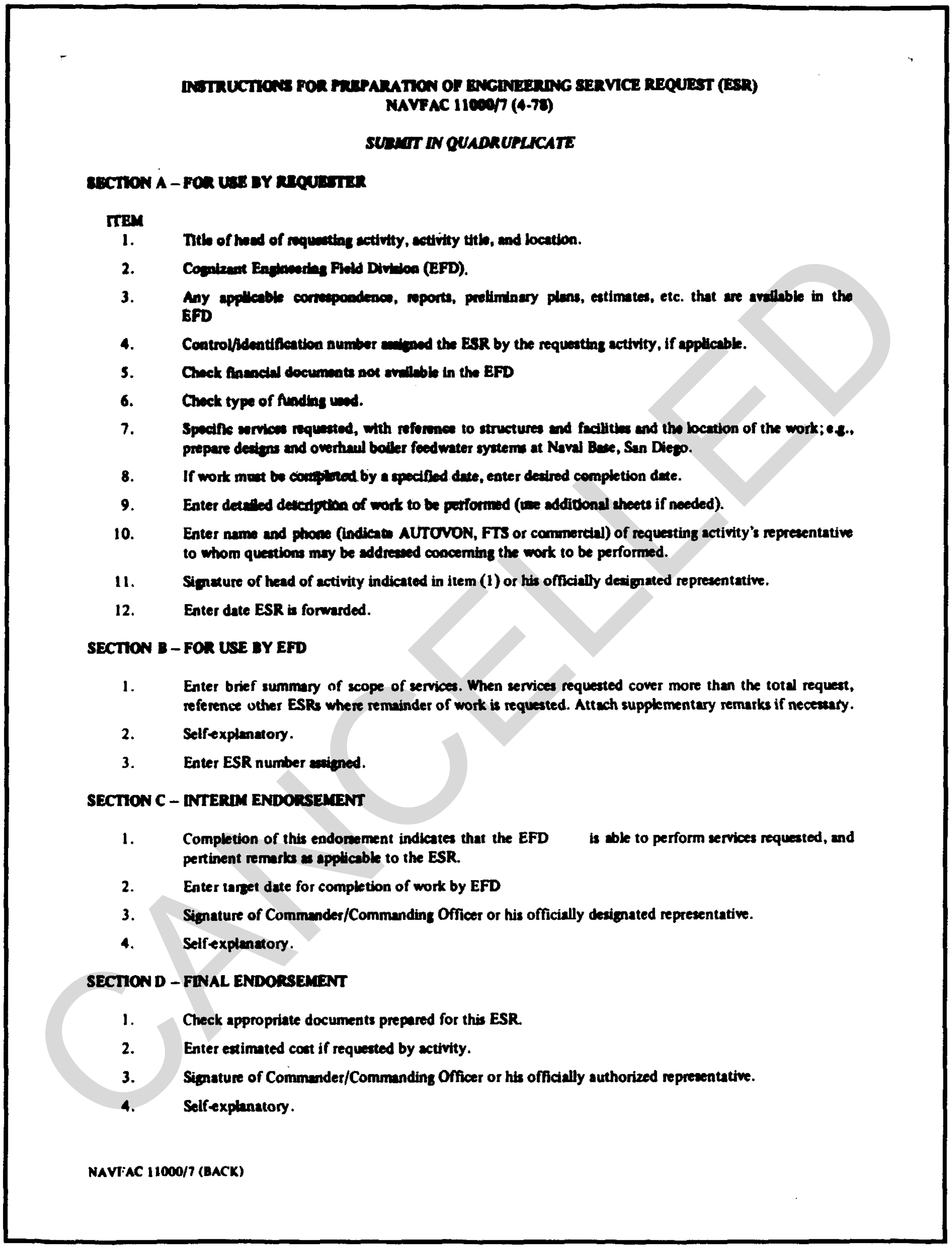
2. EST. COST (*if applicable*)
$

3. AUTHORIZED REPRESENTATIVE (*Signature*)

4. DATE OF COMPLETION

COPY TO

Figure 4-2
Engineering Service Request (ESR) NAVFAC 11000/7



INSTRUCTIONS FOR PREPARATION OF ENGINEERING SERVICE REQUEST (ESR)
NAVFAC 11000/7 (4-78)

SUBMIT IN QUADRUPLICATE

SECTION A – FOR USE BY REQUESTER

ITEM

1. Title of head of requesting activity, activity title, and location.
2. Cognizant Engineering Field Division (EFD).
3. Any applicable correspondence, reports, preliminary plans, estimates, etc. that are available in the EFD
4. Control/identification number assigned the ESR by the requesting activity, if applicable.
5. Check financial documents not available in the EFD
6. Check type of funding used.
7. Specific services requested, with reference to structures and facilities and the location of the work; e.g., prepare designs and overhaul boiler feedwater systems at Naval Base, San Diego.
8. If work must be completed by a specified date, enter desired completion date.
9. Enter detailed description of work to be performed (use additional sheets if needed).
10. Enter name and phone (indicate AUTOVON, FTS or commercial) of requesting activity's representative to whom questions may be addressed concerning the work to be performed.
11. Signature of head of activity indicated in item (1) or his officially designated representative.
12. Enter date ESR is forwarded.

SECTION B – FOR USE BY EFD

1. Enter brief summary of scope of services. When services requested cover more than the total request, reference other ESRs where remainder of work is requested. Attach supplementary remarks if necessary.
2. Self-explanatory.
3. Enter ESR number assigned.

SECTION C – INTERIM ENDORSEMENT

1. Completion of this endorsement indicates that the EFD is able to perform services requested, and pertinent remarks as applicable to the ESR.
2. Enter target date for completion of work by EFD
3. Signature of Commander/Commanding Officer or his officially designated representative.
4. Self-explanatory.

SECTION D – FINAL ENDORSEMENT

1. Check appropriate documents prepared for this ESR.
2. Enter estimated cost if requested by activity.
3. Signature of Commander/Commanding Officer or his officially authorized representative.
4. Self-explanatory.

NAVFAC 11000/7 (BACK)

Figure 4-3
Instructions for Preparation of
Engineering Service Request (ESR) NAVFAC 11000/7

4.4.6 Pest Management Program Reviews. Reviews of installation pest management programs are conducted by Command PMCs. The reviews monitor the pest management program's compliance with the pest management plan. Recommendations for improving the pest management program are provided.

4.4.7 Training. Several types of training for activity personnel can be provided by Command PMCs. Triennial training is required for all pest control quality assurance evaluators. Short courses are provided periodically for maintenance inspectors and planners/inspectors. Command PMCs are responsible for training DoD certified pesticide applicators.

Figure 4-4 is a sample career development plan for PCQAEs.

PEST CONTROL QUALITY ASSURANCE EVALUATOR CAREER DEVELOPMENT PLAN

PCQAE CAREER DEVELOPMENT PLAN I

PHASE 1

Enrollment in a QAE training course conducted periodically by the Naval Facilities Engineering Command, Engineering Field Divisions (EFDs), Code 16/10.

PHASE 2

Enrollment in a Pest Control Quality Assurance Training Course sponsored by an EFD Applied Biology/Biological Sciences Section. Attendance of a Pest Control Recertification or a PCQAE Training Course is required every three years thereafter.

Completion of a pest management correspondence course is recommended for PCQAE's inspecting pest control contracts. NAVFAC Technical Training Course 150, Basic Pest Control Technology, is available by submitting DD Form 1556 to the Navy Public Works Training Center, San Diego, CA. Endorsement by NAVFACENGCOM is required for enrollment. Equivalent pest management correspondence courses are available through the addresses listed below:

Center for Professional Correspondence Study
Room 116, Stewart Center
Purdue University
West Lafayette, IN 47907

Pennsylvania State University
202 Agricultural Education Building
University Park, PA 16802

PCQAE CAREER DEVELOPMENT PLAN II

Personnel can become a trained PCQAE for pest control contracts by following the Pest Controller Career Development Plan. It is recommended that certified pest control personnel attend a PCQAE training course within six months of becoming a pest control QAE. Attendance of a Pest Control Recertification or PCQAE Training Course is required every three years thereafter.

Figure 4-4
Pest Control Quality Assurance Evaluator
Career Development Plan

CHAPTER 5. PESTICIDE OVERVIEW

Although integrated pest management incorporates a variety of control methods, most commercial pest control firms rely heavily on the use of pesticides. Because of the widespread use of pesticides and the inherent dangers accompanying their use, PCQAEs should know as much as possible about pesticides and their application. Many contracts specify that all pesticides to be used shall be approved by the contracting officer. The Command PMC should be contacted if assistance in pesticide approval is required.

5.1 CLASSIFICATION OF PESTICIDES.

5.1 CLASSIFICATION OF PESTICIDES. A pesticide is defined in FIFRA as "any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pests, as well as any substance, or mixture of substances, intended for use as a plant regulator, defoliant, or desiccant." Pesticides can be classified according to the target pest or life stage controlled, general mode of attack, and chemical composition.

5.1.1 Classification Based on Target Pest. Figure 5-1 classifies pesticides according to the type of pest or pest stage controlled.

5.1.2 Classification Based on General Mode of Attack. (Figure 5-2)

5.1.2.1 Contact Pesticides. Contact pesticides enter and begin to work when the pesticide physically touches the target organism. Contact pesticides can be applied directly to the target organism or a surface the target organism is likely to encounter. Contact pesticides often have a protective nature, i.e. wood preservatives and turf fungicides. There are many insecticides, herbicides, and fungicides which act as contact pesticides.

5.1.2.2 Stomach Poisons. Stomach poisons must be ingested and subsequently absorbed through the digestive tract of the target organism in order to work. Stomach poisons are manufactured as baits or formulations which can be applied to the substrate to be protected. Many turf and ornamental insecticides, rodenticides, and avicides act as stomach poisons.

5.1.2.3 Systemic Pesticides. Systemic pesticides are applied to and translocated (moved) throughout the host to be protected. The majority of systemic pesticides are used in turf and ornamental, vegetation, or agricultural pest control. Some are used to control parasites of livestock.

Type of Pesticide	Type of Pest or Pest Stage Controlled
Insecticide	Insects and related arthropods
Herbicide	Plants
Fungicide	Fungi
Rodenticide	Rodents
Nematicide	Nematodes
Bactericide	Bacteria
Acaricide	Mites and Ticks
Miticide	Mites
Algicide	Algae
Molluscicide	Slugs and snails
Avicide	Birds
Piscicide	Fish

Other Pesticide Terminology

Ovicide	Kills pest eggs
Larvacide	Kills pest larvae or immatures
Adulticide	Kills adult pests
Disinfectants	Destroy or inactivate harmful microorganisms like bacteria or viruses
Plant growth regulators	Stimulate or retard plant growth
Insect growth regulator	Disrupt insect growth and reproduction
Pheromones	Chemicals used in animal communication
Repellents	Repel pest organisms
Synergists	Chemicals used with insecticides to enhance activity
Defoliants	Remove leaves from plants
Desiccants	Cause death by dehydration
Anticoagulants	Interfere with blood clotting

Figure 5-1
Pesticide Classification Based on Target Pest

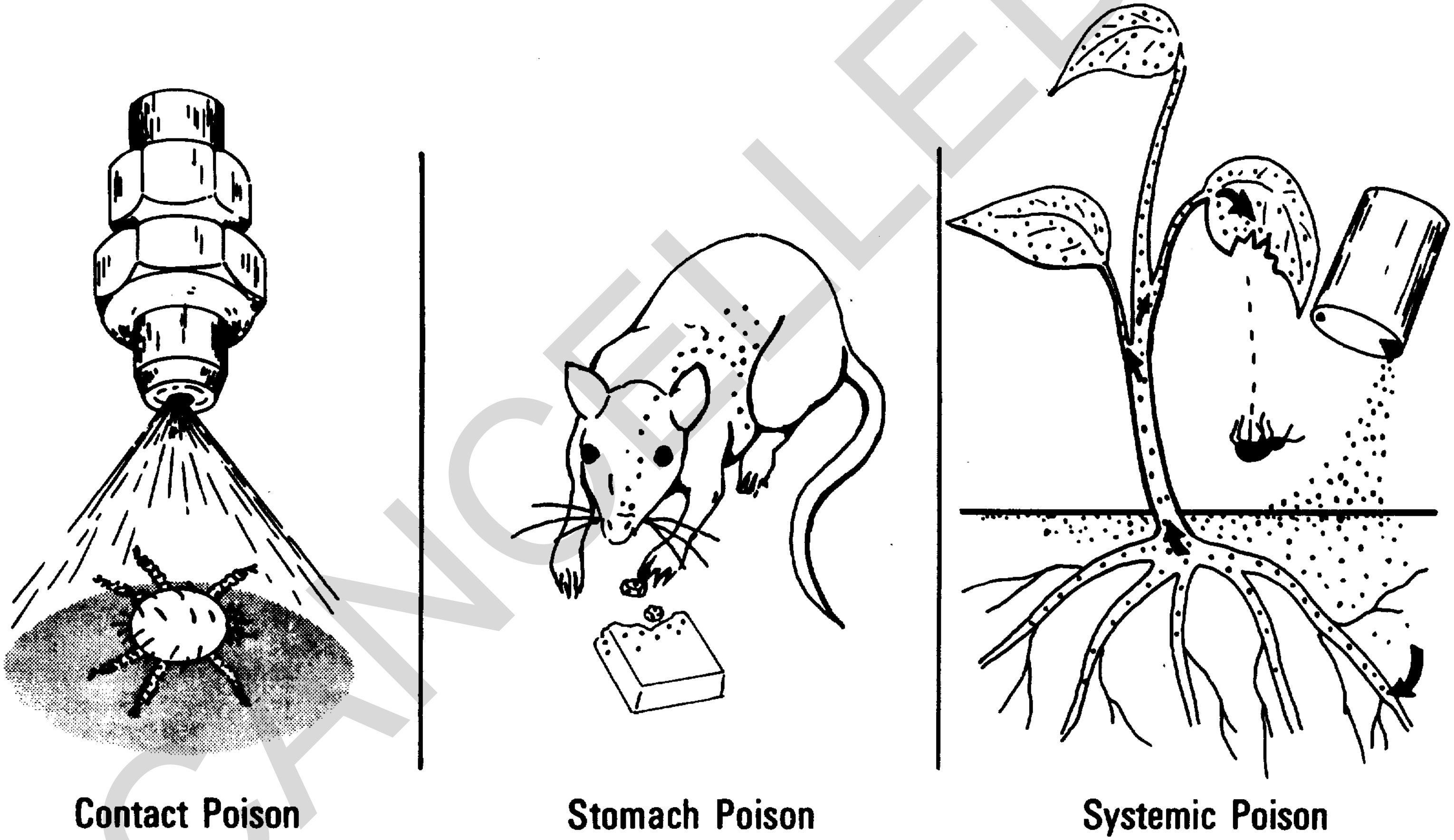


Figure 5-2
Ways Pesticides Attack Pests

5.1.3 Classification of Insecticides Based on Chemical Composition.

5.1.3.1 Inorganic Insecticides. Inorganic insecticides are made from naturally occurring minerals. Inorganic insecticides have varying modes of action including interfering with conversion of energy within cells and causing death by desiccation. Common inorganic pesticides include boric acid, silica gel, and sodium fluoride.

5.1.3.2 Synthetic Organic Insecticides. Synthetic organic pesticides are man made pesticides comprised predominately of carbon, hydrogen, and oxygen atoms. The major classes of synthetic organic insecticides include:

- **Chlorinated Hydrocarbons.** Chlorinated hydrocarbons function as nerve poisons. The chlorinated hydrocarbons are long lasting pesticides in the environment. They have been implicated in environmental problems and therefore their use is becoming more and more limited. Chlorinated hydrocarbons include such well known insecticides as DDT, chlordane, lindane, and kelthane. DDT and chlordane are no longer registered.
- **Organophosphates.** Organophosphates include insecticides such as malathion, diazinon, and chlorpyrifos. These insecticides do not last as long as the chlorinated hydrocarbons but include some very toxic pesticides. Organophosphates are also nerve poisons but have a different specific mode of action than the chlorinated hydrocarbons (acetylcholinesterase inhibitors).
- **Carbamates.** Carbamates have a similar mode of action as the organophosphates. Generally, carbamates are less toxic and less persistent in the environment. Carbamates include carbaryl, propoxur, and bendiocarb.
- **Pyrethroids.** Pyrethroids are synthetic pesticides having a structure similar to the natural pyrethrins but are more stable. The mode of action of pyrethroids is similar to the chlorinated hydrocarbons. Pyrethroids include permethrin, cypermethrin, and resmethrin.

5.1.3.3 Botanical Insecticides. Botanical insecticides are derived from plant materials and include pyrethrins, rotenone and nicotine. The most common botanical insecticides in use today are the pyrethrins.

5.1.3.4 Biological Insecticides. Biological insecticides are organisms which have been concentrated and formulated as a pesticide. Examples of biological insecticides include Bacillus thuringiensis (B.t.), B. popillae, viruses, and parasitic nematodes.

5.1.4 Herbicide Classification. Herbicides are more commonly classified by the general mode of attack, i.e., selective, contact, systemic, root absorbed. Examples of chemical families of herbicides are phenoxys, imidazolinones, triazines, and dinitroanilines.

5.1.5 Fungicide Classification. Fungicides are commonly classified by their general mode of attack, i.e. contact, systemic or mode of action, i.e., protective, curative. Examples of chemical fungicide groups are aromatic hydrocarbons, dicarboximides, EBDCs, and benzimidazoles.

5.2 PESTICIDE USE.

Pesticide use shall be in accordance with the pesticide label and labelling.

5.2.1 When to Use a Pesticide. As discussed in Chapter 6, Integrated Pest Management, pesticides theoretically should be used when pest populations have exceeded the economic or aesthetic threshold and alternate control methods have been used to the maximum extent possible. Some pesticides, i.e. termiticides, golf course fungicides, wood preservatives are applied on a preventive basis for economic reasons. Pesticide applications should be based on surveillance data as much as possible. In many instances the timing of pesticide applications is directed by logistical considerations. Pesticide use in specific pest management programs is discussed below:

5.2.1.1 Household Pests, Stored Product Pests, Rodents, and Miscellaneous Pests. Pesticide applications may be performed when:

- infestations surpass acceptable levels and alternate control methods have been used to maximum extent possible
- there is a change of occupancy in housing
- preventive schedule is required by food service
- human health is jeopardized
- food or property is endangered
- conditions surpass human level of acceptability (nuisance)
- mission is affected

5.2.1.2 Structural Pests. Pesticide applications may be performed when:

- infestations surpass acceptable levels and alternate control methods have been used to maximum extent possible
- preventing infestation by wood destroying organisms (pretreat)

5.2.1.3 Lawn and Ornamental Pests. Pesticide applications may be performed when:

- infestations surpass acceptable levels and alternate control methods have been used to maximum extent possible

- preventive applications against disease organisms is recommended to protect high value plantings such as golf courses or mature American elms

5.2.1.4 Weeds. Pesticide applications may be performed when:

- infestations surpass acceptable levels and alternate control methods have been used to maximum extent possible
- bare ground conditions are warranted

5.2.2 Accuracy of Pesticide Application. Follow label directions for application instructions so that:

- the rate of application is correct
- the time of application will be most effective

5.3 PESTICIDE SELECTION. The following procedures should be considered when selecting a pesticide:

(1) Identify the pest. Do not use the wrong pesticide on the basis of incorrect identification

(2) Determine if control is necessary

(3) Consider alternative control methods (biological, mechanical, controls etc.)

(4) Choose the right pesticide for the job. The pesticide should:

- be effective against target pests
- be labeled for the intended use
- have the least adverse affect on the environment and non-target organisms
- be the correct formulation for application equipment
- be cost effective

5.4 PESTICIDE FORMULATIONS. Pesticides are manufactured in many different forms, referred to as formulations. Formulations are composed of the mixture of active and inert ingredients. There are several different formulations, but most can be designated as either liquid or dry. The advantages, disadvantages, and principle uses of many formulations are outlined in Figure 5-3.

5.4.1 Dry Formulations.

5.4.1.1 Dusts. Most dusts are comprised of an inert carrier such as talc, chalk, clay, etc. impregnated with a pesticide. Dusts are generally available as ready-to-use materials.

Formulation	Advantages	Disadvantages	Principal Uses
1. Dry			
a. Dust	Ready to use; requires no mixing; easy to apply	Drift hazard; expensive; unsightly; can't be used in moist environments	Spot treatment; difficult to reach areas; limited foliage use
b. Baits	Ready to use; easy to apply; controls pests that move in and out of the site	Hazardous to Non-target organisms	Inside buildings; against rodents, birds, & mammals
c. Granule	Ready to use; easy to apply; can be applied to target under dense foliage	Limited foliage use; expensive; storage requirements potentially hazardous to non-target organisms	Aquatic treatment; turf fungicides; herbicides
d. Wettable Powders	Not phytotoxic; pre-measured packets are available; effective on porous surfaces	Requires frequent agitation; may clog nozzles; may leave visible residues	Lawns and ornamental plants; household pests
2. Liquids			
a. Emulsifiable concentrate	High concentration; relatively inexpensive; suitable for low pressure equipment with limited agitation	Phytotoxic; mixing hazards; odor	Household and public health pests; weeds
b. Oil Concentrates	Ready to use; no agitation required	Phytotoxic; odor	Ulv; public health pests
c. Flowable Micro Encapsulations	Relatively inexpensive; slow release; effective on porous surfaces; residual action	Requires agitation; may clog nozzles; visible residues	Household pests
d. Flowables	Similar to wettable powders	Few products available in urban pest management	Ornamental pests
3. Aerosol	Ready to use; easy to apply; fills a space with pesticide; quick knockdown	Expensive; inhalation hazard; mechanical problems	Flushing agent; flying insects; household pests
4. Fumigant	Toxic to wide range of pests; will penetrate cracks and crevices and grain	Requires special protective equipment; dangerous	Wood destroying insects; stored products pests; soil sterilants

Figure 5-3
Pesticide Formulations

5.4.1.2 Baits. Bait formulations contain a pesticide mixed with food or another attractive substance. The pest is killed when it feeds on or contacts the bait.

5.4.1.3 Granules. Granules are similar to dusts except that the particles are larger and heavier. The coarse particles are made from clay, vermiculite, or grain by-products. Granules are generally available as ready-to-use materials.

5.4.1.4 Wettable Powders. Wettable powders are concentrated dusts with a wetting agent so that the particles can be suspended in water. Wettable powder suspensions require frequent agitation to prevent particles from settling out.

5.4.2 Liquid Formulations. Many pesticides are manufactured in a liquid formulation.

5.4.2.1 Emulsifiable Concentrates. Emulsifiable concentrates are concentrated oil solutions of insecticides with emulsifiers (detergent-like materials) added which suspend the pesticide in water (the diluent) to make an emulsion.

5.4.2.2 Oil Concentrates. Oil concentrates are made by dissolving concentrated pesticides in a non-polar solvent. The concentrate is then usually diluted with a fine oil. Most oil-based concentrations are limited to ULV or other applications of non-residual insecticides.

5.4.2.3 Flowable Microencapsulations. Flowable microencapsulations are liquid formulations which have the insecticide particle covered with nylon or some other polymer material. As the encapsulation breaks down the pesticide is slowly released into the environment thus increasing the residual life.

5.4.2.4 Flowables. Flowables are wettable powders which have been mixed with water but require further dilution before application. The mixture forms a suspension which has the same characteristics as a wettable powder suspension.

5.4.3 Aerosols. An aerosol is not technically a formulation. Aerosols are liquid or dry formulations dispensed into the air as very small particles. Aerosols may be ready-to-use or formulated for use in fog or mist generators. The ready to use types are usually small, pressurized, self contained units with a nozzle valve.

5.4.4 Fumigants. Fumigants are liquid or solid formulations that liberate toxic fumes (gas) upon release. These are inherently dangerous and most are highly toxic.

5.5 PESTICIDE CONTAINERS. Unmixed, concentrated pesticides should be in containers which do not pose a risk of spill or leakage. All containers should have an EPA label identifying the pesticide. Pesticide labels are discussed in chapter 2. Some contracts specify that pesticides shall be in the original, unopened container when brought upon government property.

5.6 PESTICIDE MIXING. Many pesticides come in concentrated form and require mixing and dilution. Personal safety and environmental safety shall not be jeopardized during mixing operations. Personal safety is discussed in chapter 7; environmental safety is discussed in chapter 8.

5.7 CALIBRATION. Calibration is the process of measuring and adjusting the amount of pesticide the equipment will apply to a target area. The responsibility for properly formulating and applying pesticides rests with the contractor. However, the PCQAE should be familiar with calibration procedures in order to ensure that the contractor is applying pesticides at the correct rate, and is not endangering health or the environment. Calibration is discussed in more detail in chapter 8.

CHAPTER 6. INTEGRATED PEST MANAGEMENT

Integrated Pest Management (IPM) is the selection and implementation of a variety of pest control methods based on predicted economic, ecological, and sociological consequences. IPM seeks maximum use of naturally occurring pest controls, including weather, disease agents, predators, and parasites. IPM incorporates various control measures including biological, cultural, physical, mechanical, and chemical.

6.1 PRINCIPLES OF IPM. IPM is based on the principal that control is only required if a population will surpass an economic or aesthetic injury threshold. In other words, the presence of a pest does not warrant control efforts unless:

- the pest population will cause significant economic loss
- the pest population will endanger the health and welfare of resident life
- the pest population will become so numerous they can no longer be tolerated.

In order to achieve control prior to the pest population surpassing the economic or aesthetic injury threshold, control procedures should be conducted when the pest populations reach the "action level" (Figure 6-1). Since control measures normally take a little time, during which the pest population is still growing, the "action level" is lower

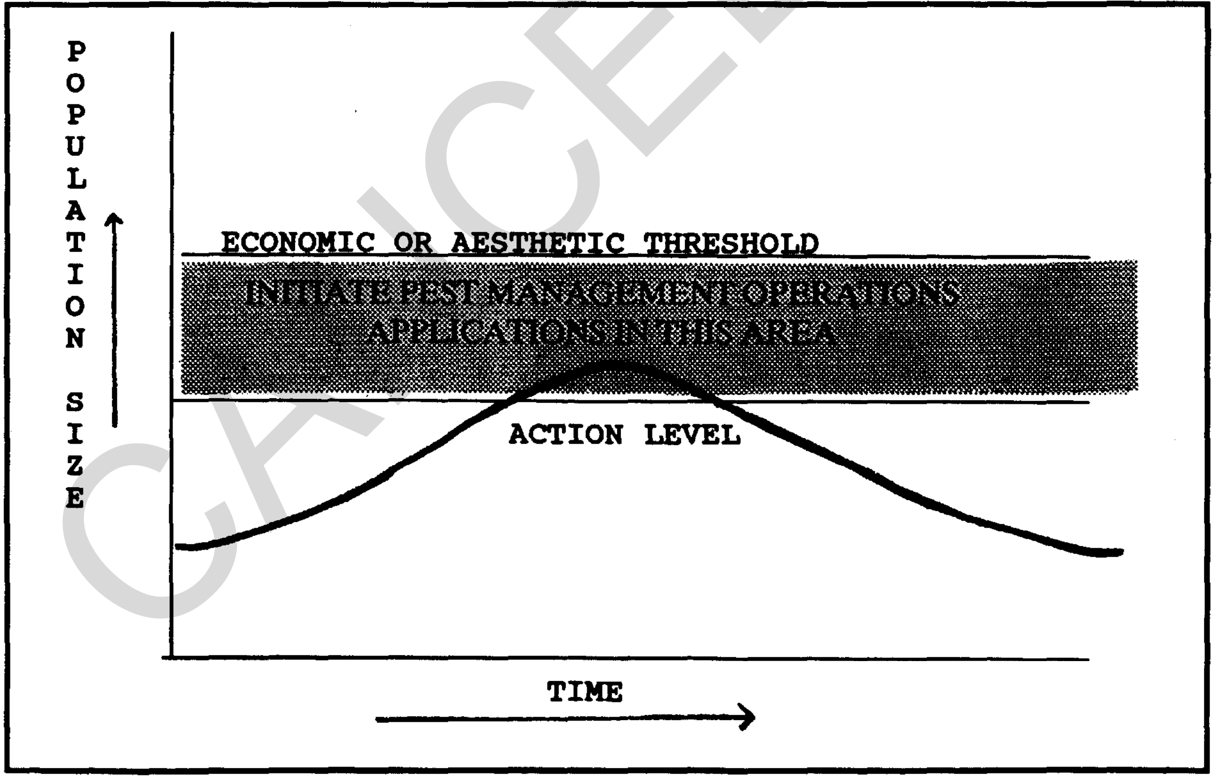


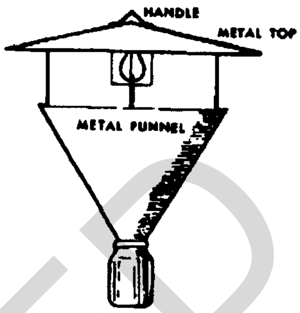
Figure 6-1
Control Procedures Should be Conducted When the Pest
Population Reaches the "Action Level"

than the economic or aesthetic injury level.

6.2 COMPONENTS OF AN INTEGRATED PEST MANAGEMENT PROGRAM. A basic integrated pest management program consists of the following components:

6.2.1 **Monitoring Or Surveillance Program.** Monitoring or surveillance programs are developed to determine the size of the pest population or to monitor conditions which are conducive for an infestation or build-up in population. Equipment and methods used in monitoring or surveillance programs include, but are not limited to:

- mosquito light traps
- larval dips in immature mosquito breeding sites
- sticky traps in cockroach harborages
- pheromone traps for stored products pest control
- random, defined plots for turfgrass weed species (Chapter 18)
- tick drags
- fly traps
- confirmed customer complaints
- devices to monitor weather conditions such as rainfall and temperature



LIGHT TRAP

DIPPING FOR LARVAL MOSQUITOS

Indefinite quantity items should be ordered based on survey results. PCQAE's should develop and implement a surveillance system to monitor pest populations and to evaluate the effectiveness of contractor control efforts.

DRAGGING FOR TICKS

6.2.2 **Economic Or Aesthetic Injury Levels.** Economic or aesthetic injury levels are defined, measurable values which have been correlated with pest caused injury sufficient to warrant treatment. The established acceptable level of control required in the specification should be consistent with the economic or aesthetic injury level.

Economic injury levels are easier to determine than aesthetic injury levels because there usually is a correlation with loss of product or substance. The cost of treatment can be compared to the loss of product to determine if control measures should be implemented. There is an action level below the economic injury level which should initiate treatments to prevent the population from reaching or exceeding the economic injury level. The action level should be established and monitored by the contractor to aid in his performance. Most economic injury levels are associated with agricultural production. However, economic injury levels have been established and published for many turfgrass, stored product, and ornamental plantings.

Aesthetic injury levels are more arbitrary because of a wide range of personal attitudes and feelings towards insects and other pest organisms. A single cockroach sighting may be unacceptable to some people. Education is an important tool in decreasing pesticide use by establishing higher aesthetic injury levels.

Injury levels can change depending on environmental conditions, life stage, and location. For example, the injury level for certain mosquitoes becomes much lower when the potential for disease transmission increases in an area. The economic injury level may be different for larval mosquitoes and adult mosquitoes. Turfgrass diseases are more tolerable in semi-improved areas than on golf course greens and fairways or parade grounds.

6.2.3 Control Techniques. An integrated pest management program should implement control techniques that are:

- least disruptive to naturally occurring controls upon the target pest populations and other potential pest populations
- likely to be relatively permanent
- cost effective in the short and long term
- in harmony with short and long term human and environmental health
- easiest to carry out effectively

The following are different control techniques that have been established.

6.2.4 Biological Control. Biological control seeks to maximize the influence of natural enemies. Natural enemies include parasites, predators, and pathogens. Some of these enemies occur naturally to suppress a pest whereas others must be introduced at considerable expense and time.

Natural enemies of the pest may be adversely affected by pesticide applications. Proper selection of materials and timing and placement of treatments is necessary to minimize adverse affects.

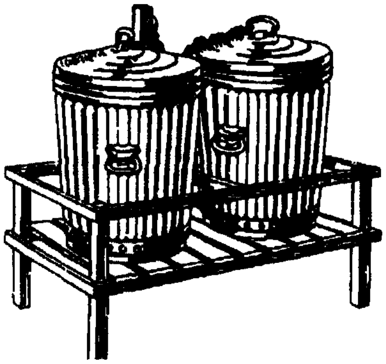
LADYBUGS EAT OTHER BUGS

6.2.5 **Host Resistance.** Host resistance incorporates the use of plant varieties or structural materials that are either resistant or tolerant to a pest. This control technique is important in turfgrass management and ornamental pest control.

RESISTANT PLANT VARIETIES

6.2.6 **Cultural Control.** Cultural controls are modifications of management practices that make the environment less favorable to pest reproduction, dispersal, and survival. Cultural controls applicable to military pest management programs include:

- sanitation
- cultivation
- irrigation
- fertilization
- proper planting time



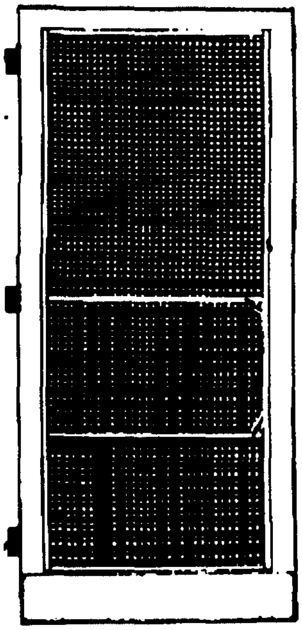
PEST RESISTANT TRASH CANS

6.2.7 **Physical and Mechanical Control.** Physical and mechanical controls are direct or indirect (nonchemical) measures that destroy pests outright or make the environment unsuitable for their entry, dispersal, survival, or reproduction. These include:

- temperature manipulation
- water management
- exclusion
- trapping
- scare and/or pyrotechnic devices

6.2.8 **Regulatory Control.** Regulatory control involves legislative action (quarantine) to prevent transportation of pests from one area to another. Such actions may be established for interstate or international transport.

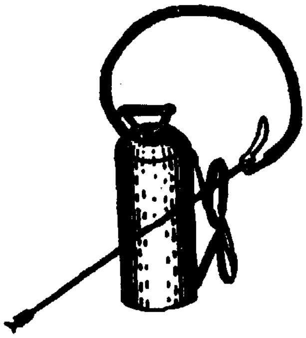
REGULATORY CONTROL POINT



MECHANICAL EXCLUSION OF PESTS

6.2.9 Chemical Control. Chemical control involves the use of pesticides which are discussed in Chapter (4), Pesticide Overview, and in the different control functions.

Figure 6-2 (3 pages) outlines integrated pest management control techniques for various pest organisms. These techniques are discussed in greater detail in the chapters on the specific pest organisms. The Command PMC should be consulted to develop and maintain an effective integrated pest management program for the target pests.



TWO GALLON
COMPRESSED AIR
SPRAYER

INTEGRATED PEST MANAGEMENT METHODS

	CONTROL METHODS					
TARGET PEST	**CULTURAL**	**MECHANICAL**	**PHYSIOLOGICAL**	**BIOLOGICAL**	**CHEMICAL**	**REGULATORY**
ANTS	Sanitation Good Housekeeping Vegetation Removal	Ant Proofing Sealing cracks Vacuuming Barrier (water) (Petroleum jelly, stickum)	Soak houseplant pots to drown		Insecticides Baits Residual liquids	Federal and state quarantine (fire ants)
BITING FLIES	Sanitation (Stable Fly) Breeding source reduction Manure Grass Clippings Seaweed Water management (culicoides, black fly, deerfly) Soil management Schedule activities to reduce exposure Acquatic weed (emergent) management	Screening Trapping Sticky Trap Live Trap		Parasitic wasp (Spalangia sp.)	Repellents (personal) Insecticides Non-Residuals (aerosols) Residuals	Activity instructions on stable operations (Stable Flies) Quarantine Public Health
COCKROACHES	For preventive control, design out harborages (cracks) and allow for chemical treatment. Sanitation is mandatory to eliminate food sources. Good housekeeping (remove clutter). Use cockroach proof containers for storage of food stuffs & pet food.	Harborage elimination by caulking. Removal of unused equipment and material. Trapping with sticky traps.	Cold storage slows the development of insects. Elimination of source of moisture. Repair leaky pipes.	Some wasps are parasitic on American and Brown-banded cockroaches. Not usually a suitable alternative.	Repellents Insecticides Bait stations Residual toxicants Liquids Dusts Fumigants CO_2 for non-residue on hospital carts	P-352 Pest Control in Family Housing contains guidance for occupants of family housing. NAVMEDCOM instructions on sanitation standards and inspection, including NAVMEDCOM P-5010, CH-8. NAVFACINST 6250.14 on Self-Help Pest Control. Various installation instructions including the installation pest management plan.
FILTHFLIES	Sanitation Breeding source reduction Steam clean dumpsters	Screening Air curtains Trapping Fly paper Attractant Fly swatter Electric fly grid Light traps Locate open waste containers 200 ft. from entryways		Parasitic wasp (Spalangia sp.)	Insecticides Baits Non-Residual (aerosols) (ULV) Residuals	Activity instructions on sanitation standards and inspections
FLEAS	Sanitation Good Housekeeping Management of domestic host animals Control of feral host animals	Vacuuming			Insecticides Non-residual (residuals) Residuals Flea collars	Quarantine (Derat certificate)
HOUSEHOLD PESTS (SILVERFISH, PSOCIDS, CRICKETS, BEDBUGS)	Sanitation Good Housekeeping Control of feral host animals (bedbugs)	Pest proofing (crickets) Harborage elimination Vacuuming Sanitizing/laundering Trapping sticky traps	Temperature control Humidity control		Repellents Insecticides Baits Non-residual (aerosols) Residual liquids	
INSECT PESTS OF VEGETATION	Resistant Plant varieties Plant care	Removal Hand picking Water sprays Soap sprays Pheromone Traps (Japanese Beetles)		Many systems available based on pest species Bacillus thurigiensis	Pesticides Residual contact and systemics	Quarantine

Figure 6-2
Integrated Pest Management Methods

INTEGRATED PEST MANAGEMENT METHODS

CONTROL METHODS

TARGET PEST	CULTURAL	MECHANICAL	PHYSIOLOGICAL	BIOLOGICAL	CHEMICAL	REGULATORY
WOOD DESTROYING INSECTS	Design Selection of resistant lumber/ materials	Repair/maintenance	Exposure to high or low temperature (drywood termites) In situ electrocution (powder post beetles)		Wood preservatives Insecticides Residual Fumigation	Quarantine Require annual inspection
WOOD DESTROYING FUNGI	Design Proper storage of wood Vegetation management Selection of treated lumber	Repair/maintenance	Ventilation Moisture control, drainage, vapor barriers in crawl spaces Protect stored lumber		Wood preservatives Pressure treatment Brush treatment Dip treatment	Require annual inspections Quality assurance inspections Require storage protection and pressure treated materials
AQUATIC WEEDS	Pond and ditch design Water management Level Flow Water Quality (Nutrients)	Removal Barriers Mowing Cutting		Fish (White Amur) (highly restricted) Insect Alligator-Weed Beetle Moth (Alligator-Weed) Weevil	Herbicides	Quarantine
NON-SELECTIVE WEED CONTROL	Selective planting Cultivation Burning	Barriers Plastic Gravel Pavement Hand removal			Growth regulators Herbicides Selective Non-selective Short-term Long-term	Quarantine Regulations on weeds
SELECTIVE WEED CONTROL (GRASSES/BROAD, LEAF/BRUSH)	Selective planting Mulching Cultivation Fertilization Grazing Watering practices	Removal/clearing mowing Cutting Pruning Barriers	Controlled Fire	Insects on Lantana, musk thistle	Growth regulators Fruiting inhibition Herbicides selective Pine release Frilling Stump injection	Regulations on weed control
BATS	Design structures with barriers, screening, etc.	Bat proofing screening flashing caulking insulation netting Trapping	Do not rely on decoys, flood lights, sonic devices, and fans		Repellents (marginally effective) Pesticide (DDT)	Federal and state regulations
BIRDS	Design out roosting sites Sanitation Food source removal Landfill siting Sewage lagoon siting	Bird proofing Nest removal Trapping Shooting Mist nets Scare devices Habitat modification	Habit interruption Distress calls Light and sound emitters not effective Predator facsimiles are not effective Exposure to cold (reduced insulation) Simulated predator kites	Predators falcons	Repellents Avicides Baits Residual liquids and greases Sterilants	Federal and state permits
RATS & MICE	Site landfill and other rodent attractive areas away from residential areas. Maintain sanitary conditions and remove sources of food and water. Store food stuffs in rodent proof containers. Educate public.	Harborage elimination: Rodent proof areas by sealing entryways into building, closing doors, windows, etc. Cover openings with hardware cloth, metal flashing or cement. Stuff utility chases and other small openings with steel wool. Trapping: Snap Traps, with expanded triggers Live trapping Glue boards Nest removal.	Sonic and electromagnetic devices are not effective.		Rodenticides Anticoagulant baits Single dose baits Tracking powders Burrow fumigation	Local public health ordinances, installation instructions OPNAVINST 4565.1 regulates retrograde cargo. SECNAVINST provides quarantine requirements.
WILD RODENTS	Sanitation Food source removal Water management (aquatic vertebrates) Habitat manipulation	Pest proofing Haborage elimination Trapping Snare trap Live traps Barriers Shooting		Low temperature exposure	Repellents Pesticides single dose multiple dose baits Birth control hormones Burrow fumigation	Federal and state permits Activity instructions on pest control

Figure 6-2 (Cont'd)
Integrated Pest Management Methods

INTEGRATED PEST MANAGEMENT METHODS

TARGET PEST	CONTROL METHODS					
	CULTURAL	MECHANICAL	PHYSIOLOGICAL	BIOLOGICAL	CHEMICAL	REGULATORY
MOSQUITOES	Water Management Ditch Drain Fill Flood Vegetation Control Aquatic Plants Mowing to Reduce resting sites Plant selection (water trappers)	Screening Remove trash providing breeding site	Sonic devices *not* effective	Predatory fish Nematodes Fungi Bacteria Predatory mosquito (*Toxorhynchites* *sp.*) Purple martins *not* effective	Repellents (personal) Larvicides Insect growth regulators Biodegradable oils Residuals Controlled release Liquids Adulticides Non-Residual (aerosols) Residual (ULV) Barrier treatments	Coordination with local mosquito abatement districts Quarantine - Public Health
SPIDERS	Sanitation Harborage removal (debris)	Removal of webs, adults, eggs (vacuum) Spider proofing Screen Sealing cracks		Wasps	Freezing agent aerosols Insecticides Non-residual aerosols Residuals	
STORED PRODUCTS PESTS (INSECTS)	Sanitation Acceptance inspection Good Housekeeping Selection of synthetic materials	Insect proof packaging/storage Short storage time Sieving Survey/disposal Isolation of infested stores	Cold storage Dehumidification		Repellents (packaging) Insecticides Non-residual (ULV) Residual Fumigation Dry cleaning	Quarantine In transit fumigation requirements
SUBTERRANEAN TERMITES	Design (Preventive) Sanitation (Pre-construction clearing of all wood material) Termite shields for survey Construction with treated wood	Repair and maintenance (corrective) Moisture control/water drainage Removal of wood scraps Screening		Bait with symbiont-killing antibiotics	Wood preservatives Insecticides Soil treatment with residuals Bait blocks Repellents	Quarantines Activity instructions requiring annual inspections
TICKS/MITES	Weed and brush control Management of domestic host animals Control of feral host animals Personal inspection for ticks	Hand removal Vacuuming			Repellents Pesticides Residual Systemics	Surveillance Activity instructions on tick exposure and removal
WASPS, HORNETS & BEES	Sanitation Food source removal Turf management Clover removal Diversion Grow nectar and pollen sources in frequented sites	Nest removal Swarm removal (Honey Bees) Trapping Screening			Freezing agent aerosols/CO_2 dispenser Repellents Insecticides Non-Residual aerosols Residuals Baits	Prohibit sale of attractants (Yellow Jackets) such as cotton candy, soda and sweet drinks Quarantine USDA, others

Figure 6-2 (Cont'd)
Integrated Pest Management Methods

CHAPTER 7. ENVIRONMENTAL HAZARDS FROM PESTICIDES

Most pesticides are poisonous. They have the potential to adversely affect:

- non target organisms
- water supplies
- human health
- the environment

Pest control often requires the use of pesticides to control pests. Generally, the amount of pesticide used is very small. However, because pesticides are the "tool-of-the-trade", public scrutiny is often directed at the pest control industry.

Pesticide effects on non-target organisms and areas is a major concern. Pesticide spills resulting in contamination must be avoided. The PCQAE should be aware of the types of non-target effects and contamination which may occur and how to prevent it.

7.1 NON-TARGET PESTICIDE EFFECTS. Non-target pesticide effects result when a pesticide reaches an area or organism where it was not directed. Non-target effects occur in several ways.

7.1.1 Drift. Drift results from **wind** carrying the pesticide off-target. Pesticide applications which use small liquid particles applied under high pressure, or dusts, are most likely to drift. Applications using large particles such as granules, or liquid formulations using anti-drift adjuvants, applied under low pressure are less likely to drift.

7.1.1.1 Wind Drift. Wind drift may occur if a liquid pesticide is used when winds are blowing at 5 miles/hour or higher.

7.1.1.2 Vapor Drift. Some pesticides volatilize (become vapors) upon use. This is a greater non-target threat than wind drift. Vapors are lighter than liquid particles, thus they travel further. Excessive winds (above 5 mph) may carry vapors 2-3 miles, or more, from the target site.

7.1.1.3 Drift Prevention. To minimize the potential for drift:

- don't spray in excessive winds
- use drift resistant formulations when possible
- use adjuvants (thickeners) when feasible
- be aware of sensitive areas and set-up a buffer zone(s) where applicable

7.1.2 Runoff. Runoff results from water carrying the pesticide off-target. The most likely cause of runoff is rainwater carrying a recently applied pesticide to lower areas. Pesticide runoff may reach streams, ponds, and lakes resulting in fish kills.

7.1.2.1 Runoff Prevention. To minimize the potential for run-off:

- avoid pesticide applications prior to heavy rains
    - check daily and weekly weather forecasts (local newspapers, radio/television stations, airfields, and weather stations)
- be aware of large scale pesticide operations in the vicinity of storm drains, canals, streams, and other bodies of water
- use runoff-resistant formulations when possible (emulsions are less likely to runoff than granules or powders)

7.1.3 Leaching. Leaching occurs when pesticide travels through soil to non-target areas or organisms. The most common cause of leaching is water carrying the pesticide down through layers of soil. Leaching can contaminate underground water sources.

Soil types affect leaching. Sandy soils, which are porous, are a more likely site for leaching than clay soils, which are not as porous. Pesticides that bind well with the soil are less likely to leach than pesticides that do not bind well with the soil. Your Command PMC can help select pesticides.

7.1.3.1 Leaching Prevention. To minimize the potential for leaching:

- avoid pesticide applications prior to heavy rains
- be aware of any wells, sinkholes, lowlands, or other areas where leaching may occur
- use pesticides which bind with the soil rather than pesticides that tend to leach
- read the label for restrictions on soil types

7.1.4 Direct Contact. Direct pesticide contact is the accidental application of a pesticide to a non-target area or organism. Some common examples are:

- children or animals being contaminated by early re-entry to an area recently sprayed
- application of a termiticide directly into a well or cistern
- children or animals sleeping on a rug recently treated for fleas
- contamination of a pesticide applicator during mixing, application, or handling of pesticides

7.2 SENSITIVE AREAS. Some areas are sensitive to pesticide applications by virtue of their location, site, characteristics, or the time of pesticide application. Sensitive areas have the most potential for pesticide contamination or can be significantly affected by pesticides.

The QAE should always consider sensitive areas during pesticide applications so that proper action may be taken to prevent an incident.

7.2.1 **Sensitive Sites.** The following may be sensitive sites:

- schools, playgrounds, and recreational areas where children frequent
- hospital wards and patient care areas
- food storage and preparation areas
- pets and domestic animal sites such as aquariums or pet bedding
- desirable plants and agricultural crops
- bodies of water
- lowlands, wells or cisterns
- endangered species sites
- bee hives

7.2.2 **Sensitive Times.** Sensitive "times" are when the potential for contamination is greatest. Some examples are:

- when the wind exceeds 5 MPH
- when it may downpour later that day
- when the contractor has a record of poor performance
- when the contractor is new
- when you feel that contracted personnel are not trained sufficiently

7.3 GOOD PRACTICES PREVENT CONTAMINATION. The PCQAE may have the authority to stop an operation as described in their Quality Assurance Appointment Letter. The PCQAE who establishes a good working relationship with a contractor will accomplish a lot more than one who maintains an authoritarian attitude.

Often, pointing out a potential hazard, or calling the contractor's attention to a problem will be more effective than stopping work. The following are some simple precautions to be taken by the contractor, and noted by the PCQAE, to prevent accidents.

7.3.1 **Follow Label Directions.** Following all label directions is the best way to prevent accidental contamination. The contract specifications should require the contractor to provide a book of all pesticide labels and MSDSs that the contractor intends to use in his work. The book should be kept by the PCQAE, who should be familiar with the labels and MSDS. The PCQAE should always review the pesticide label and MSDS before inspecting an operation involving the pesticide(s).

7.3.2 Use the Right Pesticide. The label will indicate the pests and the sites for which a particular pesticide can be used. The contractor should always select a pesticide that will be the most effective with the least threat to the environment. Being familiar with the label will enable a PCQAE to know if the safest pesticide is used.

7.3.3 Use Appropriate Control Method(s). Appropriate control methods are the pest control operations that:

- provide the best control
- minimize toxic material use
- meet the requirements of the contract

Control methods do not have to use pesticides.

Frequently, commercial pest control firms rely entirely on pesticides to obtain control. In many cases, the use of traps, sticky boards, exclusion, or some other method would be as effective, less toxic, and safer. Since contracts specify the results that a contractor must accomplish, and not the methods employed to that end, it is the contract writer's responsibility to include survey and non-chemical control provisions in the contract.

7.3.4 Conscientious Personnel. Carelessness, inexperience, and disinterest are the main causes of pesticide accidents. The commercial pest control industry is prone to high employee turnover. Well trained and experienced pest controllers know the importance of the work they do and will exhibit self confidence.

The PCQAE's role is to observe pest control personnel at work and determine if an individual is interested in his work and concerned for what he is doing. When a contractor or contractor's employee does not seem competent, it is appropriate to bring this to the attention of the individual's supervisor.

7.3.5 Attention to Weather. Outdoor applications of pesticides must be coordinated with the weather. Often, contractors will apply pesticides on their scheduled day, ignoring potential problems which may result from changes in weather. It is the PCQAE's responsibility to know what the predicted weather changes may be.

7.3.5.1 Wind. Excessive winds may cause pesticide drift. Because the wind may be from the south at 3-5 mph at the start of pesticide application, this does not guarantee that it will be so at the finish of application. The PCQAE should know what the weather changes may be, and advise the contractor appropriately. If the wind exceeds what you consider safe for the pesticide formulation and application technique, stop the operation.

7.3.5.2 Rain. The late afternoon thunderstorm has probably caused more non-target effects than any other weather related hazard. Granular pesticide formulations (ex. granular broadleaf weed control products) will end up on the wrong site after a downpour. The PCQAE should be aware of the "potential for thunderstorms" and advise the contractor when the potential exists. Emulsions are significantly less likely to run off than granules.

7.3.5.3 Convection. Convection is the vertical (upward) movement of air in a given area. Convection occurs when the ground temperature is hotter than the surrounding air resulting in the upward air movement. A typical example of "convection" is the air above a black asphalt road on a hot summer day. We have all seen those mirage like "heat risers" coming off that really hot asphalt.

Convection affects pesticides by carrying the spray particles upward and away from the target site. The pesticide can be carried a long way from the target site. Use of granular formulations, or spreader/sticker adjuvants may prevent off-target effects from convection. Use of low spray pressures and large nozzle sizes will make the pesticide droplets larger and less affected by convection.

Convection will affect spray droplets which are less than 75 microns in diameter. Convection may affect pesticide applications such as tree spraying, aerial application, or ULV applications.

7.3.5.4 Inversions. Temperature inversions occur when the ground temperature is at least 1 degree cooler than the air above it. The result is a downward movement of air over that particular area. Inversions affect pesticide applications by forcing the small droplets directly down (droplets less than 75 microns). Inadequate coverage may result.

Inversions can be desirable. ULV pesticide applications for mosquito control when the ground is cooler than the air will prevent the pesticide from moving up and out of the target area.

7.3.6 Equipment. Equipment used for pesticide mixing, dispersal, or cleanup must be maintained in good repair. A direct correlation can often be made between the attitude of the contractor and the cleanliness and repair of the equipment. Details of proper equipment calibration, state of repair, and selection are covered in Chapter 9, Equipment.

7.4 PESTICIDE SPILL PREVENTION. Even when conscientious applicators observe all the necessary precautions, accidents may occur. When a pesticide spill happens, it is essential that the PCQAE know the procedures a contractor should follow to minimize the hazard, and to be aware of the actions the PCQAE will be required to perform.

7.4.1 PCQAE Pesticide Spill Prevention Management. An ounce of prevention is worth a pound of cure. This old saying must have been designed for the pesticide industry.

Pesticides can be spilled in the environment in a number of ways. Most spills occur during mixing and filling, and when a spray tank, hose, or pump ruptures or malfunctions. Sometimes, pesticide containers are punctured in transit or in store rooms.

Technical Information Memorandum (TIM) #15, Pesticide Spill Prevention and Management, published by the Armed Forces Pest Management Board provides more information on this subject.

7.4.1.1 Trained Personnel. It is essential that contractor employees be trained in the proper use and handling of equipment, proper application techniques, and management of spills. Without trained personnel, accidents are more likely to occur, and probably have more serious results.

7.4.1.2 Identify Sensitive Sites. The contractor and his employees, as well as the QAE, should identify sensitive sites:

- sites where accidents are likely to occur such as mixing areas, highway intersections etc.
- sites where accidents could have a profound effect on life and/or the environment such as near waterways, near wells, sinkholes, storm drains or near housing

7.4.1.3 Spill Contingency Plan. The PCQAE should know the Activity Spill Contingency Plan (SCP). Pesticides should be included in the Facilities Hazardous Waste Management Plan, Spill Contingency Plan and Hazardous Substance Spill Prevention Control and Countermeasure Plan. The SCP should include the following information:

- **Notification List Including Emergency Phone Numbers for:**
    - activity spill coordinator
    - habitations near potential spill sites
    - fire department
    - security
    - HAZMAT response team
    - environmental personnel

    - medical response team
    - local poison control center
    - CHEMTREC (800-424-9300) or National Agriculture Chemical Association (NCAA) operator
    - nearest Coast Guard district office (in case spill is near waterways)
    - EPA regional spill coordinator
- **Pesticide Inventory or List/Labels.** The PCQAE should maintain a complete inventory listing plus labels and MSDS for all pesticides which are stored on Facility grounds or that the contractor may have at the installation at any given time.
- **Map.** Part of the SCP should be a map which notes sensitive areas. Special notes concerning storm sewers, gate valves in storm drains and location of spill kits should be made.

7.4.1.4 Fire Awareness. The PCQAE should coordinate with the installation fire chief immediately after the contractor's pesticide inventory is made available. Discussions with the fire chief should include information about prevailing winds and evacuation plans if appropriate. The pesticide inventory should be updated as materials are added or deleted, and the nature of the pesticides, their flash points, and quantities in storage should be made known to the chief. The best means of handling pesticide fires should be planned.

7.4.2 Work Stoppage. The PCQAE may have the authority to stop the application of any pesticide or control operation whenever there is an imminent possibility of:

- environmental contamination
- threat of injury to people or animals

This responsibility should not be taken lightly as a contractor protest may result. Prior to inspecting any pest control contract, it is advisable for the PCQAE to discuss with management the criteria that justify work stoppage. It is advisable that procedures be established and that these procedures be followed.

If the PCQAE perceives the criteria have been met that justify a work stoppage, the PCQAE should:

1. Document all pertinent incidents/evidence related to the stoppage of the operation, and

2. Notify the Officer in Charge IMMEDIATELY.

7.4.3 Contractor Oversight. The pest controlQAE is responsible for oversight of the contractor's spill prevention efforts. The contractor's preparedness may be considered more important than the actual job of pest control.

7.4.3.1 Contractor Spill Kits. The contractor must have a spill kit(s) on the pest control vehicle(s). There are many excellent chemical absorbent materials available for spill control. The general rule of thumb for the quantity of absorbent found in a spill kit is: the absorbent should be able to handle the maximum amount of pesticide carried at any one time on the vehicle. However, there are no set regulations for the amount of absorbent needed. A spill kit designed to contain 15 gallons of material will be adequate for 90% of all spills.

7.4.3.2 Contractor Equipment. The contractor should inspect all equipment monthly. A sign should be permanently fixed on the vehicle to indicate the dates of inspection, the inspector, and any comments. The PCQAE should periodically check to see that inspections are performed. Some contracts state that unsatisfactory ratings for equipment/kits can result in an unsatisfactory rating for the entire contract.

7.4.3.3 Contractor Utilities/Storage.

- **Utilities.** The PCQAE should be aware of any utilities (ex: water supply) that the contractor is permitted to use. Quite often, water supplies will be limited to one location where filling operations are performed on a bermed concrete pad. Regardless of the location of the filling operation, a backflow preventer must be used.
- **Storage.** If the contract permits the contractor to store pesticides on DoD property, the PCQAE should be familiar with the facilities that will be made available to the contractor. The contractor should maintain the following spill control procedures at the site:
    - **Pesticide Labels.** All pesticide materials shall be stored in their individual containers and they shall be clearly labeled with the manufacturer's label. The materials shall be stored so that all labels can be easily read by an inspector. Pesticide containers should not have any other type of label other than the original manufacturer's label. A current copy of all pesticide MSDS shall be easily available to all DoD and contractor employees.
    - **Incompatible Pesticides.** Certain types of pesticides should not be stored near others. They may be incompatible because of the volatile nature of their ingredients. If a pesticide is incompatible with another it should have a precautionary statement that this material shall not be stored with or near another material. Herbicides and insecticides are usually stored separately to prevent cross contamination.

The PCQAE should check all labels to ensure that the contractor is not storing incompatible materials together.

- **Posted Emergency Procedures.** The storage facility should have emergency procedures posted on it. The contractor should display detailed instructions for fires and/or pesticide spills. An inventory of all materials should be on file with the local fire department. In case of a fire in the storage area, the fire department will be aware of the nature of the materials in storage and can act accordingly in wearing protective apparel and in their procedures for controlling the fire.
- **Damaged Containers.** The contractor should post instructions in the storage area, and have necessary equipment available, for handling damaged containers. Provisions should be made for over-packing leaking containers, or for disposal.
- **Spill Contingency Plan.** The contractor should display instructions for handling spill emergencies. Since the contractor maintains storage on DoD property, it is the contractor's responsibility to develop a Pesticide Spill Contingency Plan which includes all details noted in Paragraph 7.4.1.3 of this Chapter.

7.5 PESTICIDE ACCIDENT RESPONSE. In the event of a pesticide spill, the PCQAE should be trained in the proper procedures for spill response.

It is the contractor's responsibility to contain, neutralize, and clean up the spill. It is the PCQAE's responsibility to oversee contractor procedures.

7.5.1 PCQAE Accident Response.

7.5.1.1 Records. The PCQAE should record all pertinent information regarding the accident such as:

- the pest control operation
- the pesticide(s) involved
- the equipment involved
- your evaluation of the condition of the equipment
- all personnel involved
    - eyewitnesses
    - victims
    - participants

  - all personnel
- where it happened
- when it happened
- any unusual or adverse weather conditions
- anything you evaluate as unusual
- why you think it happened

7.5.1.2 Photographs. Photographs are the best chronicle of an event. They will provide detail when your memory begins to fade. If you do not have a camera (cameras can be purchased through the NSN system) photographs can usually be obtained through the base Public Affairs Office.

7.5.1.3 Contaminated Material. If possible, secure and label contaminated items in sturdy plastic bags. The bags should be stored until proper disposal can be arranged.

7.5.2 Contractor Spill Emergency Procedures. The contractor's personnel should be well versed in spill emergency procedures. The PCQAE should ensure that the contractor effectively manages the spill, that personnel and the environment are not endangered, and that appropriate base safety personnel are notified. The following are recommended procedures to be followed for accidental spills:

7.5.2.1 Safety and First Aid. Safety and first aid are the primary action. Victims should be moved to a safe distance from the site and treated accordingly. More information on this topic can be found in Chapter 8, The PCQAE and Personal Safety.

7.5.2.2 Warning to Adjacent Personnel. If any personnel are in imminent danger, they should be warned immediately so that proper evacuation can be performed.

7.5.2.3 Pesticide Identification. Identification of the pesticide(s) will dictate the proper response. This is why labels and MSDS must be immediately available.

7.5.2.4 Site Security. The site of the pesticide accident should be marked, or isolated so that it is clearly visible to people that the area is contaminated and should be avoided.

7.5.2.5 Containment and Control. The spill must be prevented from spreading. Temporary berms (curb-like mounds) can be erected around the spill using chemically absorbent material from the spill kit. The spill should then be covered with absorbent material. If the spill is a dust it should be covered with a polyethylene tarpaulin to prevent it from blowing about.

7.5.2.6 Spill Reporting. After the injured have been cared for, and the spill is contained and controlled, the spill should be reported to base security and the on-scene coordinator regardless of the size. If coastal or other waterways are involved it may be necessary to notify the Coast Guard. If vehicles are involved, the Department of Transportation may require notification. If the spill exceeds the notifiable quantity amount as defined in TIM # 15, other federal agencies must be notified. The contract specifications should include all relevant regulations pertaining to spill reporting.

7.5.2.7 Cleanup. After reporting the spill, the contractor should proceed with cleanup. This entails removal of the spilled pesticide. The spill should be mixed with absorbent and then placed in covered containers (or plastic bags), and labeled.

7.5.2.8 Decontamination-Deactivation. After the spill is removed, the spill site should be washed with soap and water or other reagents as required. TIM # 15, Pesticide Spill Prevention and Management, Appendix B, provides a practical decontamination guide.

7.6 POST-ACCIDENT PROCEDURES. All post-accident procedures should be performed by the contractor. It is the PCQAE's responsibility to inspect the contractor's compliance with these procedures. The PCQAE should be familiar with these procedures in case legal or regulatory action is taken. The PCQAE should be concerned with:

- sample collection
- probable cause
- proper disposal of all contaminants

7.7 DISPOSAL. Generally, contracts do not permit the contractor to dispose of any pesticide, pesticide container, hazardous waste, or byproduct of pesticide application on DoD property. If the contract does permit this, all contaminated items must be disposed of according the Hazardous Waste Management Plan developed by the Activity. Use of storm sewers for disposal is prohibited. Use of sanitary sewers for disposal must be approved by the Activity Environmental Coordinator.

7.8 INFORMATION AND ASSISTANCE. The contractor, and PCQAE may obtain information and assistance from the following:

1. Activity Hazardous Materials Specialist
2. The Command PMC
3. U. S. Coast Guard Chemical Hazard Response Information System (CHRIS)
4. CHEMTREC (phone numbers previously listed)
5. Activity Industrial Hygienist

CHAPTER 8. THE PCQAE AND PERSONAL SAFETY

With few exceptions, pesticides are hazardous to man and other non-target animals. Therefore, it is essential that all personnel who supervise, use, or apply pesticides be trained in the safe handling, mixing, storage, transportation, and application of pesticides.

Accidents with pesticides do happen. Contractor personnel may not be well trained in personal safety. Interest and care may wane on a given day. Therefore, the PCQAE should ensure that precautions that minimize the risk of accidents are implemented. Knowledge is the key to personal safety.

Knowledge about a pesticide can be obtained from:

- the pesticide label and labelling
- the MSDS
- reference manuals

If pest control operators, PCQAEs, and other personnel involved in the pest control industry use proper precautions, the chance of pesticide poisoning is very small.

8.1 PROTECTION PROGRAMS. In humans, pesticides can cause both acute (immediate) and chronic (long term) poisoning. In order to prevent acute poisoning, and monitor intermediate and long term effects from pesticides, the PCQAE may be included in the Station's Occupational Health Monitoring and Respiratory Protection programs. The PCQAE may receive respirator training, be respirator fit tested, and be issued protective gear. OPNAVINST 1500.23B contains more information on this topic.

8.2 CHOLINESTERASE LEVELS. Cholinesterase is an enzyme involved in the transmission of nerve impulses. Organophosphate and carbamate pesticides are cholinesterase inhibitors. A simple blood test can be performed to determine the cholinesterase base level prior to pesticide exposure.

Thereafter, periodic blood tests can assess pesticide exposure. OPNAVINST 6250.4A is very specific on the intervals for cholinesterase testing for personnel involved with pesticides. The base medical officer should be consulted to determine the need, procedures, and frequency for cholinesterase testing.

8.3 EFFECTS OF PESTICIDE POISONING.

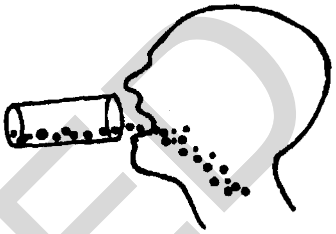
8.3.1 **Acute Toxicity.** Acute toxicity is a rapid response, usually within minutes or hours, to a single dose or exposure of a pesticide(s).

8.3.2 <u>**Chronic Toxicity.**</u> Chronic toxicity is the result of repeated exposures over time to sub-lethal doses of the pesticide(s). The result may be a gradual onset of severe symptoms, or decline of health over time.

8.4 PESTICIDE ROUTES OF ENTRY. Pesticides primarily enter the body in three ways.

8.4.1 <u>**Oral.**</u> Oral pesticide poisoning occurs when pesticides are taken through the mouth. Oral poisoning is the main type in children. Examples of oral intake of pesticides are:

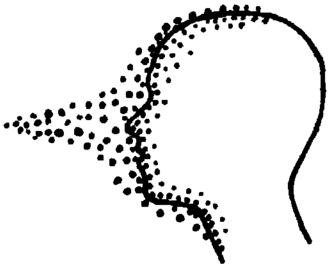
- mistaking pesticide for food or drink
- not washing hands prior to eating, smoking, or drinking
- eating or drinking pesticide laced baits
- pesticide contamination of food or drink
- accidentally splashing pesticide into or near the mouth



ORAL
ROUTE OF ENTRY

8.4.2 <u>**Dermal.**</u> Dermal poisoning occurs when pesticides are absorbed through the skin or membranes. Dermal exposure is the most common type of pesticide poisoning for pest control applicators. Examples of dermal exposure are:

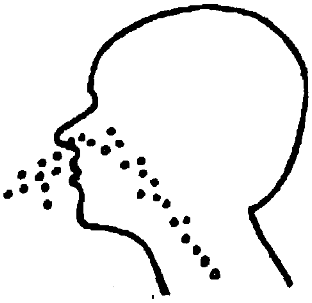
- splashing or spilling pesticides on the hands, face or wrists while mixing
- pesticide contaminated clothing coming in contact with the skin
- accidental contamination during pesticide application
- faulty equipment leaking pesticide on surfaces that come in contact with the skin



DERMAL
ROUTE OF ENTRY

8.4.3 <u>**Inhalation.**</u> Pesticide vapors can be inhaled. Inhalation is a primary concern for all pesticide applicators because of rapid absorption. Examples of ways that pesticide(s) inhalation can occur are:

- exposure to pesticides in poorly ventilated places where vapor concentrations may build up
- mixing pesticides without proper ventilation



INHALATION
ROUTE OF ENTRY

- not wearing proper respiratory equipment when required
- entering a treated area prior to proper ventilation

8.5 PESTICIDE GROUPS AND THEIR EFFECTS ON HUMANS. Pesticides affect humans in many different ways. The general signs and symptoms of pesticide poisoning will vary depending on the chemical group and the degree of exposure. Pesticide exposure may cause one or more of the following:

- **Mild Poisoning.** Mild poisoning includes irritation of one or all of the following; skin, eyes, nose or throat. The results may be:
    - headache
    - nausea
    - diarrhea
    - dizziness.
- **Moderate Poisoning.** Moderate poisoning may result in one or all of the following:
    - blurred vision
    - difficult breathing
    - poor muscle coordination
    - rapid pulse
    - flushed skin
    - constriction of the pupils of the eye(s)
    - stomach cramps
    - vomiting
    - uncontrolled muscle twitches
- **Severe Poisoning.** Severe poisoning may result in one or all of the following:
    - convulsions
    - severe difficulty in breathing
    - loss of consciousness
    - mucus secretions from mouth and/or nose
    - high fever

Severe poisoning can result in death.

8.5.1 Insecticides/Acaricides.

8.5.1.1 Organochlorines. Also called "chlorinated hydrocarbons", organochlorines are one of the oldest groups of synthetic pesticides. Organochlorines affect the nervous system by interfering with nerve impulse transmission.

- **Acute Poisoning.** Acute effects include extreme nervousness, moderate to severe twitching, and other severe poisoning symptoms. Death can occur.
- **Chronic Effects.** Organochlorines readily accumulate in fatty tissues. Symptoms of moderate or severe poisoning result.

8.5.1.2 Organophosphates. Organophosphates are cholinesterase inhibitors.

- **Acute Poisoning.** Acute effects from organophosphate pesticide poisoning include nervousness, blurred vision, profuse sweating, headache and a general excited feeling. Many organophosphates are highly toxic to humans and can be readily absorbed through the skin. Atropine and 2-PAM are antidotes to organophosphate poisoning.
- **Chronic Effects.** Organophosphates pesticides can be broken down by the body. Continuous exposure, however, may cause an onset of moderate or severe poisoning symptoms.

8.5.1.3 Carbamates. Carbamates are also cholinesterase inhibitors. In general, they are less toxic than organophosphates and are metabolized faster.

- **Acute Poisoning.** The symptoms of carbamate poisoning are similar to the symptoms of organophosphate poisoning.
- **Chronic Effects.** Carbamates are not persistent in the human body. However, some carbamates are known to cause birth defects in experimental laboratory animals. Antidotes to carbamate poisoning are the same as those used for organophosphate poisoning.

8.5.1.4 Pyrethroids. Pyrethroid insecticides are nerve poisons. They have a similar mode of action as the organochlorines.

- **Acute Poisoning.** The toxicity to mammals from pyrethroid insecticides is considered lower than that from the three groups mentioned above. However, large doses of pyrethroid insecticides will cause severe poisoning.
- **Chronic Effects.** Pyrethroids are metabolized in the body. Long term exposure, however, can result in general body disorder and sickness.

8.5.1.5 "Botanical" Pesticides. Botanical pesticides are derived from natural substances. In general, botanicals are quickly metabolized and have low human toxicity.

- **Acute Poisoning.** Symptoms vary greatly. Most botanicals are poorly absorbed through the skin and are of low inhalation toxicity. Some people (or animals) may have an allergic reaction causing dermatitis, hay fever, or asthmatic type reactions. Allergic reactions can be severe and life threatening.
- **Chronic Effects.** Most botanicals break down rapidly in the human body. However, long term exposure may result in general physical decline.

8.5.1.6 Biological Pesticides. Biological pesticides are living organisms which have been formulated, and concentrated to be used as pesticides. Biological pesticides may be bacteria, nematodes or viruses. Overall, biological pesticides are safer to use than the groups mentioned above. However, they are not without risks. For example, Bacillus thuringiensis can be very damaging to the eye.

8.5.1.7 Other Insecticides.

- **Juvenile Hormones.** Juvenile Hormone Analogs (JHA) are insecticides which affect the molting process of arthropods. The acute and long term human effects of exposure to JHA are considered small.

8.5.2 Herbicides, Algicides and Fungicides. Many herbicides, algicides, and fungicides are similar to the organochlorine and organophosphate insecticides. Acute and chronic effects to these materials vary widely. Overexposure can result in death.

8.5.3 Rodenticides. Rodenticides are toxic to humans.

- **Acute Poisoning.** Depending on the type of rodenticide, acute effects may be dizziness, profuse sweating, severe headache, disorientation, internal bleeding, severe stomach cramps, and death.
- **Chronic Effects.** Depending on the type of rodenticide, long term exposure may cause general weakness, loss of appetite, and other symptoms of moderate and severe poisoning.

8.5.4 Avicides. Avicides are used for bird control. Some avicides are very toxic. For example, fenthion used in toxic bird perches, has a very low dermal LD_{50} for humans. Fenthion is an organophosphate product and has been used as an insecticide in the past. The acute and chronic effects are the same as noted for organophosphate insecticides.

Avitrol, (2-aminopyridine) is a poison with flock alarming properties. It is generally mixed with a bait that is attractive to birds. If ingested by humans, this avicide can cause moderate or severe poisoning symptoms. Most avicides are stomach poisons.

8.5.5 Nematicides. Nematicides are used to control nematodes. Generally speaking, they are extremely toxic to mammals. If you are monitoring a nematicide application, caution should be used.

8.5.6 Fumigants. Fumigants may be used for:

- structural pest control
- stored product pest control
- turf pest control (occasional)

Fumigation involves the release of toxic gas in an enclosed area. Because fumigants are inhaled, the danger is rapid absorption of large doses of poison. Death can result. Extreme caution should be exercised if the PCQAE is to over-see any fumigation procedure. Consult your Command PMC.

8.6 PERSONAL SAFETY. Knowing as much as possible about a pesticide will help the PCQAE to take precautionary measures to protect himself and others against pesticide poisoning. Knowing the correct type of protective measures, and USING THEM are essential to minimize pesticide exposure.

8.6.1 Protective Clothing. Proper protective clothing and equipment will help prevent pesticides from entering the body. Pesticide label directions, and the MSDS will assist the PCQAE in determining when to wear gloves, goggles, respirator, etc. The absence of information does not rule out the need for protection.

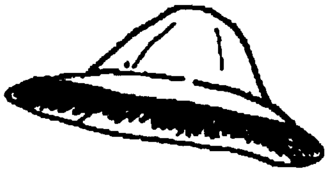
Be aware that some chemicals can go through or dissolve certain materials used for protective clothing. Read the label and MSDS to match the right material to the right pesticide.

Wash all safety equipment after use. (A common sense recommendation to prevent accidental poisoning the next time it is used). Safety/personal protective equipment includes:

- **Gloves** made of unlined neoprene, viton or nitrile. The gloves should be long enough to protect the wrists if working with concentrated or highly toxic pesticides

UNLINED GLOVES

- **Wide Brimmed Waterproof Hat** will protect the face and back of the neck from sprays
- **Hardhats** should be used in designated hardhat areas or areas where head protection is needed



WIDE BRIMMED HAT

UNLINED WATERPROOF NEOPRENE BOOTS

- **Coveralls** or long pants with long sleeve shirt should protect the operator from occasional spray of splash: Use of non-absorbent or waterproof materials may be needed if concentrated pesticides are used
- **Non-absorbent shoes** and socks should be worn: Leather shoes may absorb pesticide
- **Waterproof Non-absorbent Boots** made of unlined neoprene should be worn if working with highly toxic pesticides.

COVERALLS

- **Mixing Apron** or a rubberized rain coat should be worn when mixing pesticides
- **Unvented Goggles or a face shield** should be used anytime pesticide can get into the eyes
- **Chemical Splash Goggles with covered vents**

8.6.2 **Respirator.** Always wear a respirator if:

- directed by precautionary statements on the label
- exposed to a pesticide for prolonged periods of time
- working in confined spaces
- mixing in non-ventilated areas
- indicated by an Industrial Hygiene Survey

CARTRIDGE RESPIRATOR

The four major types of respirators are:

- Cartridge Respirator. The cartridge respirator is used for low level pesticide concentrations for short intervals of time. Cartridges should be replaced after eight hours of use, or sooner if vapor can be smelled or tasted.
- Canister Respirator. The canister respirator is a heavy duty cartridge respirator. It should be worn when personnel will be continuously exposed to pesticides vapors. Canister respirators will not protect personnel from high concentrations of pesticides or when the oxygen supply is low. Cartridge or canister respirators should not be used during fumigation procedures.

CANISTER RESPIRATOR

- **Self-Contained Breathing Apparatus (SCBA).** SCBA is for use when working:

SELF CONTAINED BREATHING APPARATUS

  - with high concentrations of pesticides
  - with highly toxic pesticides
  - in enclosed areas where pesticide concentrations may become high
  - **Supplied Air Breathing Apparatus (SABA).** SABA is a variation of SCBA where the air supply comes from an outside source. The air supply must be under a light positive pressure.

Regardless of type of respirator, it must be fitted to your particular face. Beards and some mustaches prevent a tight seal between the respirator and the face. You must receive a medical evaluation; training on the selection, use, and maintenance; and the respirator must be fitted to your particular face.

Consult your Occupational Safety and Health Manager for additional assistance.

SUPPLIED AIR BREATHING APPARATUS

8.7 FIRST AID. The PCQAE should know the correct procedures to follow in case of an emergency. Quick action may prevent injury or death.

8.7.1 Instructions Provided on the Label and MSDS. Read the label and the MSDS. These documents will provide instructions on what to do to prevent further injury until medical treatment is provided. Provide a label to the physician to aid in treatment. Make sure the contractor knows first aid procedures for the pesticides being used.

8.7.2 Get Medical Attention as Soon as Possible. By knowing the location and phone number(s) of medical and other emergency response teams, help for the injured will not be delayed.

8.7.3 First Aid Procedures. First aid procedures will vary depending on the pesticide and the exposure.

8.7.3.1 Pesticide in Eyes. If recommended by the label, flush the eyes immediately with clean, pure water, preferably from an eye wash station, for at least 15 minutes. Call a physician.

8.7.3.2 Pesticide on Skin. Remove contaminated clothing. Thoroughly wash skin and hair with detergent and lots of water. This is a good reason why pesticide vehicles should carry 6 gallons of fresh water. Call a physician.

8.7.3.3 Pesticide Swallowed. Check the label to see if vomiting should be induced (don't do it unless the label says so). Use emetic (vomit inducer) only as directed. Watch that the patient does not choke. Get medical help as soon as possible.

8.7.3.4 Pesticide Inhaled. Remove the affected individual(s) to fresh air and have them recline. Loosen tight or restrictive clothing to aid breathing. Keep the patient warm and quiet. Apply artificial respiration only if breathing stops. Get medical help as soon as possible.

If a person(s) is exposed to a pesticide(s), the source of exposure should be controlled as quickly as possible. After the contamination source has been controlled, and immediate first aid procedures have been administered, medical assistance should be sought. A small exposure should not be considered "nothing".

CHAPTER 9. PESTICIDE APPLICATION EQUIPMENT

The equipment used for the application of pesticides should be:

- the proper size and type for the purpose
- free from visible leaks and deterioration
- clean and in good working order
- operated in the correct pressure range
- calibrated properly
- used by competent personnel

If these criteria are met, pesticide risk to personnel and the environment are reduced to a minimum level.

The state of repair and cleanliness of equipment are excellent indicators about contractor professionalism. The PCQAE should take notice if the contractor's equipment is covered with grime. The PCQAE should be concerned if the contractor's equipment is poorly maintained.

9.1 PARTICLE SIZE. The size of the particles containing pesticide which are dispersed from a piece of equipment is governed by the type of equipment used. Different particle sizes are used for different tasks.

NOTE: 1 MICRON = 1/1000 MILLIMETER

NOTE: 1 MICRON = 1/25,000 INCH

9.1.1 **Liquid Sprays.** Spray particle sizes are defined by:

- the range of the particle sizes in the spray
- the Mass Median Diameter (MMD) of the particle sizes in the spray

If all the droplets in a spray were measured, and the droplet sizes were divided into two equal sections (large droplets and small droplets), the droplet diameter size that fits between the two categories is the Mass Median Diameter (MMD).

9.1.1.1 Course Sprays. Course sprays contain droplets that are 400 microns or more in diameter. In relation, a raindrop is 4000 microns or more in diameter. Course sprays are dispensed from solid stream nozzles.

9.1.1.2 Fine Sprays. Fine spray droplet sizes range from 100 to 400 microns in diameter. Fine sprays are usually generated from hollow cone or flat fan nozzles.

9.1.1.3 Mists. Mist droplet sizes range from 50 to 100 microns in diameter. Mists are produced by high pressure pumps, high speed mist blowers, and atomizers.

9.1.1.4 Aerosols/Fogs. Aerosol and fog droplet sizes range from .1 to 50 microns. Droplets of this size stay suspended in the air for a very long time.

Ultra Low Volume (ULV) equipment and aerosol containers are the primary equipment which produce aerosols/fogs. Generally, ULV preferred droplet sizes are 5 to 25 microns in diameter, with a MMD of 12 - 14 microns.

9.1.1.5 Smokes and Fumes. Smoke and fume droplet sizes range from 0.001 to 0.1 microns in diameter. Thermal fog generators are used to generate smokes and fumes.

9.1.1.6 Vapors. Vapors are liquids in the droplet range sizes of less than 0.001 microns in diameter (Example: The pesticide DDVP volatilizes in the presence of air giving off pesticide vapors).

9.1.2 Dusts.

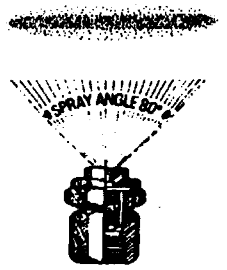
9.1.2.1 Course Dusts. Course dusts have a particle size of 175 microns or larger in diameter. Course dust is heavier than medium or fine dust thus course dust is less prone to drift.

9.1.2.2 Medium Dusts. Medium dust sizes range from 45 microns to 175 microns in diameter.

9.1.2.3 Fine Dusts. Fine dust particle sizes are 44 microns or less in diameter. A fine dust will pass through a 325 mesh (325 wires to the inch) screen. Fine dusts are very light and will become airborne easily.

9.2 HAND OPERATED COMPRESSED AIR SPRAY EQUIPMENT. Hand operated compressed air sprayers are used in most indoor pest control operations and in some outdoor applications.

Hand operated compressed air sprayers are economical, simple to operate, and reasonably easy to clean and repair.



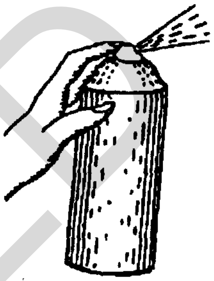
Pressure and output rate may fluctuate. For this reason, a pressure gauge should be used. The sprayer may require frequent agitation with certain formulations (wettable powders or flowables). Hand held compressed air sprayers are limited in area coverage because the tank capacities are small.

Hand operated compressed air sprayers are the most common piece of equipment used by professional pest controllers. The PCQAE is most likely to see these.

9.2.1 Aerosol Can Dispenser. Aerosol cans are usually small (1 quart or less), but can be larger and refillable. Aerosols are useful:

- against flying insects
- as flushing agents
- in crack and crevice treatments when a "straw-like" nozzle extension is used

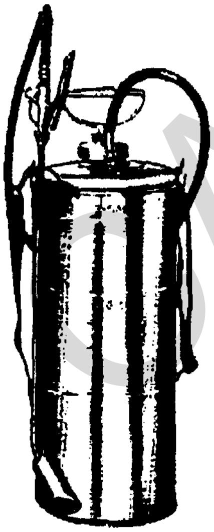
Some pest control companies use aerosol cans with extension hoses and nozzle tips.



AEROSOL CAN

9.2.2 Compressed Air Sprayer. The compressed air sprayer is the standard sprayer for the pest control operator. The sprayers generally have a tank capacity of 1-3 gallons. Air is compressed in the tank by working the hand pump building a positive pressure. The pesticide is driven out through the hose to the wand. A squeeze type valve actuates the spray. Several varieties are available.

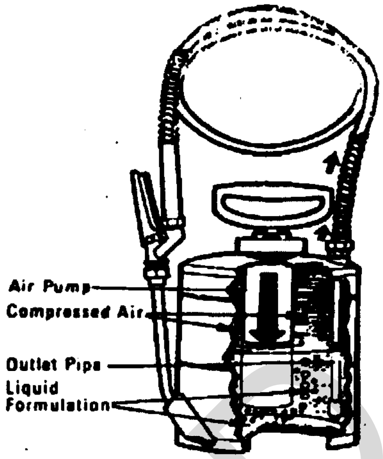
The compressed air sprayer is used primarily to apply residual sprays (example: roach, flea or ant control). Depending on the type of nozzle tip, compressed air sprayers can be used for crack and crevice, spot, area or baseboard application.



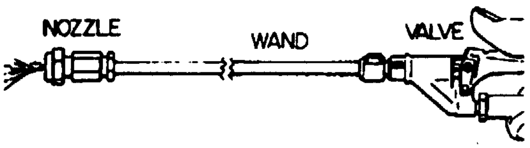
COMPRESSED AIR SPRAYER

- **The Tank.** The tank should be made of stainless steel, brass or galvanized steel. The seams may be welded or soldered. Galvanized steel may corrode with some pesticide solutions. Silver soldered seams will deteriorate faster than welded seams.
- **Hoses.** Hoses should be made of synthetic rubber (Example: neoprene, viton, butyl rubber) and not made of natural rubber as natural rubber will deteriorate in the presence of some solvents which are used as emulsifiers. The hose should be reinforced (usually a nylon weave), being 1/4" - 3/8" internal diameter. Clamps or hose fittings are desirable to attach the hose to the tank and the wand.
- **Valve.** The valve is generally a lever type. The valve is one of the most likely places to leak along with the hose fittings.

- **Wand.** The wand is generally a slender metal tube which provides reach from the valve/handle to the nozzle. Sometimes two or three wands may be joined together to create more "reach".
- **Nozzle.** The nozzle is the most important part of the sprayer for it determines the pattern that the pesticide will be sprayed. The nozzle determines the rate of spray output at a given pressure. If a nozzle is clogged or worn, the pesticide may be unevenly distributed, excessively or inadequately put on. More will be devoted to nozzles in this chapter.



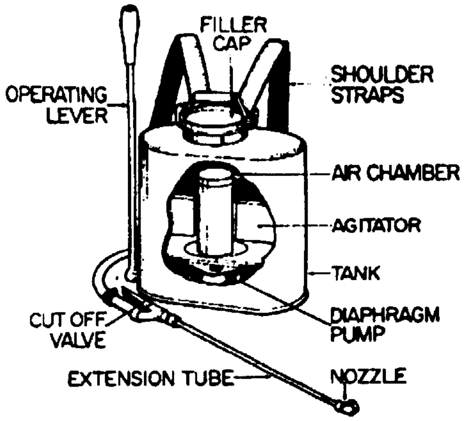
INTERNAL PARTS OF COMPRESSED AIR SPRAYER



SPRAY WAND

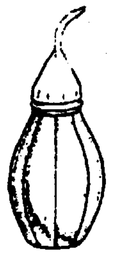
9.2.3 <u>Hand Operated Backpack Sprayer.</u> The hand operated backpack sprayer is a variation of the compressed air sprayer noted above. The sprayer is carried on the operator's back using straps. Air compression and agitation are performed by the operator pumping the lever, which is located on the side of the unit. Backpack sprayers generally have a larger tank capacity than the compressed air sprayer. These units are used for some outside pest control work such as application of herbicides on cracks in parking lots, or perimeter pesticide application outside of a private dwelling.

9.3 HAND OPERATED DUST AND/OR GRANULE EQUIPMENT. Hand operated granule and dust application equipment is easy to use, inexpensive to purchase and maintain, and fairly easy to clean.



HAND OPERATED BACKPACK SPRAYER

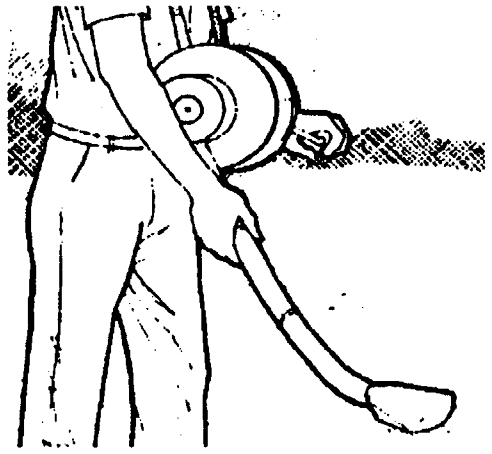
9.3.1 **Bulb Duster.** The bulb duster has been used for many years and is still an effective tool. It is used to deposit dusts (such as silica or boric acid) in cracks and crevices for cockroach and other indoor pest control operations.



BULB DUSTER

9.3.2 **Rotary Hand Duster.** Rotary hand dusters are used for:

- dust dispersion in underbrush around dwellings
- applying dusts as mosquito larvicides

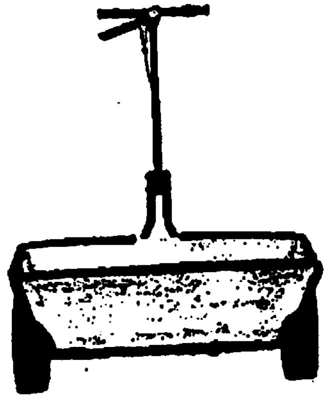


ROTARY HAND DUSTER

A fan shaped tip is usually used for broadcast applications. A narrow tip may be used for injecting the dusts into burrows for ectoparasite control.

Because dust is mechanically forced out of the rotary hand duster, there is a significant possibility of pesticide drift. Rotary hand dusters should be used only if winds are 5 mph or less.

9.3.3 **Drop Spreaders.** Although hand driven drop spreaders are mostly used around the home, they can be used industrially. Drop spreaders are used for small to medium size turf areas. They distribute the material in a path as wide as the spreader itself. Like any piece of pesticide application equipment, drop spreaders must be calibrated. Generally, granular formulations are used in drop spreaders.



DROP SPREADER

9.3.4 **Cyclone Applicator.** The cyclone applicator is also called the alfalfa seeder or grass seeder. The operator turns a hand crank, which is geared to a rotary slinger.

CYCLONE APPLICATOR

The cyclone spreader pictured here is primarily used for seeding operations.

Pushcart cyclone spreaders (also called broadcast spreaders) are used for some pesticide operations. Contractors may use a pushcart cyclone spreader to distribute:

- herbicide granules onto turf
- insecticide granules onto turf or underbrush
- over seeding

The pattern of distribution from cyclone spreaders is generally uneven. The PCQAE should check that cyclone spreaders are not used close to sensitive areas.

9.4 POWER DRIVEN PESTICIDE APPLICATION EQUIPMENT. Power driven pesticide application equipment can be small or large. Liquids or dry materials can be distributed. Power sources can be:

- electrical (12 VDC, 110 VAC)
- fuel motor driven (gasoline, fuel oil, other)

There are many different types of pumps used for power pesticide dispersal. They include hydraulic, centrifugal, and diaphragm pumps. Each type of pump governs the discharge qualities of the entire system. For example, hydraulic pumps can generate the maximum pressures used in pest control (generally around 100 PSI), but may have limited volume capacity. Centrifugal pumps may be limited to 40 PSI or less, but can move large volumes of liquids.

9.4.1 Advantages and Disadvantages.

9.4.1.1 Advantages. The advantages of power driven pesticide application equipment compared to hand held equipment are:

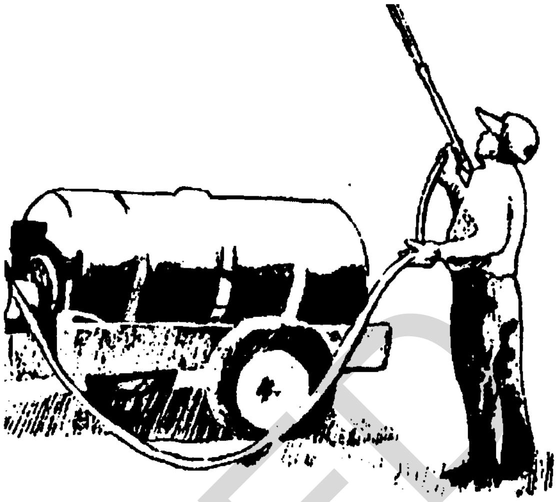
- provides good coverage and penetration of vegetation
- can deliver high volumes to large areas
- can apply pesticides considerable distances

9.4.1.2 Disadvantages. The disadvantages of power driven pesticide application equipment compared to hand held equipment are:

- more likely to cause an environmental problem because larger volumes of pesticide are involved
- leaks are likely to be larger and more serious than hand operated equipment because pressures are higher
- may be hard to confine the discharge to target areas
- are more costly to maintain and run than hand operated equipment

9.4.2 Hydraulic sprayers. Hydraulic sprayers are also called boomless sprayers or handgun sprayers. A hydraulic pump is used to generate the higher pressures (40-100 PSI) required to distribute the pesticide. Hydraulic sprayers may be fitted with a single nozzle or with a nozzle cluster that produces a horizontal spray pattern similar to a boom. These sprayers are used for:

- irregular shaped areas such as ditches
- penetrating brush
- tree spraying
- fenceline or area weed control operations



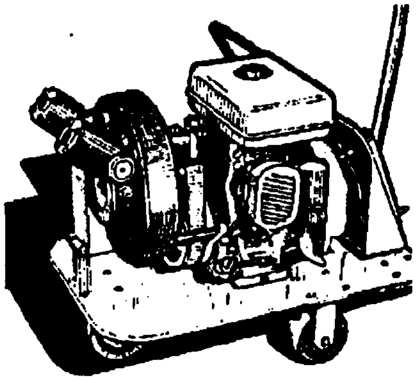
HYDRAULIC SPRAYER
(HANDGUN SPRAYER)

9.4.3 Ultra Low Volume (ULV) Equipment. ULV equipment distributes a very small amount of concentrated pesticide over a relatively large area. ULV equipment produces aerosol droplets in the 0.1 - 50 micron range. The use of ULV equipment to control arthropod pests has increased in recent years. The most common use is in outdoor adult mosquito control. However, ULV equipment is also used against arthropod pests in:

- food warehouses and elevators
- bakeries
- warehouses

When compared to older technology thermal foggers, ULV pesticide application equipment is adventitious because of:

- increased penetration of concealed areas
- no thermal degradation
- reduced potential of environmental contamination
- reduced fire hazard
- reduced volume of liquid pesticide

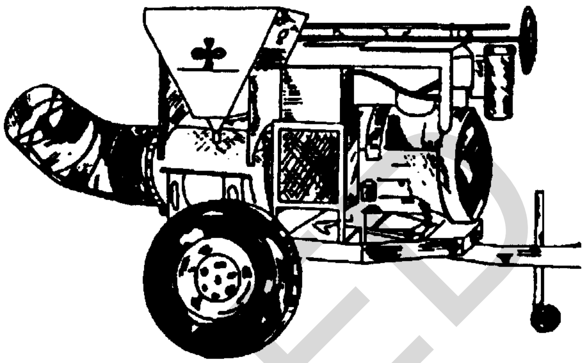


ULV AEROSOL
GENERATOR FOR
INDOOR USE

ULV equipment may be electric or gasoline-powered. Check with local fire codes to determine the suitability of using gasoline powered equipment indoors.

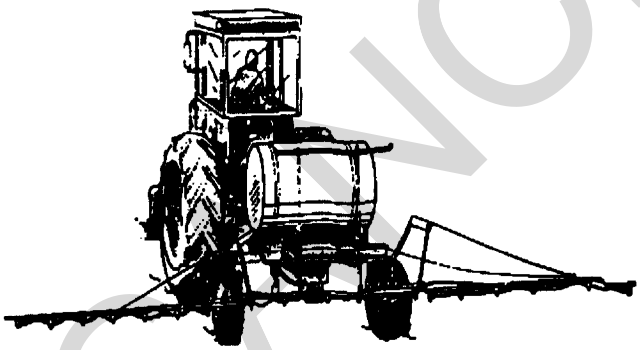
9.4.4 **Power Duster/Mister.** Also called air-blast sprayers, power duster/misters can deliver liquids or dry pesticide formulations (dusts, granules). For liquid pesticide applications, high velocity air aids pesticide dispersal. The liquid spray nozzle operates at low pressure injecting the pesticide droplets into the high velocity airstream which is generated by a large fan. The air blast shatters the droplets into fine droplets and blows them to the target.

Dusts, or granules are dispersed by metering the dry pesticide formulation into the airstream.

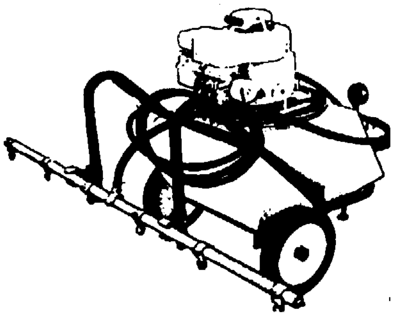

POWER DUSTER/MISTER

Usually the air blast sprayer is mounted on a swivel so that it can be aimed. Power duster/misters can place pesticide on a swath up to 90 feet wide and reach trees 70 feet tall.

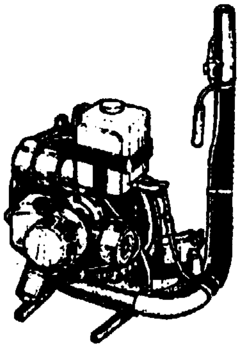
9.4.5 **Boom Sprayers.** Boom sprayers distribute liquid formulations through a series of nozzles which are mounted on a boom. The boom can range from 10 to 60 feet in length. Boom sprayers are designed to apply pesticide on large areas using a swath pattern of distribution. The PCQAE should check to see that all of the nozzles are in proper working order and good repair. If nozzles are worn, clogged or improperly calibrated, the distribution of pesticide will be uneven.


TRACTOR-MOUNTED BOOM SPRAYER

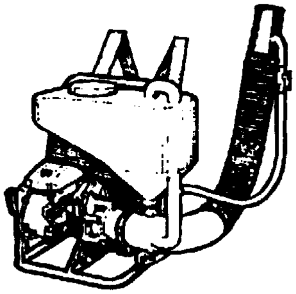
Most boom sprayers use low application pressure so that drift is minimized. Wherever the spray must penetrate dense vegetation, high pressure is used. Booms can be mounted on most vehicles along with the necessary pump, tank and engine. Aircraft may use boom equipment.


TRAILER-MOUNTED
BOOM SPRAYER

9.4.6 Gasoline Powered Backpack Equipment. Gas powered backpack sprayers are carried on the operators back. A small gas engine drives the pump. ULV (aerosols), mists, and dusts/granules can be applied depending on the make/model of the sprayer. Pesticide tank capacity is normally 2-4 gallons for liquids. While these units cannot be considered "heavy duty", they are useful in pesticide applications to brush or terrain where wheeled vehicles cannot travel.

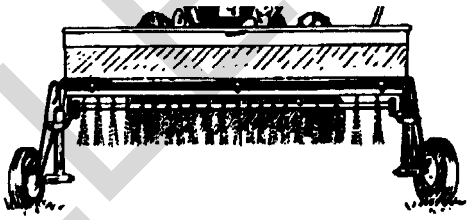


BACKPACK ULV AEROSOL GENERATOR



BACKPACK DUSTER-MISTER

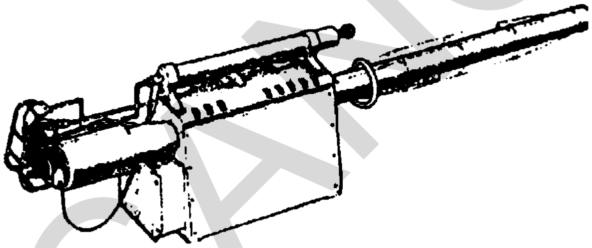
9.4.7 Power Drop Spreader. The power drop spreader is a large variation of the hand drop spreader. Only dry pesticide formulations are dispersed. Generally, power drop spreaders are trailer mounted.



POWER DROP SPREADER

The power drop spreader is extensively used in turf management. Potential for drift is considerably less than air-blast sprayers.

9.4.8 Other Powered Equipment. Although, the equipment listed below is outdated, some contractors may still use them.



PULSE JET GENERATOR

- Thermal Fog Generators. The thermal fog generator ignites an oil based pesticide formulation. Aerosol fog results.
- Pulse Jet Generator. The pulse jet generator ignites gasoline and mixes it with an oil based pesticide to create a fog similar to a thermal fog generator.

Pulse jet and thermal generators have been replaced with ULV technology. Neither piece of equipment should be used indoors.

9.4.9 Power Equipment Tank Inspection. Pesticide power equipment tanks should:

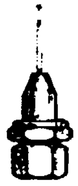
- have large openings for easy filling and cleaning
- provide for mechanical or hydraulic agitation during operation
- be made of corrosion resistant material such as stainless steel or fiberglass
- have a large drain
- have a gauge to show liquid level
- gauges should be protected against breakage
- have a shut-off valve to stop dispensing pesticide while other parts of the sprayer are being serviced
- be free of splits, rust or leaks
- have all pipe and hose attachments tightly sealed and free of leaks
- be free of dirt, grime, and pesticide residue

9.5 PESTICIDE SPRAY NOZZLES. The correct selection, assembly and maintenance of spray nozzles will govern pesticide application. If a spray nozzle discharges an incorrect pattern, too much or too little active ingredient may be applied. Clogged or worn nozzles will affect the quantity and dispersion of pesticides. Nozzles should be replaced or cleaned as necessary. The PCQAE should, as part of planned sampling, check that the contractor is calibrating the pesticide application equipment on a periodic basis.

9.5.1 Spray Nozzle Types. There are many different types of nozzles that will operate under different pressures, and produce different spray patterns.

9.5.1.1 Pin Stream Pattern Nozzle. Pin stream nozzles are also called solid stream. Pin stream nozzles are used:

- in hydraulic equipment for spraying distant targets such as ditch banks or full trees
- for crack and crevice treatment when used on hand held compressed air sprayers



PIN
STREAM
NOZZLE

9.5.1.2 Flat Fan Pattern Nozzle. Flat fan pattern nozzles issue the spray in a thin band that fans out from the nozzle tip. The pesticide is applied to the surface much as a large paintbrush would. The width of the fan spray is chosen (50 - 80 degrees) by nozzle selection. Flat fan nozzles are used:

- as a series of nozzles on a boom for applying fungicides, herbicides, and insecticides to turf
- for residual spray applications using a hand held compressed air sprayer
- spot applications

FLOODING
FLAT FAN
NOZZLE

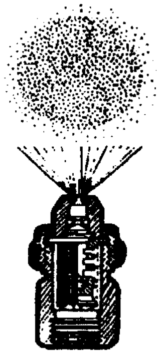
9.5.1.3 Hollow Cone Pattern Nozzle. The hollow cone pattern nozzle is used for:

- mosquito larviciding
- pesticide application to vegetation

The hollow cone pattern is a simple design. It is the most inexpensive to manufacture. This is why most new hand held equipment is equipped with hollow cone nozzles.

HOLLOW
CONE
NOZZLE

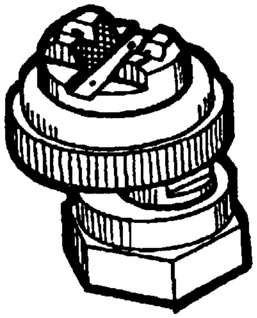
9.5.1.4 Solid Cone Pattern Nozzle. Solid cone pattern nozzles produce a circular shaped deposit of pesticide on-target. The pesticide is distributed evenly throughout the circular pattern whereas the hollow cone nozzles, noted above, deposit most of the pesticide in a circular pattern around the perimeter. Solid cone pattern nozzles are useful for:



SOLID
CONE
NOZZLE

- penetration and coverage of plant foliage or other irregular targets
- mosquito larviciding
- spot coverage using hand held compressed air equipment

9.5.1.5 Multijet Nozzles. The multijet nozzle is a combination spray pattern nozzle. Quite often, hand held compressed air sprayers are equipped with them. By rotating the nozzle head, four different spray patterns can be achieved. Generally, flat fan, hollow cone, solid cone and pin stream shaped fan sprays can be produced. This variability is advantageous when performing general pest control work.



MULTIJET
NOZZLE

9.5.2 Nozzle Materials. Nozzles can be constructed out of a number of materials. The pesticide and the type of application determines nozzle material selection. Nozzles can be made of:

- Stainless Steel: for use on all sprayers
- Nylon: resists corrosion and abrasion; swells on exposure to some solvents
- Aluminum: subject to corrosion; short thread life
- Brass: susceptible to abrasion by wettable powders
- Ceramic or Porcelain: highly resistant to abrasion and corrosion; expensive
- Tungsten Carbide: highly resistant to corrosion and abrasion; expensive

9.6 EQUIPMENT SAFETY.

9.6.1 Equipment Checks. Inspection of pesticide application equipment is important. Equipment that is poorly maintained, or incorrect for the application may create problems.

These are some procedures that an operator should use to ensure protection of the environment and proper application of pesticides. The PCQAE should check the operator's equipment periodically to:

a. Ensure that safety shields are in place.
b. Inspect tank and applicator rig.
    (1) Equipment should be free of corrosion, scale or foreign material.
    (2) No leaks in tank, valves or hoses.
    (3) Nozzle tips are clean and flowing freely with the correct spray pattern.
    (4) Check operating pressure gauge (ask operator what correct pressure should be, check manual, etc. Keep pressure low for all operations except misting and tree spray. (Keep down drift).
    (5) Boom Sprayers: Ensure that nozzles overlap spray to obtain coverage.
    (6) Calibration: Determine if correct amount is applied.
    (7) Other: As required by the Command PMC.

9.6.2 Observing Safety Precautions. (The contractor's operation of equipment can tell a great deal about his attitude and ability to accomplish the task). The PCQAE should observe the equipment operator to see that:

a. The operator is wearing protective equipment.
b. Riders are not allowed on equipment.
c. Children, pets or livestock are not allowed into treated areas during or soon after treatment.
d. Food, utensils, toys, animal feed containers, etc. are not contaminated.
e. Measuring of pesticides is done with calibrated measuring devices, not old bottles or food containers.
f. Application equipment is shut off when moving from one spray area to another.
g. Conscious efforts made to minimize drift (visible spray may drift as much as 100 yards, whereas invisible spray may drift 1 mile or more).
h. The operator checks equipment and calibration regularly.

CHAPTER 10. RECORDS AND REPORTING

Accurate records of pesticide use is required by law. FIFRA (Federal Insecticide, Fungicide and Rodenticide Act) requires that records be kept of all RESTRICTED-USE pesticide applications for a minimum of two years. OPNAVINST 6250.4A (Attachment 10-A1) requires that records be kept of all pest control operations conducted on Navy and Marine Corps property.

It is DoD and Navy policy that contractors should comply with all state and local laws. States may require contractors to keep additional records.

The Biological Sciences Section/Applied Biology Section of the EFD is responsible for compiling all of the pest management reports for their division.

10.1 MEMORANDUM OF AGREEMENTS (MOAs) WITH THE STATES. Most States have signed a memorandum of agreement between their State Pesticide Regulatory Agency and the Department of Defense (DoD). In brief, most MOAs authorize:

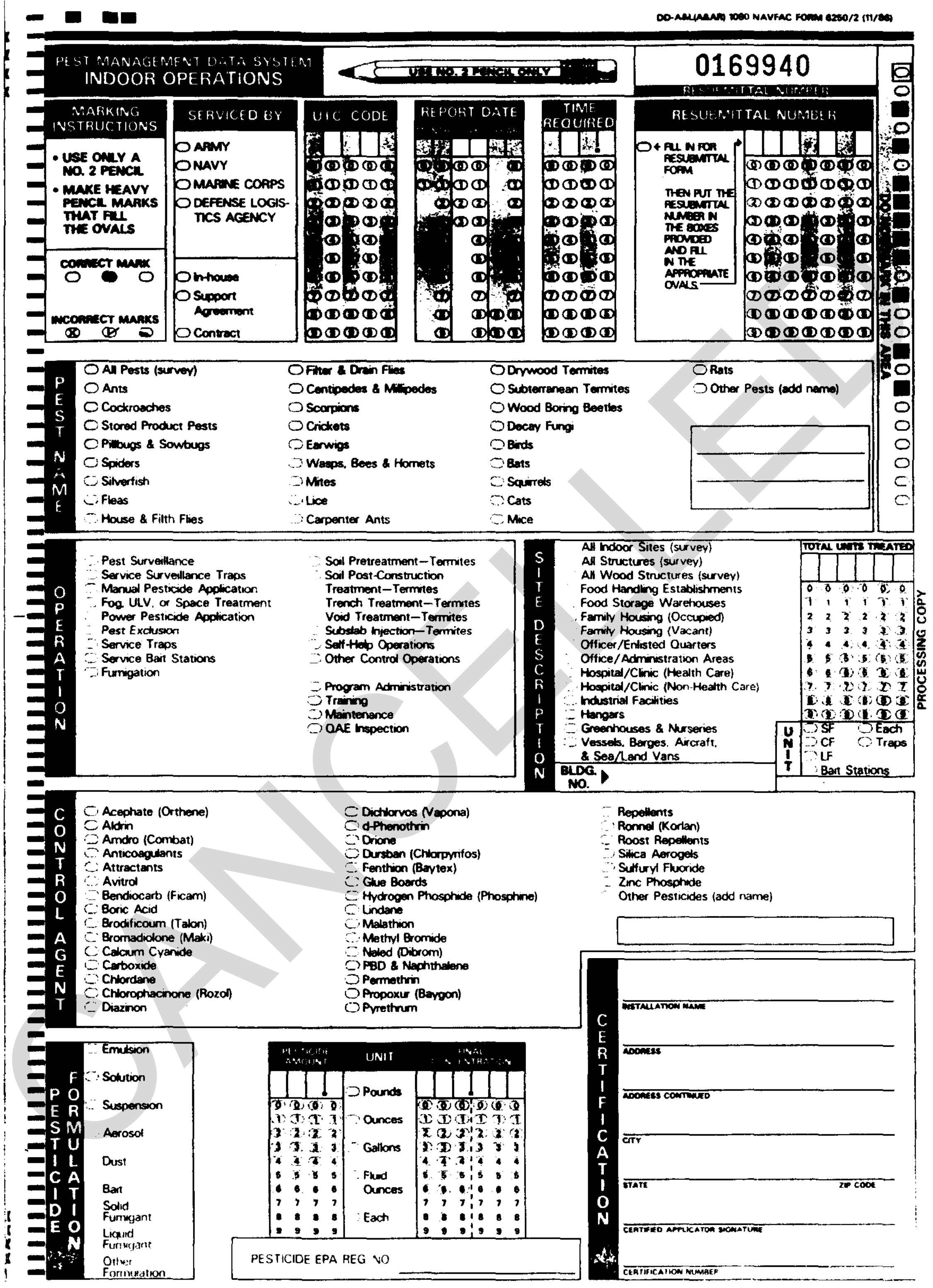
- DoD certified applicators to purchase restricted-use and state limited-use pesticides from retail outlets.
- pesticide use on land owned by the DoD within state boundaries
- the State pesticide regulatory agency to:
    - enter DoD premises and inspect pesticide application equipment and the areas where the equipment is used
    - inspect land exposed to pesticides
    - inspect pesticide storage and disposal areas
    - observe pesticide use and applications on DoD property

Your Command PMC can advise you of specific requirements for the MOA with your State, if one exists.

10.2 RELATIONSHIP WITH THE STATES. Contractors that work on DoD property must comply with all STATE laws and regulations concerning pesticide use, applicator certification, etc. The PCQAE should obtain a copy of current laws and regulations for their State, be familiar with them, and keep the file updated.

10.3 REPORTING REQUIREMENTS. Figure 10-1 is a sample 6250/2 (Indoor Reporting Form). Figure 10-2 is a sample 6250/3 (Outdoor Reporting Form).

The pest control contract will require that all pest control operations on DoD property be reported on 6250/2 for indoor work, or 6250/3 for outdoor work.



DD-A&L(A&AR) 1080 NAVFAC FORM 6250/2 (11/86)

PEST MANAGEMENT DATA SYSTEM
INDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

0169940
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK
○ ● ○

INCORRECT MARKS

SERVICED BY

○ ARMY
○ NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
○ Contract

UIC CODE

REPORT DATE

TIME REQUIRED

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS

0 1 2 3 4 5 6 7 8 9

DO NOT MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Ants
○ Cockroaches
○ Stored Product Pests
○ Pillbugs & Sowbugs
○ Spiders
○ Silverfish
○ Fleas
○ House & Filth Flies
○ Filter & Drain Flies
○ Centipedes & Millipedes
○ Scorpions
○ Crickets
○ Earwigs
○ Wasps, Bees & Hornets
○ Mites
○ Lice
○ Carpenter Ants
○ Drywood Termites
○ Subterranean Termites
○ Wood Boring Beetles
○ Decay Fungi
○ Birds
○ Bats
○ Squirrels
○ Cats
○ Mice
○ Rats
○ Other Pests (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Pest Exclusion
○ Service Traps
○ Service Bait Stations
○ Fumigation
○ Soil Pretreatment—Termites
○ Soil Post-Construction Treatment—Termites
○ Trench Treatment—Termites
○ Void Treatment—Termites
○ Subslab Injection—Termites
○ Self-Help Operations
○ Other Control Operations

○ Program Administration
○ Training
○ Maintenance
○ QAE Inspection

SITE DESCRIPTION

○ All Indoor Sites (survey)
○ All Structures (survey)
○ All Wood Structures (survey)
○ Food Handling Establishments
○ Food Storage Warehouses
○ Family Housing (Occupied)
○ Family Housing (Vacant)
○ Officer/Enlisted Quarters
○ Office/Administration Areas
○ Hospital/Clinic (Health Care)
○ Hospital/Clinic (Non-Health Care)
○ Industrial Facilities
○ Hangars
○ Greenhouses & Nurseries
○ Vessels, Barges, Aircraft, & Sea/Land Vans

BLDG. NO. ▶

TOTAL UNITS TREATED

0 1 2 3 4 5 6 7 8 9

UNIT

○ SF
○ CF
○ LF
○ Bait Stations
○ Each
○ Traps

PROCESSING COPY

CONTROL AGENT

○ Acephate (Orthene)
○ Aldrin
○ Amdro (Combat)
○ Anticoagulants
○ Attractants
○ Avitrol
○ Bendiocarb (Ficam)
○ Boric Acid
○ Brodificoum (Talon)
○ Bromadiolone (Maki)
○ Calcium Cyanide
○ Carboxide
○ Chlordane
○ Chlorophacinone (Rozol)
○ Diazinon
○ Dichlorvos (Vapona)
○ d-Phenothrin
○ Drione
○ Dursban (Chlorpyrifos)
○ Fenthion (Baytex)
○ Glue Boards
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Methyl Bromide
○ Naled (Dibrom)
○ PBD & Naphthalene
○ Permethrin
○ Propoxur (Baygon)
○ Pyrethrum
○ Repellents
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Sulfuryl Fluoride
○ Zinc Phosphide
○ Other Pesticides (add name)

PESTICIDE FORMULATION

○ Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT

0 1 2 3 4 5 6 7 8 9

UNIT

○ Pounds
○ Ounces
○ Gallons
○ Fluid Ounces
○ Each

FINAL CONCENTRATION

0 1 2 3 4 5 6 7 8 9

PESTICIDE EPA REG NO ______

CERTIFICATION

INSTALLATION NAME ______

ADDRESS ______

ADDRESS CONTINUED ______

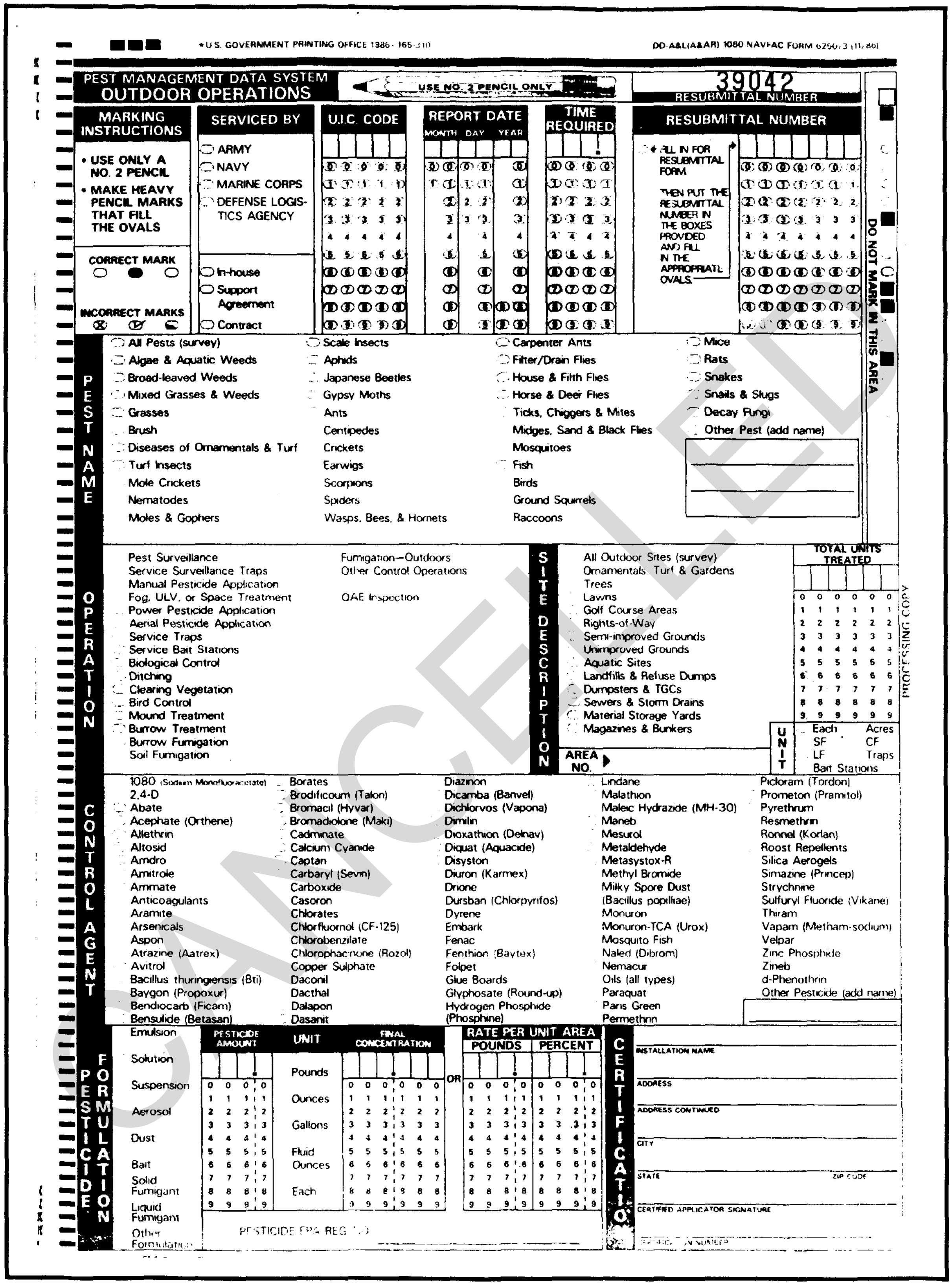
CITY ______

STATE ______ ZIP CODE ______

CERTIFIED APPLICATOR SIGNATURE ______

CERTIFICATION NUMBER ______

Figure 10-1
Pest Management Data System Indoor Operations Form 6250/2



*U.S. GOVERNMENT PRINTING OFFICE 1986 - 165-310

DD-A&L(A&AR) 1080 NAVFAC FORM 6250/3 (11/86)

PEST MANAGEMENT DATA SYSTEM
OUTDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

39042
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS

SERVICED BY

○ ARMY
○ NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
○ Contract

U.I.C. CODE (5 columns, 0–9 each)

REPORT DATE MONTH DAY YEAR

TIME REQUIRED (4 columns, 0–9 each)

RESUBMITTAL NUMBER

○ FILL IN FOR RESUBMITTAL FORM

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS

DO NOT MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Algae & Aquatic Weeds
○ Broad-leaved Weeds
○ Mixed Grasses & Weeds
○ Grasses
○ Brush
○ Diseases of Ornamentals & Turf
○ Turf Insects
○ Mole Crickets
○ Nematodes
○ Moles & Gophers
○ Scale Insects
○ Aphids
○ Japanese Beetles
○ Gypsy Moths
○ Ants
○ Centipedes
○ Crickets
○ Earwigs
○ Scorpions
○ Spiders
○ Wasps, Bees, & Hornets
○ Carpenter Ants
○ Filter/Drain Flies
○ House & Filth Flies
○ Horse & Deer Flies
○ Ticks, Chiggers & Mites
○ Midges, Sand & Black Flies
○ Mosquitoes
○ Fish
○ Birds
○ Ground Squirrels
○ Raccoons
○ Mice
○ Rats
○ Snakes
○ Snails & Slugs
○ Decay Fungi
○ Other Pest (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Aerial Pesticide Application
○ Service Traps
○ Service Bait Stations
○ Biological Control
○ Ditching
○ Clearing Vegetation
○ Bird Control
○ Mound Treatment
○ Burrow Treatment
○ Burrow Fumigation
○ Soil Fumigation
○ Fumigation—Outdoors
○ Other Control Operations
○ QAE Inspection

SITE DESCRIPTION

○ All Outdoor Sites (survey)
○ Ornamentals, Turf & Gardens
○ Trees
○ Lawns
○ Golf Course Areas
○ Rights-of-Way
○ Semi-improved Grounds
○ Unimproved Grounds
○ Aquatic Sites
○ Landfills & Refuse Dumps
○ Dumpsters & TGCs
○ Sewers & Storm Drains
○ Material Storage Yards
○ Magazines & Bunkers

AREA NO. ▶

TOTAL UNITS TREATED (6 columns, 0–9 each)

UNIT

○ Each ○ Acres
○ SF ○ CF
○ LF ○ Traps
○ Bait Stations

PROCESSING COPY

CONTROL AGENT

○ 1080 (Sodium Monofluoroacetate)
○ 2,4-D
○ Abate
○ Acephate (Orthene)
○ Allethrin
○ Altosid
○ Amdro
○ Amitrole
○ Ammate
○ Anticoagulants
○ Aramite
○ Arsenicals
○ Aspon
○ Atrazine (Aatrex)
○ Avitrol
○ Bacillus thuringiensis (Bti)
○ Baygon (Propoxur)
○ Bendiocarb (Ficam)
○ Bensulide (Betasan)
○ Borates
○ Brodificoum (Talon)
○ Bromacil (Hyvar)
○ Bromadiolone (Maki)
○ Cadminate
○ Calcium Cyanide
○ Captan
○ Carbaryl (Sevin)
○ Carboxide
○ Casoron
○ Chlorates
○ Chlorfluornol (CF-125)
○ Chlorobenzilate
○ Chlorophacinone (Rozol)
○ Copper Sulphate
○ Daconil
○ Dacthal
○ Dalapon
○ Dasanit
○ Diazinon
○ Dicamba (Banvel)
○ Dichlorvos (Vapona)
○ Dimilin
○ Dioxathion (Delnav)
○ Diquat (Aquacide)
○ Disyston
○ Diuron (Karmex)
○ Drione
○ Dursban (Chlorpyrifos)
○ Dyrene
○ Embark
○ Fenac
○ Fenthion (Baytex)
○ Folpet
○ Glue Boards
○ Glyphosate (Round-up)
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Maleic Hydrazide (MH-30)
○ Maneb
○ Mesurol
○ Metaldehyde
○ Metasystox-R
○ Methyl Bromide
○ Milky Spore Dust (Bacillus popilliae)
○ Monuron
○ Monuron-TCA (Urox)
○ Mosquito Fish
○ Naled (Dibrom)
○ Nemacur
○ Oils (all types)
○ Paraquat
○ Paris Green
○ Permethrin
○ Picloram (Tordon)
○ Prometon (Pramitol)
○ Pyrethrum
○ Resmethrin
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Simazine (Princep)
○ Strychnine
○ Sulfuryl Fluoride (Vikane)
○ Thiram
○ Vapam (Metham-sodium)
○ Velpar
○ Zinc Phosphide
○ Zineb
○ d-Phenothrin
○ Other Pesticide (add name)

PESTICIDE FORMULATION

○ Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT (4 columns, 0–9 each)

UNIT

○ Pounds
○ Ounces
○ Gallons
○ Fluid Ounces
○ Each

FINAL CONCENTRATION (6 columns, 0–9 each)

OR

RATE PER UNIT AREA

POUNDS (4 columns, 0–9 each) **PERCENT** (4 columns, 0–9 each)

PESTICIDE EPA REG NO

CERTIFICATION

INSTALLATION NAME

ADDRESS

ADDRESS CONTINUED

CITY

STATE ZIP CODE

CERTIFIED APPLICATOR SIGNATURE

CERTIFICATION NUMBER

CANCELLED

Figure 10-2
Pest Management Data System Outdoor Operations Form 6250/3

10.3.1 **Who Reports?** All pest control operations on DoD property must be reported. Navy and Marine Corps pest control operations are recorded using the Navy Pest Management Data System (PMDS). Naval Instructions state that the PMDS data include: "... all pest control operations conducted on Navy and Marine Corps property and non-Navy property under Navy stewardship performed by lessees". This includes:

- non-appropriated fund activities
- commercial activities
- government-owned contractor-operated facilities
- agricultural out-lease lands
- land management areas
- forestry program areas
- in-house program areas

10.3.2 **What is Reported?** Everything pertaining to pest management is reported. Some examples are:

- the time a PCQAE spends evaluating a contractor's pest control work
- the time a PCQAE spends providing reports to the Contracting Officer regarding a contractor's pest control work
- the contractor's pest control work
- contracted ditching for mosquito abatement projects
- the contractor's sealing and caulking for exclusion pest control
- contracted herbicide applications to turf
- contracted cooling tower water maintenance which uses algicides
- contracted pest surveys
- agricultural out-lease pesticide applications
- the time you (the PCQAE) are spending taking this course on pest control quality assurance evaluation

Some examples of things that should NOT be reported are:

- snow plowing with pest control vehicles
- mowing
- fertilization
- seeding operations
- thatching
- any work performed off station

10.3.3 Who Completes the Form(s)? The person who does the work completes the form. This person does not have to be certified. The person who fills it out should sign it. Some examples are:

- the contractor's employee who applied insecticide to the boiler room
- the contractor's employee who applied a "weed and feed" product to the parade ground
- the contractor's employee who picked bagworms off the arborvitae bushes
- the contractor's employee who performs quality control work for a pest control contract
- the PCQAE who surveys, evaluates, administrates or studies pest control operations

10.3.4 When to Complete the Form. The best time to complete the 6250/2/3 is right after completion of the work. Information will be fresh; there will be less chance for forgotten details.

The alternative to completing the forms immediately after the work is to complete the forms at the end of each working day. Information concerning pesticides, their EPA numbers, label information etc., which may be stored at a desk, are handy. Report completion should not be left overnight or longer. Collecting data for a month and then completing the forms often causes errors.

The pest control contract will specify how often the contractor should submit the report forms. The PCQAE should be familiar with the contract's "reporting" section. Often, the contract will require the contractor to submit the forms within 24 hours after the work is performed. Failure to do so may result in an unsatisfactory rating for that contract requirement.

10.3.5 What to Do With The Form. Once a month, the top copies (blue for indoor; green for outdoor) should be sent to your Engineering Field Division (EFD) Pest Management Consultant (PMC). The PCQAE should keep and maintain the bottom (yellow) copy for their own records.

10.3.5.1 The Optical Scanning Form. 6250/2/3's are optically read at the EFD's. This means that the forms are sensitive to abuse. If you handle them wrong, the optical scanner will not "read" them.

Remember: 6250/2/3 are legal records of pesticide applications. They should be filled out accurately and completely.

10.3.5.2 Handling the Forms. The following is a list of "do nots" which cause the optical scanning machine to reject the form.

- Do Not use tape on the form
- Do Not staple the form(s)
- Do Not fold the forms
- Do Not write on the forms except to fill in the "bubbles" or blocks
- Do Not cram the forms into an envelope that is too small when sending them to the Command PMC
- Do Not write on the back of the forms
- Do Not tear the top of the form when separating the blue/green original from the yellow copy; separate at the perforation only
- Do Not use a pen to fill out the forms
- Do Not mar the "skunk marks" on the side of the form

If a mistake is made, **completely** erase the bubble before filling in a new one. Instructions are provided.

The following is a list of "do's" for handling the forms.

- use a No. 2 black lead pencil only
- when mailing the forms, place them in a flat padded shipping envelope addressed to your Command PMC
- keep the yellow copy for your files: do not give your yellow copy to the contractor
- supplement your 6250/2/3 records with another record format; Figure 10-3 is an example of a supplementary pest control log
- a cover letter is not required when submitting the forms to the Command PMC

10.4 ROLE OF THE QAE. The role of the PCQAE concerning reports and records will be determined by the contract specification. The PCQAE should be prepared to become involved by:

1. Assisting the contractor/contractor's personnel in completing DoD records and reports until such time as the contractor is able to complete the reports alone

2. Assembling and submitting the required reports that are completed by the contractor (all submitted forms should be reviewed for content and accuracy)

3. Reviewing (evaluating) copies of reports that have been completed and submitted by the contractor

SAMPLE DAILY PEST CONTROL LOG

Date	Bldg. or Area	Units Treated Sq. Ft. Acres	Pesticide Concentration Name - Amount	Pest	Man-hours	Comments	Operator Initial

Figure 10-3
Sample Daily Pest Control Log

4. Completing the appropriate report form each time surveillance is accomplished.

10.5 COMPLETING THE FORM. Instructions for completing the form are located in OPNAVINST 6250.4A (Attachment 10-A1). It is a good idea to provide copies of Attachment 10-A1 for the contractor.

10.5.1 General Rules.

1. Each form is completed by marking the appropriate bubble in each data entry block.
2. Only ONE BUBBLE in each block is to be marked.
3. When an operation involves more than one pest, pesticide, or operation, then a separate form shall be completed for each (or only the major pest, pesticide or operation shall be marked).
4. "Zero Out" the bubbles. For example: The "Time Required" is 2 hours. The Time Required Block should be filled out:

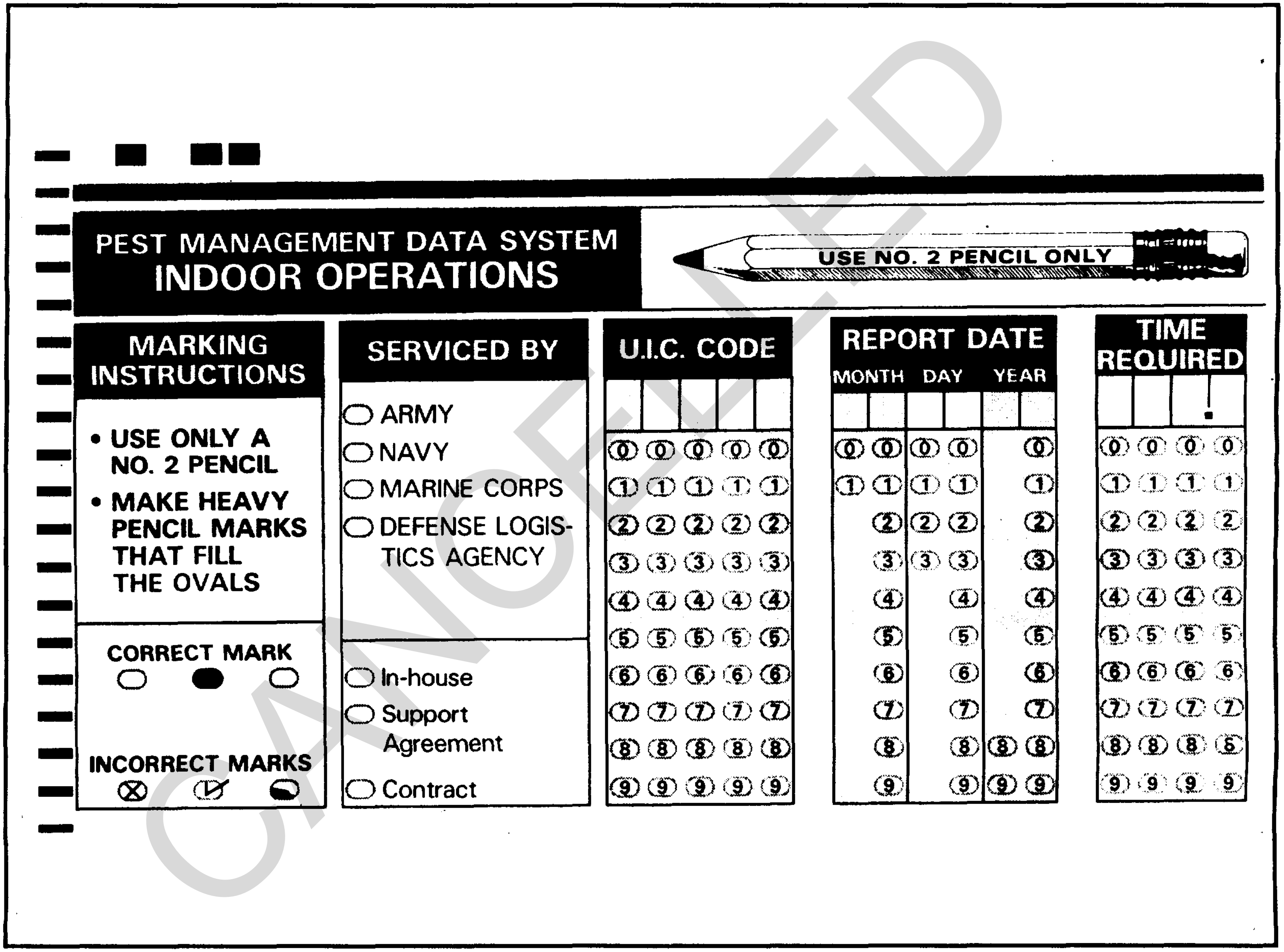
0 0 2 0
● ● 0 ●
1 1 1 1
2 2 ● 2
3 3 3 3
4 4 4 4
5 5 5 5
6 6 6 6
7 7 7 7
8 8 8 8
9 9 9 9

10.5.2 The Top Section. The top section of both forms requires basic information pertaining to the service provider (contract), installation identity (U.I.C. Code), and report date (date work is performed). Entries in the top section will have both written numbers and filled bubbles.

Figure 10-4 is a close-up of the top of a form.

Note the "Marking Instructions" block. Note the type of pencil to use and how to make a correct mark.

For the block "Serviced By", either NAVY or MARINES are to be marked. Army and Defense Logistics should not be filled in.



PEST MANAGEMENT DATA SYSTEM
INDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK
○ ● ○

INCORRECT MARKS
⊗ ✓ ◒

SERVICED BY

○ ARMY
○ NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
○ Contract

U.I.C. CODE

☐	☐	☐	☐	☐
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

REPORT DATE

MONTH		DAY		YEAR	
☐	☐	☐	☐	☐	☐
0	0	0	0		0
1	1	1	1		1
	2	2	2		2
	3	3	3		3
	4		4		4
	5		5		5
	6		6		6
	7		7		7
	8		8	8	8
	9		9	9	9

TIME REQUIRED

☐	☐	☐	☐
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Figure 10-4
Pest Management Data System Indoor Operations Form 6250/2

The contractor is not required to fill in the "Time Required" block.

Do not fill in the "Resubmittal" block.

10.5.3 The Middle Sections. The middle sections of the forms require information about the pest controlled, the operation, the site of the operation and the control agent.

Remember, only one (1) bubble is to be filled out in each section. If multiple pests are controlled (ex. spiders, centipedes, silverfish, and millipedes), name the main pest controlled or fill out a different form for each pest controlled.

> PCQAE Please Note: The PCQAE shall complete and submit a form each time QA surveillance is performed. In the "Operation" block, the QAE Inspection bubble shall be filled. Reporting the target pest is optional, but do not report the site.
>
> However, if a pesticide is used by the PCQAE as part of the QA evaluation procedure, then it should be reported, as well as the site of application.

Only one operation and one site should be reported. If multiple sites were involved, then a form for each site should be filled out.

Attachment (10-A2) is a guide for use in filling out the form. The KEY BLOCK is the "Operation" block. The noted data fields must be completed depending on which "Operation" bubble is filled in.

Figure 10-5 is a list of common mistakes made on the report forms. By being familiar with them, the PCQAE may instruct the contractor, cutting down on the amount of time spent correcting the reports.

10.5.4 The Bottom Sections. The bottom sections provide information about:

- the pesticide (ie: formulation, amount, concentration or rate of application, and the pesticide EPA Reg. number)
- the person who did the work

10.6 EXERCISES. Pages 10-13 through 10-18 are photocopies of blank 6250/2s or 6250/3s which you should use to complete the exercises. Since they are copies (they are not color coded), remember to look in the upper left hand corner to see if they are indoor or outdoor forms.

10.6.1 Directions. Read the exercises listed below. Fill out the appropriate 6250/2(s) or 6250/3(s).

COMMON MISTAKES MADE ON REPORT FORMS

MISTAKE * 1: reporting SF as the UNIT when the OPERATION is Service Traps or Service Bait Stations. These must be reported as either Traps or Bait Stations, respectively.

MISTAKE * 2: reporting SF as the UNIT when the PESTICIDE FORMULATION used is Bait. The correct UNIT to be reported is Bait Stations. The OPERATION is Service Bait Stations.

MISTAKE * 3: not zero filling. Contrary to recent information presented at the 1989 Recertification Course, zero filling is still required to the left <u>and</u> right of decimal points.

MISTAKE * 4: not naming an OPERATION when a pesticide is applied.

MISTAKE * 5: reporting more than one PEST NAME per operation; only list the main target pest or use two separate forms.

MISTAKE * 6: reporting more than one SITE DESCRIPTION per OPERATION.

MISTAKE * 7: reporting All Outdoor Sites (survey) for pesticide applications. This site description can only be reported with surveys.

MISTAKE * 8: not filling in a SERVICED BY bubble.

MISTAKE * 9: not filling out a SITE DESCRIPTION when an OPERATION is performed. Often a Bldg. No. is written in, but a SITE DESCRIPTION bubble is not filled out.

MISTAKE * 10: not filling in an OPERATION. One of these bubbles must be filled in on <u>every</u> form.

MISTAKE * 11: improperly filling in the final concentration. Don't guess at the correct concentration for a product.

MISTAKE * 12: WRITING ON TOP OF FORM. Don't do it.

MISTAKE * 13: WRITING ON BACK OF THE FORM. Don't do this either.

MISTAKE * 14: Using a pen instead of a *2 pencil to fill out forms.

* 1 HINT - If in doubt, CALL your EFD Applied Biologist for help.

Figure 10-5
Common Mistakes Made on Report Forms

10.6.2 Exercise #1. Use UIC Code 12345 if you don't know your own. On February 26, 1991, you visit the galley in building number 5 to evaluate the contractor while he is performing a cockroach treatment. The contractor uses 2 gallons of 0.5% diazinon emulsion (EPA REG. No. 10182-38) to perform the work using a hand sprayer. It takes him one and a half hours to complete the job. A total of 15,000 square feet are treated.

A. Fill out a form as the contractor should.

B. Fill out a form to report your work.

10.6.3 Exercise #2. Use UIC code 12345 if you don't know your own. As a follow-up, you inspect this galley on March 3, 1991. You use 2 fluid ounces of 0.7% pyrethrum aerosol as a flushing spray to see if the contractor has achieved the acceptable level of control. You are there for 30 minutes. The pyrethrum has an EPA number of 555-1212.

10.6.4 Exercise #3. On July 4, 1990, the grounds maintenance contractor applied the herbicide Arsenal^{TM} EC (EPA No. 123-456 to control broad leaf weeds and grass growing along 8.25 miles of the installation perimeter fence. The material was applied at a rate of 1.2 pounds per acre. A one foot band on each side of the fence was sprayed. The contractor used his 500 gallon hydraulic sprayer. The work required two full tank loads of pesticide. The contractor was on site for 13 hours.

A. Fill out a form as the contractor should.

B. Fill out a form to report your work.

10.7 SOURCE OF SUPPLY FOR THE FORM. 6250/2/3 forms can be ordered from:

NAVY PUBLICATIONS AND FORMS CENTER
5801 TABOR AVENUE
PHILADELPHIA, PA 19120

Stock # 0105-LF-062-5020 is for 6250/2
Stock # 0105-LF-062-5030 is for 6250/3

They are packed 100 to a package.

Note: Attachment (10-A3) are the answers to the exercises.

DD-A&L(A&AR) 1080 NAVFAC FORM 6250/2 (11/86)

PEST MANAGEMENT DATA SYSTEM
INDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

0169940
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- **USE ONLY A NO. 2 PENCIL**
- **MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS**

CORRECT MARK
○ ● ○

INCORRECT MARKS
☒ ✓ ○

SERVICED BY

○ ARMY
○ NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
○ Contract

U.I.C. CODE

REPORT DATE
MONTH DAY YEAR

TIME REQUIRED

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS

MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Ants
○ Cockroaches
○ Stored Product Pests
○ Pillbugs & Sowbugs
○ Spiders
○ Silverfish
○ Fleas
○ House & Filth Flies
○ Filter & Drain Flies
○ Centipedes & Millipedes
○ Scorpions
○ Crickets
○ Earwigs
○ Wasps, Bees & Hornets
○ Mites
○ Lice
○ Carpenter Ants
○ Drywood Termites
○ Subterranean Termites
○ Wood Boring Beetles
○ Decay Fungi
○ Birds
○ Bats
○ Squirrels
○ Cats
○ Mice
○ Rats
○ Other Pests (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Pest Exclusion
○ Service Traps
○ Service Bait Stations
○ Fumigation
○ Soil Pretreatment—Termites
○ Soil Post-Construction Treatment—Termites
○ Trench Treatment—Termites
○ Void Treatment—Termites
○ Subslab Injection—Termites
○ Self-Help Operations
○ Other Control Operations

○ Program Administration
○ Training
○ Maintenance
○ QAE Inspection

SITE DESCRIPTION

○ All Indoor Sites (survey)
○ All Structures (survey)
○ All Wood Structures (survey)
○ Food Handling Establishments
○ Food Storage Warehouses
○ Family Housing (Occupied)
○ Family Housing (Vacant)
○ Officer/Enlisted Quarters
○ Office/Administration Areas
○ Hospital/Clinic (Health Care)
○ Hospital/Clinic (Non-Health Care)
○ Industrial Facilities
○ Hangars
○ Greenhouses & Nurseries
○ Vessels, Barges, Aircraft, & Sea/Land Vans

BLDG. NO. ▶

TOTAL UNITS TREATED

UNIT

○ SF
○ CF
○ LF
○ Each
○ Traps
Bait Stations

PROCESSING COPY

CONTROL AGENT

○ Acephate (Orthene)
○ Aldrin
○ Amdro (Combat)
○ Anticoagulants
○ Attractants
○ Avitrol
○ Bendiocarb (Ficam)
○ Boric Acid
○ Brodificoum (Talon)
○ Bromadiolone (Maki)
○ Calcium Cyanide
○ Carboxide
○ Chlordane
○ Chlorophacinone (Rozol)
○ Diazinon
○ Dichlorvos (Vapona)
○ d-Phenothrin
○ Drione
○ Dursban (Chlorpyrifos)
○ Fenthion (Baytex)
○ Glue Boards
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Methyl Bromide
○ Naled (Dibrom)
○ PBD & Naphthalene
○ Permethrin
○ Propoxur (Baygon)
○ Pyrethrum
○ Repellents
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Sulfuryl Fluoride
○ Zinc Phosphide
○ Other Pesticides (add name)

PESTICIDE FORMULATION

○ Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT

UNIT

○ Pounds
○ Ounces
○ Gallons
○ Fluid Ounces
○ Each

FINAL CONCENTRATION

PESTICIDE EPA REG. NO. ______________

CERTIFICATION

INSTALLATION NAME

ADDRESS

ADDRESS CONTINUED

CITY

STATE ZIP CODE

CERTIFIED APPLICATOR SIGNATURE

CERTIFICATION NUMBER

S/N 0105-LF-062-6020

DD-A&L(A&AR) 1080 NAVFAC FORM 6250/2 (11/86)

PEST MANAGEMENT DATA SYSTEM
INDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

0169940

RESUBMITTAL NUMBER

DO NOT MARK IN THIS AREA

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS ⊗ ✓ ◒

SERVICED BY

○ ARMY
○ NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
○ Contract

UIC CODE

0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

REPORT DATE

MONTH DAY YEAR

TIME REQUIRED

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS

PEST NAME

○ All Pests (survey)
○ Ants
○ Cockroaches
○ Stored Product Pests
○ Pillbugs & Sowbugs
○ Spiders
○ Silverfish
○ Fleas
○ House & Filth Flies
○ Filter & Drain Flies
○ Centipedes & Millipedes
○ Scorpions
○ Crickets
○ Earwigs
○ Wasps, Bees & Hornets
○ Mites
○ Lice
○ Carpenter Ants
○ Drywood Termites
○ Subterranean Termites
○ Wood Boring Beetles
○ Decay Fungi
○ Birds
○ Bats
○ Squirrels
○ Cats
○ Mice
○ Rats
○ Other Pests (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Pest Exclusion
○ Service Traps
○ Service Bait Stations
○ Fumigation
○ Soil Pretreatment—Termites
○ Soil Post-Construction Treatment—Termites
○ Trench Treatment—Termites
○ Void Treatment—Termites
○ Subslab Injection—Termites
○ Self-Help Operations
○ Other Control Operations
○ Program Administration
○ Training
○ Maintenance
○ QAE Inspection

SITE DESCRIPTION

○ All Indoor Sites (survey)
○ All Structures (survey)
○ All Wood Structures (survey)
○ Food Handling Establishments
○ Food Storage Warehouses
○ Family Housing (Occupied)
○ Family Housing (Vacant)
○ Officer/Enlisted Quarters
○ Office/Administration Areas
○ Hospital/Clinic (Health Care)
○ Hospital/Clinic (Non-Health Care)
○ Industrial Facilities
○ Hangars
○ Greenhouses & Nurseries
○ Vessels, Barges, Aircraft, & Sea/Land Vans

BLDG. NO. ▶

TOTAL UNITS TREATED

0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

UNIT

○ SF
○ CF
○ LF
○ Each
○ Traps
○ Bait Stations

PROCESSING COPY

CONTROL AGENT

○ Acephate (Orthene)
○ Aldrin
○ Amdro (Combat)
○ Anticoagulants
○ Attractants
○ Avitrol
○ Bendiocarb (Ficam)
○ Boric Acid
○ Brodificoum (Talon)
○ Bromadiolone (Maki)
○ Calcium Cyanide
○ Carboxide
○ Chlordane
○ Chlorophacinone (Rozol)
○ Diazinon
○ Dichlorvos (Vapona)
○ d-Phenothrin
○ Drione
○ Dursban (Chlorpyrifos)
○ Fenthion (Baytex)
○ Glue Boards
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Methyl Bromide
○ Naled (Dibrom)
○ PBD & Naphthalene
○ Permethrin
○ Propoxur (Baygon)
○ Pyrethrum
○ Repellents
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Sulfuryl Fluoride
○ Zinc Phosphide
○ Other Pesticides (add name)

PESTICIDE FORMULATION

○ Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT

0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

UNIT

○ Pounds
○ Ounces
○ Gallons
○ Fluid Ounces
○ Each

FINAL CONCENTRATION

0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

PESTICIDE EPA REG. NO. ____________

CERTIFICATION

INSTALLATION NAME

ADDRESS

ADDRESS CONTINUED

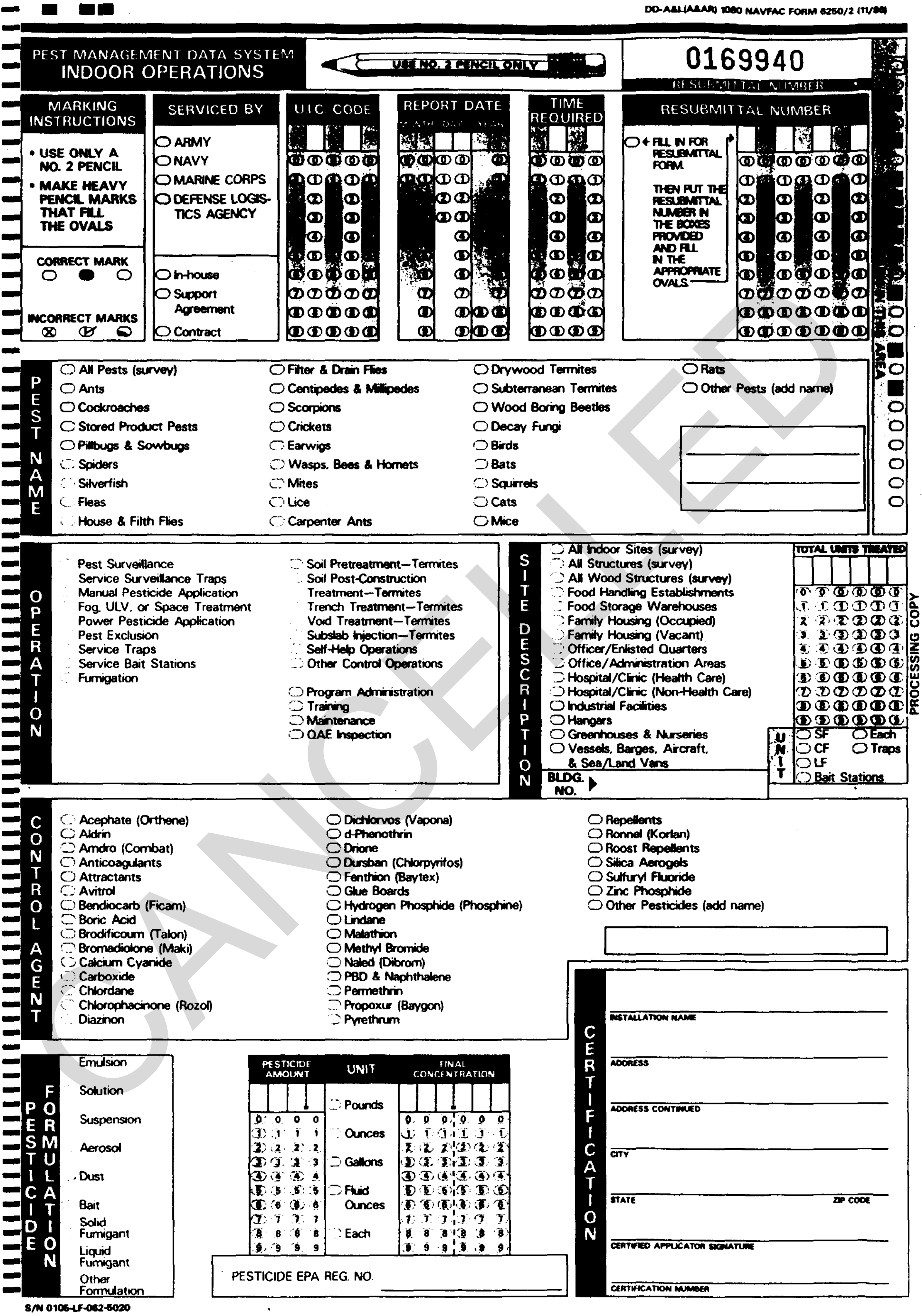
CITY

STATE ZIP CODE

CERTIFIED APPLICATOR SIGNATURE

CERTIFICATION NUMBER

S/N 0105-LF-062-5020



DD-A&L(A&AR) 1080 NAVFAC FORM 6250/2 (11/86)

PEST MANAGEMENT DATA SYSTEM
INDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

0169940
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS ⊗ ✓ ◒

SERVICED BY

○ ARMY
○ NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
○ Contract

U.I.C. CODE

REPORT DATE MONTH DAY YEAR

TIME REQUIRED

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS

IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Ants
○ Cockroaches
○ Stored Product Pests
○ Pillbugs & Sowbugs
○ Spiders
○ Silverfish
○ Fleas
○ House & Filth Flies
○ Filter & Drain Flies
○ Centipedes & Millipedes
○ Scorpions
○ Crickets
○ Earwigs
○ Wasps, Bees & Hornets
○ Mites
○ Lice
○ Carpenter Ants
○ Drywood Termites
○ Subterranean Termites
○ Wood Boring Beetles
○ Decay Fungi
○ Birds
○ Bats
○ Squirrels
○ Cats
○ Mice
○ Rats
○ Other Pests (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Pest Exclusion
○ Service Traps
○ Service Bait Stations
○ Fumigation
○ Soil Pretreatment—Termites
○ Soil Post-Construction Treatment—Termites
○ Trench Treatment—Termites
○ Void Treatment—Termites
○ Subslab Injection—Termites
○ Self-Help Operations
○ Other Control Operations

○ Program Administration
○ Training
○ Maintenance
○ QAE Inspection

SITE DESCRIPTION

○ All Indoor Sites (survey)
○ All Structures (survey)
○ All Wood Structures (survey)
○ Food Handling Establishments
○ Food Storage Warehouses
○ Family Housing (Occupied)
○ Family Housing (Vacant)
○ Officer/Enlisted Quarters
○ Office/Administration Areas
○ Hospital/Clinic (Health Care)
○ Hospital/Clinic (Non-Health Care)
○ Industrial Facilities
○ Hangars
○ Greenhouses & Nurseries
○ Vessels, Barges, Aircraft, & Sea/Land Vans

BLDG. NO. ▶

TOTAL UNITS TREATED

0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

UNIT

○ SF ○ Each
○ CF ○ Traps
○ LF
○ Bait Stations

PROCESSING COPY

CONTROL AGENT

○ Acephate (Orthene)
○ Aldrin
○ Amdro (Combat)
○ Anticoagulants
○ Attractants
○ Avitrol
○ Bendiocarb (Ficam)
○ Boric Acid
○ Brodifacoum (Talon)
○ Bromadiolone (Maki)
○ Calcium Cyanide
○ Carboxide
○ Chlordane
○ Chlorophacinone (Rozol)
○ Diazinon
○ Dichlorvos (Vapona)
○ d-Phenothrin
○ Drione
○ Dursban (Chlorpyrifos)
○ Fenthion (Baytex)
○ Glue Boards
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Methyl Bromide
○ Naled (Dibrom)
○ PBD & Naphthalene
○ Permethrin
○ Propoxur (Baygon)
○ Pyrethrum
○ Repellents
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Sulfuryl Fluoride
○ Zinc Phosphide
○ Other Pesticides (add name)

PESTICIDE FORMULATION

○ Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT				UNIT	FINAL CONCENTRATION					
0	0	0	0	○ Pounds	0	0	0	0	0	0
1	1	1	1	○ Ounces	1	1	1	1	1	1
2	2	2	2	○ Gallons	2	2	2	2	2	2
3	3	3	3	○ Fluid Ounces	3	3	3	3	3	3
4	4	4	4	○ Each	4	4	4	4	4	4
5	5	5	5		5	5	5	5	5	5
6	6	6	6		6	6	6	6	6	6
7	7	7	7		7	7	7	7	7	7
8	8	8	8		8	8	8	8	8	8
9	9	9	9		9	9	9	9	9	9

PESTICIDE EPA REG. NO. ____________

CERTIFICATION

INSTALLATION NAME

ADDRESS

ADDRESS CONTINUED

CITY

STATE ZIP CODE

CERTIFIED APPLICATOR SIGNATURE

CERTIFICATION NUMBER

S/N 0105-LF-062-5020

*U.S. GOVERNMENT PRINTING OFFICE 1986–165-310

DD-A&(A&AR) 1080 NAVFAC FORM 6250/3 (11/86)

PEST MANAGEMENT DATA SYSTEM
OUTDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

39042
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS

SERVICED BY

○ ARMY
○ NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
○ Contract

U.I.C. CODE

0 1 2 3 4 5 6 7 8 9

REPORT DATE

MONTH DAY YEAR

0 1 2 3 4 5 6 7 8 9

TIME REQUIRED

0 1 2 3 4 5 6 7 8 9

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS

0 1 2 3 4 5 6 7 8 9

DO NOT MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Algae & Aquatic Weeds
○ Broad-leaved Weeds
○ Mixed Grasses & Weeds
○ Grasses
○ Brush
○ Diseases of Ornamentals & Turf
○ Turf Insects
○ Mole Crickets
○ Nematodes
○ Moles & Gophers
○ Scale Insects
○ Aphids
○ Japanese Beetles
○ Gypsy Moths
○ Ants
○ Centipedes
○ Crickets
○ Earwigs
○ Scorpions
○ Spiders
○ Wasps, Bees, & Hornets
○ Carpenter Ants
○ Filter/Drain Flies
○ House & Filth Flies
○ Horse & Deer Flies
○ Ticks, Chiggers & Mites
○ Midges, Sand & Black Flies
○ Mosquitoes
○ Fish
○ Birds
○ Ground Squirrels
○ Raccoons
○ Mice
○ Rats
○ Snakes
○ Snails & Slugs
○ Decay Fungi
○ Other Pest (add name) ________

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Aerial Pesticide Application
○ Service Traps
○ Service Bait Stations
○ Biological Control
○ Ditching
○ Clearing Vegetation
○ Bird Control
○ Mound Treatment
○ Burrow Treatment
○ Burrow Fumigation
○ Soil Fumigation
○ Fumigation—Outdoors
○ Other Control Operations
○ QAE Inspection

SITE DESCRIPTION

○ All Outdoor Sites (survey)
○ Ornamentals, Turf & Gardens
○ Trees
○ Lawns
○ Golf Course Areas
○ Rights-of-Way
○ Semi-improved Grounds
○ Unimproved Grounds
○ Aquatic Sites
○ Landfills & Refuse Dumps
○ Dumpsters & TGCs
○ Sewers & Storm Drains
○ Material Storage Yards
○ Magazines & Bunkers

AREA NO. ▶

TOTAL UNITS TREATED

0 1 2 3 4 5 6 7 8 9

PROCESSING COPY

UNIT

○ Each ○ Acres
○ SF ○ CF
○ LF ○ Traps
○ Bait Stations

CONTROL AGENT

○ 1080 (Sodium Monofluoracetate)
○ 2,4-D
○ Abate
○ Acephate (Orthene)
○ Allethrin
○ Altosid
○ Amdro
○ Amitrole
○ Ammate
○ Anticoagulants
○ Aramite
○ Arsenicals
○ Aspon
○ Atrazine (Aatrex)
○ Avitrol
○ Bacillus thuringiensis (Bti)
○ Baygon (Propoxur)
○ Bendiocarb (Ficam)
○ Bensulide (Betasan)
○ Borates
○ Brodifacoum (Talon)
○ Bromacil (Hyvar)
○ Bromadiolone (Maki)
○ Cadminate
○ Calcium Cyanide
○ Captan
○ Carbaryl (Sevin)
○ Carboxide
○ Casoron
○ Chlorates
○ Chlorfluornol (CF-125)
○ Chlorobenzilate
○ Chlorophacinone (Rozol)
○ Copper Sulphate
○ Daconil
○ Dacthal
○ Dalapon
○ Dasanit
○ Diazinon
○ Dicamba (Banvel)
○ Dichlorvos (Vapona)
○ Dimilin
○ Dioxathion (Delnav)
○ Diquat (Aquacide)
○ Disyston
○ Diuron (Karmex)
○ Drione
○ Dursban (Chlorpyrifos)
○ Dyrene
○ Embark
○ Fenac
○ Fenthion (Baytex)
○ Folpet
○ Glue Boards
○ Glyphosate (Round-up)
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Maleic Hydrazide (MH-30)
○ Maneb
○ Mesurol
○ Metaldehyde
○ Metasystox-R
○ Methyl Bromide
○ Milky Spore Dust (Bacillus popilliae)
○ Monuron
○ Monuron-TCA (Urox)
○ Mosquito Fish
○ Naled (Dibrom)
○ Nemacur
○ Oils (all types)
○ Paraquat
○ Paris Green
○ Permethrin
○ Picloram (Tordon)
○ Prometon (Pramitol)
○ Pyrethrum
○ Resmethrin
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Simazine (Princep)
○ Strychnine
○ Sulfuryl Fluoride (Vikane)
○ Thiram
○ Vapam (Metham-sodium)
○ Velpar
○ Zinc Phosphide
○ Zineb
○ d-Phenothrin
○ Other Pesticide (add name) ________

PESTICIDE FORMULATION

○ Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT

0 1 2 3 4 5 6 7 8 9

UNIT

○ Pounds
○ Ounces
○ Gallons
○ Fluid Ounces
○ Each

FINAL CONCENTRATION

0 1 2 3 4 5 6 7 8 9

OR

RATE PER UNIT AREA

POUNDS PERCENT

0 1 2 3 4 5 6 7 8 9

PESTICIDE EPA REG. NO. ________

CERTIFICATION

INSTALLATION NAME ________
ADDRESS ________
ADDRESS CONTINUED ________
CITY ________
STATE ________ ZIP CODE ________
CERTIFIED APPLICATOR SIGNATURE ________
CERTIFICATION NUMBER ________

★U.S. GOVERNMENT PRINTING OFFICE:1986–165-310 DD-A&L(A&AR) 1080 NAVFAC [illegible]RM [illegible]/3 (11/86)

PEST MANAGEMENT DATA SYSTEM
OUTDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

39042
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK
○ ● ○

INCORRECT MARKS
X ✓ ▬

SERVICED BY

○ ARMY
○ NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
○ Contract

U.I.C. CODE

0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

REPORT DATE

MONTH		DAY		YEAR	
0	0	0	0		0
1	1	1	1		1
	2	2	2		2
	3	3	3		3
	4		4		4
	5		5		5
	6		6		6
	7		7		7
	8		8	8	8
	9		9	9	9

TIME REQUIRED

0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS

0	0	0	0	0	0	0
1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	4	4	4	4	4
5	5	5	5	5	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9

DO NOT MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Algae & Aquatic Weeds
○ Broad-leaved Weeds
○ Mixed Grasses & Weeds
○ Grasses
○ Brush
○ Diseases of Ornamentals & Turf
○ Turf Insects
○ Mole Crickets
○ Nematodes
○ Moles & Gophers
○ Scale Insects
○ Aphids
○ Japanese Beetles
○ Gypsy Moths
○ Ants
○ Centipedes
○ Crickets
○ Earwigs
○ Scorpions
○ Spiders
○ Wasps, Bees, & Hornets
○ Carpenter Ants
○ Filter/Drain Flies
○ House & Filth Flies
○ Horse & Deer Flies
○ Ticks, Chiggers & Mites
○ Midges, Sand & Black Flies
○ Mosquitoes
○ Fish
○ Birds
○ Ground Squirrels
○ Raccoons
○ Mice
○ Rats
○ Snakes
○ Snails & Slugs
○ Decay Fungi
○ Other Pest (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Aerial Pesticide Application
○ Service Traps
○ Service Bait Stations
○ Biological Control
○ Ditching
○ Clearing Vegetation
○ Bird Control
○ Mound Treatment
○ Burrow Treatment
○ Burrow Fumigation
○ Soil Fumigation
○ Fumigation—Outdoors
○ Other Control Operations
○ QAE Inspection

SITE DESCRIPTION

○ All Outdoor Sites (survey)
○ Ornamentals, Turf & Gardens
○ Trees
○ Lawns
○ Golf Course Areas
○ Rights-of-Way
○ Semi-improved Grounds
○ Unimproved Grounds
○ Aquatic Sites
○ Landfills & Refuse Dumps
○ Dumpsters & TGCs
○ Sewers & Storm Drains
○ Material Storage Yards
○ Magazines & Bunkers

AREA NO. ▶

TOTAL UNITS TREATED

0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

PROCESSING COPY

UNIT

○ Each
○ SF
○ LF
○ Bait Stations
○ Acres
○ CF
○ Traps

CONTROL AGENT

○ 1080 (Sodium Monofluoracetate)
○ 2,4-D
○ Abate
○ Acephate (Orthene)
○ Allethrin
○ Altosid
○ Amdro
○ Amitrole
○ Ammate
○ Anticoagulants
○ Aramite
○ Arsenicals
○ Aspon
○ Atrazine (Aatrex)
○ Avitrol
○ Bacillus thuringiensis (Bti)
○ Baygon (Propoxur)
○ Bendiocarb (Ficam)
○ Bensulide (Betasan)
○ Borates
○ Brodifacoum (Talon)
○ Bromacil (Hyvar)
○ Bromadiolone (Maki)
○ Cadminate
○ Calcium Cyanide
○ Captan
○ Carbaryl (Sevin)
○ Carboxide
○ Casoron
○ Chlorates
○ Chlorfluornol (CF-125)
○ Chlorobenzilate
○ Chlorophacinone (Rozol)
○ Copper Sulphate
○ Daconil
○ Dacthal
○ Dalapon
○ Dasanit
○ Diazinon
○ Dicamba (Banvel)
○ Dichlorvos (Vapona)
○ Dimilin
○ Dioxathion (Delnav)
○ Diquat (Aquacide)
○ Disyston
○ Diuron (Karmex)
○ Drione
○ Dursban (Chlorpyrifos)
○ Dyrene
○ Embark
○ Fenac
○ Fenthion (Baytex)
○ Folpet
○ Glue Boards
○ Glyphosate (Round-up)
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Maleic Hydrazide (MH-30)
○ Maneb
○ Mesurol
○ Metaldehyde
○ Metasystox-R
○ Methyl Bromide
○ Milky Spore Dust (Bacillus popilliae)
○ Monuron
○ Monuron-TCA (Urox)
○ Mosquito Fish
○ Naled (Dibrom)
○ Nemacur
○ Oils (all types)
○ Paraquat
○ Paris Green
○ Permethrin
○ Picloram (Tordon)
○ Prometon (Pramitol)
○ Pyrethrum
○ Resmethrin
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Simazine (Princep)
○ Strychnine
○ Sulfuryl Fluoride (Vikane)
○ Thiram
○ Vapam (Metham-sodium)
○ Velpar
○ Zinc Phosphide
○ Zineb
○ d-Phenothrin
○ Other Pesticide (add name)

PESTICIDE FORMULATION

○ Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT

0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

UNIT

○ Pounds
○ Ounces
○ Gallons
○ Fluid Ounces
○ Each

FINAL CONCENTRATION

0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

OR

RATE PER UNIT AREA

POUNDS				PERCENT			
0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9

PESTICIDE EPA REG. NO. ______________________

CERTIFICATION

INSTALLATION NAME ______________________
ADDRESS ______________________
ADDRESS CONTINUED ______________________
CITY ______________________
STATE ______________________ ZIP CODE ______________________
CERTIFIED APPLICATOR SIGNATURE ______________________
CERTIFICATION NUMBER ______________________

PEST MANAGEMENT DATA SYSTEM
OUTDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

39042
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS ✗ ✓ ▬

SERVICED BY

○ ARMY
○ NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
○ Contract

U.I.C. CODE

0 1 2 3 4 5 6 7 8 9 (five columns)

REPORT DATE

MONTH DAY YEAR

0 1 2 3 4 5 6 7 8 9

TIME REQUIRED

0 1 2 3 4 5 6 7 8 9 (four columns)

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS

0 1 2 3 4 5 6 7 8 9 (six columns)

DO NOT MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Algae & Aquatic Weeds
○ Broad-leaved Weeds
○ Mixed Grasses & Weeds
○ Grasses
○ Brush
○ Diseases of Ornamentals & Turf
○ Turf Insects
○ Mole Crickets
○ Nematodes
○ Moles & Gophers
○ Scale Insects
○ Aphids
○ Japanese Beetles
○ Gypsy Moths
○ Ants
○ Centipedes
○ Crickets
○ Earwigs
○ Scorpions
○ Spiders
○ Wasps, Bees, & Hornets
○ Carpenter Ants
○ Filter/Drain Flies
○ House & Filth Flies
○ Horse & Deer Flies
○ Ticks, Chiggers & Mites
○ Midges, Sand & Black Flies
○ Mosquitoes
○ Fish
○ Birds
○ Ground Squirrels
○ Raccoons
○ Mice
○ Rats
○ Snakes
○ Snails & Slugs
○ Decay Fungi
○ Other Pest (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Aerial Pesticide Application
○ Service Traps
○ Service Bait Stations
○ Biological Control
○ Ditching
○ Clearing Vegetation
○ Bird Control
○ Mound Treatment
○ Burrow Treatment
○ Burrow Fumigation
○ Soil Fumigation
○ Fumigation—Outdoors
○ Other Control Operations
○ QAE Inspection

SITE DESCRIPTION

○ All Outdoor Sites (survey)
○ Ornamentals, Turf & Gardens
○ Trees
○ Lawns
○ Golf Course Areas
○ Rights-of-Way
○ Semi-improved Grounds
○ Unimproved Grounds
○ Aquatic Sites
○ Landfills & Refuse Dumps
○ Dumpsters & TGCs
○ Sewers & Storm Drains
○ Material Storage Yards
○ Magazines & Bunkers

AREA NO. ▶

TOTAL UNITS TREATED

0 1 2 3 4 5 6 7 8 9 (six columns)

UNIT

○ Each ○ Acres
○ SF ○ CF
○ LF ○ Traps
○ Bait Stations

PROCESSING COPY

CONTROL AGENT

○ 1080 (Sodium Monofluoracetate)
○ 2,4-D
○ Abate
○ Acephate (Orthene)
○ Allethrin
○ Altosid
○ Amdro
○ Amitrole
○ Ammate
○ Anticoagulants
○ Aramite
○ Arsenicals
○ Aspon
○ Atrazine (Aatrex)
○ Avitrol
○ Bacillus thuringiensis (Bti)
○ Baygon (Propoxur)
○ Bendiocarb (Ficam)
○ Bensulide (Betasan)
○ Borates
○ Brodificoum (Talon)
○ Bromacil (Hyvar)
○ Bromadiolone (Maki)
○ Cadminate
○ Calcium Cyanide
○ Captan
○ Carbaryl (Sevin)
○ Carboxide
○ Casoron
○ Chlorates
○ Chlorfluornol (CF-125)
○ Chlorobenzilate
○ Chlorophacinone (Rozol)
○ Copper Sulphate
○ Daconil
○ Dacthal
○ Dalapon
○ Dasanit
○ Diazinon
○ Dicamba (Banvel)
○ Dichlorvos (Vapona)
○ Dimilin
○ Dioxathion (Delnav)
○ Diquat (Aquacide)
○ Disyston
○ Diuron (Karmex)
○ Drione
○ Dursban (Chlorpyrifos)
○ Dyrene
○ Embark
○ Fenac
○ Fenthion (Baytex)
○ Folpet
○ Glue Boards
○ Glyphosate (Round-up)
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Maleic Hydrazide (MH-30)
○ Maneb
○ Mesurol
○ Metaldehyde
○ Metasystox-R
○ Methyl Bromide
○ Milky Spore Dust (Bacillus popilliae)
○ Monuron
○ Monuron-TCA (Urox)
○ Mosquito Fish
○ Naled (Dibrom)
○ Nemacur
○ Oils (all types)
○ Paraquat
○ Paris Green
○ Permethrin
○ Picloram (Tordon)
○ Prometon (Pramitol)
○ Pyrethrum
○ Resmethrin
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Simazine (Princep)
○ Strychnine
○ Sulfuryl Fluoride (Vikane)
○ Thiram
○ Vapam (Metham-sodium)
○ Velpar
○ Zinc Phosphide
○ Zineb
○ d-Phenothrin
○ Other Pesticide (add name)

PESTICIDE FORMULATION

○ Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT

0 1 2 3 4 5 6 7 8 9 (four columns)

UNIT

○ Pounds
○ Ounces
○ Gallons
○ Fluid Ounces
○ Each

FINAL CONCENTRATION

0 1 2 3 4 5 6 7 8 9 (six columns)

OR

RATE PER UNIT AREA

POUNDS PERCENT

0 1 2 3 4 5 6 7 8 9 (four columns each)

PESTICIDE EPA REG NO ____________________

CERTIFICATION

INSTALLATION NAME ____________________

ADDRESS ____________________

ADDRESS CONTINUED ____________________

CITY ____________________

STATE ____________________ ZIP CODE ____________________

CERTIFIED APPLICATOR SIGNATURE ____________________

CERTIFICATION NUMBER ____________________

RECORD KEEPING AND REPORTING

PEST MANAGEMENT OPERATIONS

Record-keeping and reporting is required to provide management information and historical records of operations that have been conducted on Navy installations. It is important to know what was done since pesticide use has the potential for significant adverse impact on public health and the environment. In addition, record-keeping is required to develop a maintenance history of structures and other application sites, human exposure data, and to comply with the Federal Insecticide, Fungicide and Rodenticide Act.

All Navy and Marine Corps installations shall maintain daily pest management records and forward copies of the records to the cognizant NAVFACENGCOM Engineering Field Division for management of the Navy program. The information is called the Navy Pest Management Data System and it includes all pesticide applications performed on the installation by non-appropriated fund activities, commercial services, government-owned contractor-operated facilities, agricultural outleases, land management and forestry programs, as well as pesticide use by in-house forces. Report control symbol DD-P&L(A&AR)1080 applies.

PART I GENERAL INFORMATION

1. Installation Responsibilities. Installations shall keep daily records of pest management operations performed on property under Navy stewardship. The records shall be entered on NAVFAC Forms 6250/2 and 6250/3 for use by pesticide applicators, contractor personnel, and others who perform the work. Each record has two parts. After entry, the top copy of each record is set aside until the accumulated reports are mailed to the appropriate NAVFACENGCOM Engineering Field Division (EFD) applied biologist. Records may be mailed as often as necessary but not less than monthly. Copies may be reproduced from the completed records if additional information copies are needed locally. No cover letter is required. Negative reports are not required. If records are returned for correction after edit by the EFDs, the installation submitting the record shall be responsible for correcting and resubmitting the data on a new record. The bottom (or yellow) copy of each record shall be retained at the installation by the facility performing the work to comply with legal requirements for daily record-keeping.

2. Engineering Field Division Responsibilities. Pest management records shall be optically scanned for input errors by the EFD and valid report data shall be transmitted to the Facilities Systems Office (FACSO) at Port Hueneme, CA, for summary processing. Invalid reports, identified in the scanning process, shall be returned to the originating installation for correction. As summarized records are returned to the EFDs from FACSO, the original input records may be discarded and the applied biologists shall review the summarized information for technical operations, safety, and compliance with the installation's pest management plan. Where unresolved pest problems exist, or hazardous situations or pesticide misuses are identified, the EFD applied biologist shall take appropriate actions to resolve the problems.

3. Coordination. The Naval Energy and Environmental Support Activity (NEESA), Port Hueneme, CA, shall coordinate processing pest management and related data with FACSO. FACSO will receive input data from the EFDs and prepare summary reports. NEESA (Code 110E) will receive and prepare all other information requests and provide summaries of installation operations for installation pest management plans and other management reports.

PART II REPORTING INDOOR PEST MANAGEMENT AND RELATED OPERATIONS

1. Use NAVFAC Form 6250/2 to record indoor pest management operations. Figure 1 illustrates the form for reporting indoor control operations and related pest management functions. Use one form for each pest management operation and use a No. 2 pencil to mark the "bubble" next to your choice of entry in each field on the form. After you have filled out a record, separate the sheets and discard the carbon sheet. At the end of each day, file the bottom (or yellow) copy at the pest control facility, since this is your legal

record required by federal law for all restricted-use pesticide applications. The yellow copy is also a maintenance record. The copies shall be filed by site (building or grounds area) for recovery of pest management information by site. Use the back of the yellow copy to record any additional details about the operation or site condition, and to show where treatment was applied, if necessary. Save the top copies of the records until the end of each month, then mail them to the EFD PMC.

2. To fill in a record, follow these instructions for each data entry field on the form. Figure 1 illustrates a report of a control operation in family housing for cockroaches using Diazinon insecticide applied manually.

A. Serviced By. Mark the bubble adjacent to appropriate service (Navy or Marine Corps). In the lower part of the same field, mark the choice telling how the work was done.

B. UIC Code. Write in the unit identification code for your installation in the five spaces at the top of the field, then mark the corresponding bubble below each number. If your UIC ends in a letter, do not fill in the bubble below the handwritten letter.

C. Report Date. Write in the date of the operation in the spaces at the top of the field, then mark the bubble below each number. Enter first the month, then the day and year.

D. Time. Write in the time in hours required for the operation, including survey time, preparation time, performance or craft time, delay time, cleanup, and travel time. If you are reporting a combined operation where more than one pesticide or control operation was done on the same job site, you must report them separately and divide the time accordingly. For example if on one job you surveyed for cockroaches, replenished bait stations and serviced snap traps, and the job took 1.5 hours, you must use one report for each task and divide the time into three parts, such as 0.5 hrs for each. If two or more applicators work on the same job, add their time together. Note that you can report tenths of hours. For example, six minutes is 0.1 hrs., 12 minutes is 0.2 hrs., and so on. A table for time conversion is printed on the last page of this instruction and may be removed for field use. Reporting time for contract services is optional. Zero-fill spaces to the right.

E. Pest. Select the target pest. Select only one pest even if you plan to control more than one. If the name of the pest you want is not listed, mark the bubble next to the last choice, "Other pests" and then write in the name of the pest in the space provided.

F. Operation. Only one operation shall be reported on each form. Select the operation performed from those listed on the form. Note also that there are several types of operations.

DD-A&L(A&AR) 1080 NAVFAC FORM 6250/2 (11/86)

PEST MANAGEMENT DATA SYSTEM
INDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

009619
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS ⊗ ⊘ ◒

SERVICED BY

○ ARMY
● NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

● In-house
○ Support Agreement
○ Contract

U.I.C. CODE 67131

REPORT DATE MONTH 04 DAY 10 YEAR 87

TIME REQUIRED 05

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM. THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS.

DO NOT MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Ants
● Cockroaches
○ Stored Product Pests
○ Pillbugs & Sowbugs
○ Spiders
○ Silverfish
○ Fleas
○ House & Filth Flies
○ Filter & Drain Flies
○ Centipedes & Millipedes
○ Scorpions
○ Crickets
○ Earwigs
○ Wasps, Bees & Hornets
○ Mites
○ Lice
○ Carpenter Ants
○ Drywood Termites
○ Subterranean Termites
○ Wood Boring Beetles
○ Decay Fungi
○ Birds
○ Bats
○ Squirrels
○ Cats
○ Mice
○ Rats
○ Other Pests (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
● Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Pest Exclusion
○ Service Traps
○ Service Bait Stations
○ Fumigation
○ Soil Pretreatment—Termites
○ Soil Post-Construction Treatment—Termites
○ Trench Treatment—Termites
○ Void Treatment—Termites
○ Subslab Injection—Termites
○ Self-Help Operations
○ Other Control Operations

○ Program Administration
○ Training
○ Maintenance
○ QAE Inspection

SITE DESCRIPTION

○ All Indoor Sites (survey)
○ All Structures (survey)
○ All Wood Structures (survey)
○ Food Handling Establishments
○ Food Storage Warehouses
● Family Housing (Occupied)
○ Family Housing (Vacant)
○ Officer/Enlisted Quarters
○ Office/Administration Areas
○ Hospital/Clinic (Health Care)
○ Hospital/Clinic (Non-Health Care)
○ Industrial Facilities
○ Hangars
○ Greenhouses & Nurseries
○ Vessels, Barges, Aircraft, & Sea/Land Vans

BLDG. NO. ▶ A-31

TOTAL UNITS TREATED 001600

PROCESSING COPY

UNIT

● SF
○ CF
○ LF
○ Each
○ Traps
○ Bait Stations

CONTROL AGENT

○ Acephate (Orthene)
○ Aldrin
○ Amdro (Combat)
○ Anticoagulants
○ Attractants
○ Avitrol
○ Bendiocarb (Ficam)
○ Boric Acid
○ Brodificoum (Talon)
○ Bromadiolone (Maki)
○ Calcium Cyanide
○ Carboxide
○ Chlordane
○ Chlorophacinone (Rozol)
● Diazinon
○ Dichlorvos (Vapona)
○ d-Phenothrin
○ Drione
○ Dursban (Chlorpyrifos)
○ Fenthion (Baytex)
○ Glue Boards
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Methyl Bromide
○ Naled (Dibrom)
○ PBD & Naphthalene
○ Permethrin
○ Propoxur (Baygon)
○ Pyrethrum
○ Repellents
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Sulfuryl Fluoride
○ Zinc Phosphide
○ Other Pesticides (add name)

PESTICIDE FORMULATION

● Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT 0004

UNIT

○ Pounds
○ Ounces
● Gallons
○ Fluid Ounces
○ Each

FINAL CONCENTRATION 000500

● PESTICIDE EPA REG. NO. 464-571

CERTIFICATION

NAVSTA
INSTALLATION NAME

ADDRESS

ADDRESS CONTINUED

FAIRPORT
CITY

DE 01010
STATE ZIP CODE

C. Breden
CERTIFIED APPLICATOR SIGNATURE

NJ-127-56-0287
CERTIFICATION NUMBER

Enclosure (5)

FIGURE 1

(1) If you are reporting an indoor or structural control operation your choices are:

- Pest Surveillance
- Service Surveillance Traps
- Manual Pesticide Application
- Fog, ULV, or Space Treatment
- Power Pesticide Application
- Pest Exclusion/Removal
- Service Traps
- Service Bait Stations
- Fumigation
- Pretreatment (termites)
- Post-construction Treatment (termites)
- Trench Treatment (termites)
- Void Treatment (termites)
- Subslab Injection (termites)
- Other Control Operations
- Self-Help Operations

(a) Use "Pest Surveillance" to report the monitoring of pest populations to determine <u>if</u> there is a problem. The operation may also be used to report follow-on surveys to determine if treatments were successful. Report any pesticide used in the surveillance effort. You may use the generic term, "All pests" if surveillance involves several pests.

(b) If you are reporting coordination time for supporting self-help control efforts in quarters or offices, select "Self-Help Operations" and fill in all other fields as appropriate. The time used by housing occupants is at no cost to the Navy and is not reported.

(2) If you are reporting an administrative or noncontrol operation your choices are:

(a) <u>Program Administration</u> is time to plan, schedule and supervise work; coordinate operations; procure materials; and report on what has been done. Include leave time.

(b) <u>Maintenance</u> is time to repair and maintain shop facilities, vehicles, and application equipment not related to a specific control operation.

(c) <u>Training</u> is time for improving and maintaining the competency of pest control and quality assurance personnel.

With these three operations do not report target pests, sites, or pesticides. Do report the time. For example, you will see that Figure 2 is filled out to report six hours used by the supervisor to schedule and assign work to the crew.

(d) <u>QAE Inspection</u> is the time required to determine pest control contract performance and for Navy contract management efforts by in-house personnel. Reporting the target pest is optional but do not report the site. However, if a pesticide is used in the course of the evaluation, report it and the site. Do not report a site unless a pesticide was used.

*U.S. GOVERNMENT PRINTING OFFICE: 1986—166-308

PEST MANAGEMENT DATA SYSTEM
INDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

009618
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS ✗ ✓ ⊖

SERVICED BY

○ ARMY
● NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

● In-house
○ Support Agreement
○ Contract

U.I.C. CODE

00111

REPORT DATE

MONTH	DAY	YEAR
02	12	87

TIME REQUIRED

0060

RESUBMITTAL NUMBER

○ ◄ FILL IN FOR RESUBMITTAL FORM

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS.

DO NOT MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Ants
○ Cockroaches
○ Stored Product Pests
○ Pillbugs & Sowbugs
○ Spiders
○ Silverfish
○ Fleas
○ House & Filth Flies
○ Filter & Drain Flies
○ Centipedes & Millipedes
○ Scorpions
○ Crickets
○ Earwigs
○ Wasps, Bees & Hornets
○ Mites
○ Lice
○ Carpenter Ants
○ Drywood Termites
○ Subterranean Termites
○ Wood Boring Beetles
○ Decay Fungi
○ Birds
○ Bats
○ Squirrels
○ Cats
○ Mice
○ Rats
○ Other Pests (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Pest Exclusion
○ Service Traps
○ Service Bait Stations
○ Fumigation
○ Soil Pretreatment—Termites
○ Soil Post-Construction Treatment—Termites
○ Trench Treatment—Termites
○ Void Treatment—Termites
○ Subslab Injection—Termites
○ Self-Help Operations
○ Other Control Operations

● Program Administration
○ Training
○ Maintenance
○ QAE Inspection

SITE DESCRIPTION

○ All Indoor Sites (survey)
○ All Structures (survey)
○ All Wood Structures (survey)
○ Food Handling Establishments
○ Food Storage Warehouses
○ Family Housing (Occupied)
○ Family Housing (Vacant)
○ Officer/Enlisted Quarters
○ Office/Administration Areas
○ Hospital/Clinic (Health Care)
○ Hospital/Clinic (Non-Health Care)
○ Industrial Facilities
○ Hangars
○ Greenhouses & Nurseries
○ Vessels, Barges, Aircraft, & Sea/Land Vans

BLDG. NO. ▶

TOTAL UNITS TREATED

UNIT

○ SF
○ CF
○ LF
○ Bait Stations
○ Each
○ Traps

PROCESSING COPY

CONTROL AGENT

○ Acephate (Orthene)
○ Aldrin
○ Amdro (Combat)
○ Anticoagulants
○ Attractants
○ Avitrol
○ Bendiocarb (Ficam)
○ Boric Acid
○ Brodifacoum (Talon)
○ Bromadiolone (Maki)
○ Calcium Cyanide
○ Carboxide
○ Chlordane
○ Chlorophacinone (Rozol)
○ Diazinon
○ Dichlorvos (Vapona)
○ d-Phenothrin
○ Drione
○ Dursban (Chlorpyrifos)
○ Fenthion (Baytex)
○ Glue Boards
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Methyl Bromide
○ Naled (Dibrom)
○ PBD & Naphthalene
○ Permethrin
○ Propoxur (Baygon)
○ Pyrethrum
○ Repellents
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Sulfuryl Fluoride
○ Zinc Phosphide
○ Other Pesticides (add name)

PESTICIDE FORMULATION

○ Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT	UNIT	FINAL CONCENTRATION
	○ Pounds ○ Ounces ○ Gallons ○ Fluid Ounces ○ Each	

○ PESTICIDE EPA REG. NO.

CERTIFICATION

NAVSTA
INSTALLATION NAME

ADDRESS

ADDRESS CONTINUED

FAIRPORT
CITY

DE 01010
STATE ZIP CODE

C. Breeden
CERTIFIED APPLICATOR SIGNATURE

NJ-127-56-0287
CERTIFICATION NUMBER

G. Site Description. Select the site of the operation. Your choices are listed on the form (Figures 1 and 2). If the operation performed was "Pest Surveillance," you may use any site listed. Be sure to write in the specific site designation as illustrated in Figure 1. You may use the back of the yellow copy to draw a sketch of the site and to identify exactly where treatment was made.

H. Site Unit. Select the appropriate measurement unit to describe the site involved in the operation. Note that not every unit can be used with every operation. Just as in writing where the parts of a sentence must agree, so must the terms used in the pest management reports. Use Table 1 to find acceptable combinations of report terms.

TABLE 1. INDOOR OPERATIONS

This table lists acceptable combinations for recording indoor pest management operations, units, and sites.

Indoor Operations	Units	Sites
Pest Surveillance	(leave blank, no unit needed) .	(any site listed)
Service Surveillance Traps (or Glue Boards) .	Traps	(any site listed except All Indoor Sites All Structures All Wood Structures)
Manual Pesticide Application or Power Pesticide Application	Square Feet . . . Linear Feet	(any site listed except All Indoor Sites All Structures & All Wood Structures)
Fog, Ultra Low Volume or . . Space Treatment	Cubic Feet . . .	(any site listed except) All Indoor Sites All Structures & All Wood Structures & Vessels, Barges, Aircraft, Sea/Land Vans & Railroad Cars
	Each	Vessels, Barges, Aircraft, Sea/Land Vans, & Railroad Cars

TABLE 1 (continued)

Indoor Operations	Units	Sites
Fumigation	Cubic Feet or Cubic Feet, Each	(any site listed) Vessels, Barges, Aircraft, Sea/Land Vans, & Railroad Cars
Pest Exclusion/Removal	Each	(any site listed)
Service Traps/Glue Boards	Traps	(any site listed)
Service Bait Stations (baiting or checking)	Bait Stations	(any site listed)
Pretreatment (termite prevention)	Square Feet or Linear Feet	All Structures
Post-construction Treatment, Trench Treatment, Void Treatment, & Subslab Injection	Square Feet or Linear Feet	(any site listed)
Self-Help Pest Control (report coordination time only)	Each (office or unit serviced)	(any site listed except All Indoor Sites All Structures & All Wood Structures)
Other Control Operations	Square Feet, Linear Feet, Cubic Feet or Each	(any site listed)
QAE Inspection (pest name optional)	(no unit needed)	(no site needed)

* * * * *

I. Total Units Treated. Fill in the number of units in the spaces at the top of the field, then mark the bubble below each number.

J. Control Agent. Select the appropriate control agent if one was used in the operation and mark the adjacent bubble. Select only one. If a tank mix was used in a pesticide application, you must fill out a separate form for each pesticide in the tank mix and divide the time reported equally between the pesticides used in the mix. If the name of the control agent you want is not listed, select "Other pesticide" and then write in the name of the control agent in the space provided.

K. Pesticide Formulation. If a pesticide was used in the operation, information is needed about that pesticide. Select the appropriate formulation and unit combination as follows: "dusts," "solid fumigants," "liquid fumigants," and "baits" must be used with "pounds" or "ounces." Liquids such as "emulsions," "solutions, "suspensions," and "aerosols" must be reported with "gallons" or "fluid ounces." "Other formulations" may be reported with any unit of measure. One other unit, "Each" is provided to report the pesticides in bait stations (only) where the amount of pesticide is very small; i.e., with Combat^{R} bait stations where the amount of hydramethylnon insecticide is much less than an ounce. See also the quick reference guide on the inside back cover of this instruction.

L. Pesticide Amount Units. Select the appropriate unit listed on the form (Figures 1 and 2).

M. Pesticide Amount. Write in the amount of the finished or formulated material in the spaces at the top of the field. Then mark the bubble below each space under the digit you entered. Note that the field has a decimal so that you can report as little as one tenth (0.1) of a unit.

N. Final Concentration. Write in the percent concentration of the active ingredient of the pesticide in the spaces provided at the top of the field and then mark the bubble below each number. Note that the field contains a decimal so that you can report as little as one one-thousandth (0.001) of a percent. The strength of anticoagulant rodenticides, for example, is often as little as 0.025 percent.

O. EPA Registration Number. When a pesticide is reported, mark the bubble provided and enter the EPA registration number of the pesticide product. For installations in foreign countries only, you may enter a host government registration number, if available. Do not mark the bubble if a registration number is not reported.

P. Certification. Enter the information requested in the spaces provided in this field. An address stamp may be used. The signature field must bear the signature of the certified applicator who performed the operation, or the signature of the certified supervisor. Their certification number must be entered on the line below. When a certification number is entered, be sure to mark the bubble on the same line. Even if the applicator is not certified, he or she must sign the form and "none" should be entered on the certification line.

Q. Resubmittal. This field is used to resubmit corrected records. If a record is returned to you for correction, complete a new record sheet with the corrected information. Then mark the bubble in the resubmittal field, enter the serial number of the original sheet in the space provided and mark one bubble below each number. Resubmittal is only used to correct records that have passed all edits and are in the data base. Do not use resubmittal for forms that have not passed through EFD or machine edit.

PART III REPORTING OUTDOOR PEST MANAGEMENT OPERATIONS

1. Use NAVFAC Form 6250/3 to record outdoor pest management operations. Figure 3 illustrates the form for recording outdoor control operations and related pest management functions. Use one green form for each pest management operation. Simply use a No. 2 pencil to mark the bubble next to your choice of entry in each field on the form. After you have filled out a record discard the carbon sheet. At the end of each day file the bottom (or yellow) copy at the pest control facility, since it is the daily legal record, as required by federal law for all pesticide applications. The yellow copy is also a maintenance record. Use the back of the yellow copy to record any additional details about the operation or site condition, and to show where treatment was applied, if necessary. Save the top copies of the records until the end of each month, then mail them to the EFD PMC.

2. To fill in the form, follow these instructions for each data entry field on the form. Figure 3 illustrates a report of a weed control operation for mixed grasses and weeds in the material storage yard using Bromacil 80 percent wettable powder, a herbicide.

A. Serviced By. Mark the bubble adjacent to appropriate service (Navy or Marine Corps). In the lower part of the same field, mark the choice telling how the work was done.

B. UIC Code. Write in the unit identification code for your installation in the five spaces at the top of the field, then mark the corresponding bubble below each number. If your UIC ends in a letter, do not fill in the bubble below the handwritten letter.

C. Report Date. Write in the date of the operation in the spaces at the top of the field, then mark the bubble below each number. Enter first the month, then the day and year.

D. Time. Write in the time in hours required for the operation, including the time for survey, preparation, performance or craft time, delay time, cleanup, and travel. If you are reporting a combined operation where more than one pesticide or control operation was done on the same job site, you must report them separately and divide the time on the reports accordingly. If two or more people work on the same job, add their time together. If you are reporting an integrated operation where more than one pesticide or control operation was done on the same job site, you must divide the time accordingly on the reports. Note that you can report tenths of hours. For example, six minutes is 0.1 hours, 12 minutes is 0.2 hours, and so on. A table for time conversion is printed on the last page of this instruction and may be removed for field use. Reporting time for contract services is optional. Zero-fill spaces to the right.

E. Pest. Select the target pest. Select only one pest even if you plan to control more than one. If the name of the pest you want is not listed, mark the bubble next to the last choice, "Other pests" and then write in the name of pest in the space provided.

F. Operation. Select the operation performed. Your choices are:

Pest Surveillance
Service Surveillance Traps
Manual Pesticide Application
Fog, ULV, or Space Treatment
Power Pesticide Application
Aerial Pesticide Application
Ditching
Service Traps
Biological Control
Mound Treatment
Soil Fumigation
Burrow Fumigation
Clearing Vegetation
Service Bait Stations
Bird Control
Burrow Treatment
Fumigation Outdoors
Other Control Operation

(1) Use "Pest Surveillance" to report survey efforts to determine *if* there is a problem present. This operation may also be used to report follow-up surveys to determine if a treatment was successful. Report any pesticide used in the surveillance effort. You may use the generic term, "All pests," if surveillance involves several pests.

(2) Use "QAE Inspection" to report the time required to determine pest control contract performance and contract management efforts by Navy personnel. Reporting the target pest is optional but do not report the site. However, if a pesticide is used in the course of the evaluation, report it and report a site. Do not report a site unless a pesticide was used.

G. Site Description. Select the site of the operation. Your choices are listed on the form (Figure 3). If the operation performed was "Pest Surveillance," you may use "All Outdoor Sites." Be sure to write in the specific site designation as illustrated in Figure 3. You may use the back of the yellow copy to draw a sketch of the site and identify exactly where treatment was made. Use the back also to note weather conditions if they are required by state regulations, such as air temperature, wind speed and direction, precipitation, and soil conditions.

H. Site Units. Select the appropriate measurement unit to describe the site involved in the operation. Note that not every unit can be used with every operation. Just as in writing where the parts of a sentence must agree, so must the terms used in the pest management reports. Use Table 2 to find acceptable combinations of report terms.

I. Total Units Treated. Fill in the number of units in the six spaces at the top of the field, then mark one bubble below each number.

I-310

DD-A&L(A&AR) 1080 NAVFAC FORM 6250/3 (11/86)

PEST MANAGEMENT DATA SYSTEM
OUTDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

35192
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK
○ ● ○

INCORRECT MARKS

SERVICED BY

○ ARMY
● NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

● In-house
○ Support Agreement
○ Contract

U.I.C. CODE
00111

REPORT DATE
MONTH DAY YEAR
02 12 87

TIME REQUIRED
0240

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS.

DO NOT MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Algae & Aquatic Weeds
○ Broad-leaved Weeds
● Mixed Grasses & Weeds
○ Grasses
○ Brush
○ Diseases of Ornamentals & Turf
○ Turf Insects
○ Mole Crickets
○ Nematodes
○ Moles & Gophers
○ Scale Insects
○ Aphids
○ Japanese Beetles
○ Gypsy Moths
○ Ants
○ Centipedes
○ Crickets
○ Earwigs
○ Scorpions
○ Spiders
○ Wasps, Bees, & Hornets
○ Carpenter Ants
○ Filter/Drain Flies
○ House & Filth Flies
○ Horse & Deer Flies
○ Ticks, Chiggers & Mites
○ Midges, Sand & Black Flies
○ Mosquitoes
○ Fish
○ Birds
○ Ground Squirrels
○ Raccoons
○ Mice
○ Rats
○ Snakes
○ Snails & Slugs
○ Decay Fungi
○ Other Pest (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
● Power Pesticide Application
○ Aerial Pesticide Application
○ Service Traps
○ Service Bait Stations
○ Biological Control
○ Ditching
○ Clearing Vegetation
○ Bird Control
○ Mound Treatment
○ Burrow Treatment
○ Burrow Fumigation
○ Soil Fumigation
○ Fumigation—Outdoors
○ Other Control Operations
○ QAE Inspection

SITE DESCRIPTION

○ All Outdoor Sites (survey)
○ Ornamentals, Turf & Gardens
○ Trees
○ Lawns
○ Golf Course Areas
○ Rights-of-Way
○ Semi-improved Grounds
○ Unimproved Grounds
○ Aquatic Sites
○ Landfills & Refuse Dumps
○ Dumpsters & TGCs
○ Sewers & Storm Drains
○ Material Storage Yards
○ Magazines & Bunkers

AREA NO. ▶ Motor Pool

TOTAL UNITS TREATED
000004

UNIT

○ Each ● Acres
○ SF ○ CF
○ LF ○ Traps
○ Bait Stations

PROCESSING COPY

CONTROL AGENT

○ 1080 (Sodium Monofluoracetate)
○ 2,4-D
○ Abate
○ Acephate (Orthene)
○ Allethrin
○ Altosid
○ Amdro
○ Amitrole
○ Ammate
○ Anticoagulants
○ Aramite
○ Arsenicals
○ Aspon
○ Atrazine (Aatrex)
○ Avitrol
○ Bacillus thuringiensis (Bti)
○ Baygon (Propoxur)
○ Bendiocarb (Ficam)
○ Bensulide (Betasan)
○ Borates
○ Brodificoum (Talon)
● Bromacil (Hyvar)
○ Bromadiolone (Maki)
○ Cadminate
○ Calcium Cyanide
○ Captan
○ Carbaryl (Sevin)
○ Carboxide
○ Casoron
○ Chlorates
○ Chlorfluornol (CF-125)
○ Chlorobenzilate
○ Chlorophacinone (Rozol)
○ Copper Sulphate
○ Daconil
○ Dacthal
○ Dalapon
○ Dasanit
○ Diazinon
○ Dicamba (Banvel)
○ Dichlorvos (Vapona)
○ Dimilin
○ Dioxathion (Delnav)
○ Diquat (Aquacide)
○ Disyston
○ Diuron (Karmex)
○ Drione
○ Dursban (Chlorpyrifos)
○ Dyrene
○ Embark
○ Fenac
○ Fenthion (Baytex)
○ Folpet
○ Glue Boards
○ Glyphosate (Round-up)
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Maleic Hydrazide (MH-30)
○ Maneb
○ Mesurol
○ Metaldehyde
○ Metasystox-R
○ Methyl Bromide
○ Milky Spore Dust (Bacillus popilliae)
○ Monuron
○ Monuron-TCA (Urox)
○ Mosquito Fish
○ Naled (Dibrom)
○ Nemacur
○ Oils (all types)
○ Paraquat
○ Paris Green
○ Permethrin
○ Picloram (Tordon)
○ Prometon (Pramitol)
○ Pyrethrum
○ Resmethrin
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Simazine (Princep)
○ Strychnine
○ Sulfuryl Fluoride (Vikane)
○ Thiram
○ Vapam (Metham-sodium)
○ Velpar
○ Zinc Phosphide
○ Zineb
○ d-Phenothrin
○ Other Pesticide (add name)

PESTICIDE FORMULATION

○ Emulsion
○ Solution
● Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT
4000

UNIT

○ Pounds
○ Ounces
● Gallons
○ Fluid Ounces
○ Each

FINAL CONCENTRATION

OR

RATE PER UNIT AREA

POUNDS	PERCENT
0200	0800

● PESTICIDE EPA REG. NO. 352-287

CERTIFICATION

NAVSUPACT
INSTALLATION NAME

ADDRESS

ADDRESS CONTINUED

FORRESTER
CITY

TX 66641
STATE ZIP CODE

C. Gregory
CERTIFIED APPLICATOR SIGNATURE

NJ-128-56-0187
CERTIFICATION NUMBER

FIGURE 3

J. Control Agent. Select the appropriate control agent if one was used in the operation and mark in the adjacent bubble. Select only one. If a tank mix was used in a pesticide application, you must fill out a separate form for each pesticide in the tank mix and divide the time reported equally between the pesticides used in the mix. If the name of the control agent you want is not listed, select "Other pesticide" and then write in the name of the control agent in the space provided.

K. Pesticide Formulation. If a pesticide was used in the operation, information is needed about that pesticide. Select the appropriate formulation and unit combination as follows: "Dusts," "solid fumigants," "liquid fumigants," and "baits" must be used with "pounds" or "ounces." Liquids such as "emulsions," "solutions," "suspensions," and "aerosols" must be reported with "gallons" or "fluid ounces." "Other formulations" may be reported with any unit of measure except "Each." See also the quick reference guide on the inside back cover of this instruction. Figure 3 illustrates reporting weed control with 80g Bromacil wettable powder.

L. Pesticide Amount Units. Select the appropriate unit and mark the adjacent bubble. Choices are listed on the form (Figure 3).

M. Pesticide Amount. Fill in the amount of the finished or formulated material in the six spaces at the top of the field, then mark the bubble below each number. Note that the field has a decimal so that you can report as little as one tenth (0.1) of a unit.

N. Final Concentration. Fill in the concentration of the active ingredient of the pesticide in percent in the six spaces provided at the top of the field then mark the bubble below each number. Note that the field contains a decimal so that you can report as little as one-thousandth (0.001) of a percent. The strength of anticoagulant rodenticides, for example, is often as little as 0.025 percent. It is an optional field. You may report the same operation by using the field described below in item "o," the "rate per unit area," instead.

O. Rate per Unit Area. Fill in the rate per unit area with the pesticide rate in pounds in the left side of this field and the concentration of the undiluted pesticide product in percent in the right side of the field. Note that there is a decimal point in each part of the field so that you can report as little as one-tenth of a pound and one-tenth of a percent. Figure 3 shows an application rate of 20 pounds of 80 percent Bromacil per acre. Note that the final concentration field is not used in this record since only one format is needed.

P. EPA Registration Number. When a pesticide is reported, mark the bubble provided and enter the EPA registration number of the pesticide product. For installations in foreign countries only, you may enter a host government registration number, if available. In all other cases, mark the

TABLE 2. OUTDOOR OPERATIONS

This table lists acceptable combinations for recording outdoor pest management operations, units, and sites.

Outdoor Operations	Units	Sites
Pest Surveillance	(leave blank . no unit needed)	All Outdoor Sites
Service Surveillance Traps (or Glue Boards)	Traps	(any site listed)
Manual Pesticide Application	Acres, Square Feet, or Linear Feet	(any site listed except All Outdoor Sites)
Power Pesticide Application	Each	Dumpsters, TGCs & Trees
	Each or Linear Feet	Sewers & Storm Drains
Fogging or Ultra-Low Volume Application	Acres	(any outdoor site except Dumpsters & TGCs, and Trees)
	Each	UGS
Aerial Pesticide Application	Acres	All Outdoor Sites
Service Traps/Glue Boards	Traps	(any site except All Outdoor Sites)
Burrow Treatment or Burrow Fumigation	Each or Acres	(any outdoor sites)
Soil Fumigation (top dressing)	Acres, Square or Cubic Feet	Ornamentals, Turf & Gardens, Lawns & Golf Course Areas, only
Fumigation, Outdoor (i.e., stack fumigation or commodity fumigation)	Cubic Feet	Semi-improved Grounds Unimproved Grounds Material Storage Yards
Mound Treatment	Each, Acres	(any site listed)

TABLE 2. (continued)

Service Bait Stations . . . . (Baiting or checking)	Bait Station .	(any site listed except All Outdoor Sites)
<u>Outdoor Operations</u>	<u>Units</u>	<u>Sites</u>
Biological Control	AC, SF, Each . Traps, Bait Stations	(any site listed)
Ditching or Clearing	AC, LF, or SF .	Rights-of-Way Semi-improved Grounds Unimproved Grounds Aquatic Sites
Bird Control	Each (numbers . of buildings or areas)	(any site listed)
Other Control Operations	SF, LF, AC . . or Each	(any site listed)
QAE Inspection (no unit) . . . . (pest name optional)	(any site listed) needed)	

****

bubble and leave the entry space blank. Do <u>not</u> mark the bubble if a registration number is not reported.

Q. <u>Certification</u>. Enter the information requested in the spaces provided in this field. A rubber address stamp may be used. The signature field must bear the signature of the certified applicator who performed the operation, or the signature of the certified supervisor. Their certification number must be entered on the line below. When a certification number is entered, be sure to mark the bubble on the same line. Even if the applicator is not certified, he or she must sign the form and enter "none" on the certification line.

R. <u>Resubmittal</u>. This field is only used to resubmit corrected records if the original record sheet cannot be corrected itself. If a record is returned to you for correction, complete a <u>new</u> record sheet with the corrected information. Then mark the bubble in the resubmittal field, enter the serial number of the <u>original</u> sheet in the six spaces provided, and mark one bubble below each number. Resubmittal is only used to correct records that have passed all edits and are in the data base. Do not use resubmittal for forms that have not passed through EFD or machine edit.

Attachment 10-A2

GUIDE FOR FORM COMPLETION USING "OPERATION" BLOCK AS KEY TO FILLING IN OTHER DATA FIELDS

KEYS:
X = MUST FILL IN BLOCK
M = MAY HAVE TO FILL IN BLOCK DEPENDING ON "IN-HOUSE" WORK, "CONTRACTED" WORK, OR WHETHER PESTICIDES WERE USED
FOR MOA (Method Of Accomplishment) C = CONTRACTED, I = IN-HOUSE

OPERATION	PEST NAME	SITE DESC	UNIT TRTD	UNIT MEAS	CONT AGNT	FORM ULAT	CONT AMT	CONT UNIT	FINL CONC		RATE LBS	RATE %	MOA
AERIAL	X	X	X	X	X	X	X	X	X	OR	X	X	C
ADMIN.													I
SERVICE BAITS	X	X	X	X	X	X	X	X	X	OR	X	X	C
BIRD CONTROL	X	X	X	X	M	M	M	M	M	OR	M	M	C
BIOLOGICAL	X	X	X	X	X	X	X	X	X	OR	X	X	C
BURROW FUMIGATION	X	X	X	X	X	X	X	X	X	OR	X	X	C
BURROW TREATMENT	X	X	X	X	X	X	X	X	X	OR	X	X	C
CLEARING BRUSH	X	X	X	X									C
DITCHING	X	X	X	X									C
EXCLUSION	X	X	X	X									C
FOGGING	X	X	X	X	X	X	X	X	X	OR	X	X	C
FUMIGATION	X	X	X	X	X	X	X	X	X	OR	X	X	C

KEYS: X = MUST FILL IN BLOCK
M = MAY HAVE TO FILL IN BLOCK DEPENDING ON "IN-HOUSE" WORK, "CONTRACTED" WORK, OR WHETHER PESTICIDES WERE USED
FOR MOA (Method Of Accomplishment) C = CONTRACTED, I = IN-HOUSE

OPERATION	PEST NAME	SITE DESC	UNIT TRTD	UNIT MEAS	CONT AGNT	FORM ULAT	CONT AMT	CONT UNIT	FINL CONC		RATE LBS	RATE %	MOA
FUMIGATION/ OUTDOORS	X	X	X	X	X	X	X	X	X	OR	X	X	C
SUBSLAB INJECTION TERMITES	X	X	X	X	X	X	X	X	X				C
MAINTENANCE													I
MANUAL PESTICIDE APPLICATION	X	X	X	X	X	X	X	X	X	OR	X	X	C
MOUND TREATMENT	X	X	X	X	X	X	X	X	X	OR	X	X	C
OTHER CONTROL OPERATIONS	X	X	X	X	M	M	M	M	M	OR	M	M	C
POWER PESTICIDE APPLICATION	X	X	X	X	X	X	X	X	X	OR	X	X	C
POST CONSTRUCTION TERMITE WORK	X	X	X	X	X	X	X	X	X				C
QAE INSPECTION	M	M			N	M	M	M	M		M	M	I

KEYS: X = MUST FILL IN BLOCK
M = MAY HAVE TO FILL IN BLOCK DEPENDING ON "IN-HOUSE" WORK, "CONTRACTED" WORK, OR WHETHER PESTICIDES WERE USED
FOR MOA (Method Of Accomplishment) C = CONTRACTED, I = IN-HOUSE

OPERATION	**PEST NAME**	**SITE DESC**	**UNIT TRTD**	**UNIT MEAS**	**CONT AGNT**	**FORM ULAT**	**CONT AMT**	**CONT UNIT**	**FINL CONC**		**RATE LBS**	**RATE %**	**MOA**
SELF HELP OPERATIONS	X	X	X	X	M	M	M	M	M				I
SOIL FUMIGATION	X	X	X	X	X	X	X	X	X	OR	X	X	C
SOIL PRE-TREATMENT (TERMITES)	X	X	X	X	X	X	X	X	X				C
SURVEY TRAPS	X	X	X	X									C
SURVEY	X	X	M	M	M	M	M	M	M	OR	M	M	I
TRENCH TREATMENT (TERMITES)	X	X	X	X	X	X	X	X	X				C
SERVICE TRAPS	X	X	X	X	M	M							C
VOID TREATMENTS (TERMITES)	X	X	X	X	X	X	X	X	X				C

Attachment 10-A3

DD-A&L(A&AR) 1080 NAVFAC FORM 6250/2 (11/86)

PEST MANAGEMENT DATA SYSTEM
INDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

0163240
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS ⊗ ✓ ◒

SERVICED BY

○ ARMY
● NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
● Contract

U.I.C. CODE 1 2 3 4 5

REPORT DATE MONTH DAY YEAR 0 2 2 6 9 7

TIME REQUIRED 1

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM. THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS.

DO NOT MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Ants
● Cockroaches
○ Stored Product Pests
○ Pillbugs & Sowbugs
○ Spiders
○ Silverfish
○ Fleas
○ House & Filth Flies
○ Filter & Drain Flies
○ Centipedes & Millipedes
○ Scorpions
○ Crickets
○ Earwigs
○ Wasps, Bees & Hornets
○ Mites
○ Lice
○ Carpenter Ants
○ Drywood Termites
○ Subterranean Termites
○ Wood Boring Beetles
○ Decay Fungi
○ Birds
○ Bats
○ Squirrels
○ Cats
○ Mice
○ Rats
○ Other Pests (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
● Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Pest Exclusion
○ Service Traps
○ Service Bait Stations
○ Fumigation
○ Soil Pretreatment—Termites
○ Soil Post-Construction Treatment—Termites
○ Trench Treatment—Termites
○ Void Treatment—Termites
○ Subslab Injection—Termites
○ Self-Help Operations
○ Other Control Operations
○ Program Administration
○ Training
○ Maintenance
○ QAE Inspection

SITE DESCRIPTION

○ All Indoor Sites (survey)
○ All Structures (survey)
○ All Wood Structures (survey)
● Food Handling Establishments
○ Food Storage Warehouses
○ Family Housing (Occupied)
○ Family Housing (Vacant)
○ Officer/Enlisted Quarters
○ Office/Administration Areas
○ Hospital/Clinic (Health Care)
○ Hospital/Clinic (Non-Health Care)
○ Industrial Facilities
○ Hangars
○ Greenhouses & Nurseries
○ Vessels, Barges, Aircraft, & Sea/Land Vans

BLDG. NO. ▶ #5

TOTAL UNITS TREATED 0 1 5 0 0 0

UNIT

● SF
○ CF
○ LF
○ Bait Stations
○ Each
○ Traps

PROCESSING COPY

CONTROL AGENT

○ Acephate (Orthene)
○ Aldrin
○ Amdro (Combat)
○ Anticoagulants
○ Attractants
○ Avitrol
○ Bendiocarb (Ficam)
○ Boric Acid
○ Brodificoum (Talon)
○ Bromadiolone (Maki)
○ Calcium Cyanide
○ Carboxide
○ Chlordane
○ Chlorophacinone (Rozol)
● Diazinon
○ Dichlorvos (Vapona)
○ d-Phenothrin
○ Drione
○ Dursban (Chlorpyrifos)
○ Fenthion (Baytex)
○ Glue Boards
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Methyl Bromide
○ Naled (Dibrom)
○ PBD & Naphthalene
○ Permethrin
○ Propoxur (Baygon)
○ Pyrethrum
○ Repellents
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Sulfuryl Fluoride
○ Zinc Phosphide
○ Other Pesticides (add name)

PESTICIDE FORMULATION

● Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT 0 0 2 . 0

UNIT

○ Pounds
○ Ounces
● Gallons
○ Fluid Ounces
○ Each

FINAL CONCENTRATION 0 0 0 . 5 0 0

● PESTICIDE EPA REG. NO. 10182-38

CERTIFICATION

INSTALLATION NAME: Your Installation

ADDRESS: the Navy Base

ADDRESS CONTINUED:

CITY: Some City

STATE: Some State ZIP CODE: 00000

CERTIFIED APPLICATOR SIGNATURE: Joe's Roach Corral

CERTIFICATION NUMBER: NJ 41000, New Jersey

Answer to Exercise #1.A

DD-A&L(A&AR) 1080 NAVFAC FORM 6250/2 (11/86)

PEST MANAGEMENT DATA SYSTEM
INDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

0169816
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS ⊗ ✓ ◔

SERVICED BY

- ○ ARMY
- ● NAVY
- ○ MARINE CORPS
- ○ DEFENSE LOGISTICS AGENCY

- ○ In-house
- ○ Support Agreement
- ● Contract

U.I.C. CODE: 1 2 3 4 5

REPORT DATE MONTH 0 2 DAY 2 6 YEAR 9[illegible]

TIME REQUIRED: 0 0 1.5

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM.

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS.

DO NOT MARK IN THIS AREA

PEST NAME

- ○ All Pests (survey)
- ○ Ants
- ● Cockroaches
- ○ Stored Product Pests
- ○ Pillbugs & Sowbugs
- ○ Spiders
- ○ Silverfish
- ○ Fleas
- ○ House & Filth Flies
- ○ Filter & Drain Flies
- ○ Centipedes & Millipedes
- ○ Scorpions
- ○ Crickets
- ○ Earwigs
- ○ Wasps, Bees & Hornets
- ○ Mites
- ○ Lice
- ○ Carpenter Ants
- ○ Drywood Termites
- ○ Subterranean Termites
- ○ Wood Boring Beetles
- ○ Decay Fungi
- ○ Birds
- ○ Bats
- ○ Squirrels
- ○ Cats
- ○ Mice
- ○ Rats
- ○ Other Pests (add name)

OPERATION

- ○ Pest Surveillance
- ○ Service Surveillance Traps
- ○ Manual Pesticide Application
- ○ Fog, ULV, or Space Treatment
- ○ Power Pesticide Application
- ○ Pest Exclusion
- ○ Service Traps
- ○ Service Bait Stations
- ○ Fumigation
- ○ Soil Pretreatment—Termites
- ○ Soil Post-Construction Treatment—Termites
- ○ Trench Treatment—Termites
- ○ Void Treatment—Termites
- ○ Subslab Injection—Termites
- ○ Self-Help Operations
- ○ Other Control Operations
- ○ Program Administration
- ○ Training
- ○ Maintenance
- ● QAE Inspection

SITE DESCRIPTION

- ○ All Indoor Sites (survey)
- ○ All Structures (survey)
- ○ All Wood Structures (survey)
- ○ Food Handling Establishments
- ○ Food Storage Warehouses
- ○ Family Housing (Occupied)
- ○ Family Housing (Vacant)
- ○ Officer/Enlisted Quarters
- ○ Office/Administration Areas
- ○ Hospital/Clinic (Health Care)
- ○ Hospital/Clinic (Non-Health Care)
- ○ Industrial Facilities
- ○ Hangars
- ○ Greenhouses & Nurseries
- ○ Vessels, Barges, Aircraft, & Sea/Land Vans

BLDG. NO. ▶

TOTAL UNITS TREATED

UNIT

- ○ SF
- ○ CF
- ○ LF
- ○ Bait Stations
- ○ Each
- ○ Traps

PROCESSING COPY

CONTROL AGENT

- ○ Acephate (Orthene)
- ○ Aldrin
- ○ Amdro (Combat)
- ○ Anticoagulants
- ○ Attractants
- ○ Avitrol
- ○ Bendiocarb (Ficam)
- ○ Boric Acid
- ○ Brodifacoum (Talon)
- ○ Bromadiolone (Maki)
- ○ Calcium Cyanide
- ○ Carboxide
- ○ Chlordane
- ○ Chlorophacinone (Rozol)
- ○ Diazinon
- ○ Dichlorvos (Vapona)
- ○ d-Phenothrin
- ○ Drione
- ○ Dursban (Chlorpyrifos)
- ○ Fenthion (Baytex)
- ○ Glue Boards
- ○ Hydrogen Phosphide (Phosphine)
- ○ Lindane
- ○ Malathion
- ○ Methyl Bromide
- ○ Naled (Dibrom)
- ○ PBD & Naphthalene
- ○ Permethrin
- ○ Propoxur (Baygon)
- ○ Pyrethrum
- ○ Repellents
- ○ Ronnel (Korlan)
- ○ Roost Repellents
- ○ Silica Aerogels
- ○ Sulfuryl Fluoride
- ○ Zinc Phosphide
- ○ Other Pesticides (add name)

PESTICIDE FORMULATION

- ○ Emulsion
- ○ Solution
- ○ Suspension
- ○ Aerosol
- ○ Dust
- ○ Bait
- ○ Solid Fumigant
- ○ Liquid Fumigant
- ○ Other Formulation

PESTICIDE AMOUNT

UNIT

- ○ Pounds
- ○ Ounces
- ○ Gallons
- ○ Fluid Ounces
- ○ Each

FINAL CONCENTRATION

PESTICIDE EPA REG. NO. ____________

CERTIFICATION

Your Installation
INSTALLATION NAME

The Navy Base
ADDRESS

ADDRESS CONTINUED

Some City
CITY

Some State 00000
STATE ZIP CODE

Sal See-it-all, QAE
CERTIFIED APPLICATOR SIGNATURE

CERTIFICATION NUMBER

S/N 0105-LF-062-6020

Answer to Exercise #1.B

PEST MANAGEMENT DATA SYSTEM
INDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

0163239
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS

SERVICED BY

○ ARMY
○ NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
● Contract

U.I.C. CODE 12345

REPORT DATE MONTH 03 DAY 03 YEAR 91

TIME REQUIRED 000.5

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS

DO NOT MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Ants
● Cockroaches
○ Stored Product Pests
○ Pillbugs & Sowbugs
○ Spiders
○ Silverfish
○ Fleas
○ House & Filth Flies
○ Filter & Drain Flies
○ Centipedes & Millipedes
○ Scorpions
○ Crickets
○ Earwigs
○ Wasps, Bees & Hornets
○ Mites
○ Lice
○ Carpenter Ants
○ Drywood Termites
○ Subterranean Termites
○ Wood Boring Beetles
○ Decay Fungi
○ Birds
○ Bats
○ Squirrels
○ Cats
○ Mice
○ Rats
○ Other Pests (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Pest Exclusion
○ Service Traps
○ Service Bait Stations
○ Fumigation
○ Soil Pretreatment—Termites
○ Soil Post-Construction Treatment—Termites
○ Trench Treatment—Termites
○ Void Treatment—Termites
○ Subslab Injection—Termites
○ Self-Help Operations
○ Other Control Operations

○ Program Administration
○ Training
○ Maintenance
● QAE Inspection

SITE DESCRIPTION

○ All Indoor Sites (survey)
○ All Structures (survey)
○ All Wood Structures (survey)
● Food Handling Establishments
○ Food Storage Warehouses
○ Family Housing (Occupied)
○ Family Housing (Vacant)
○ Officer/Enlisted Quarters
○ Office/Administration Areas
○ Hospital/Clinic (Health Care)
○ Hospital/Clinic (Non-Health Care)
○ Industrial Facilities
○ Hangars
○ Greenhouses & Nurseries
○ Vessels, Barges, Aircraft, & Sea/Land Vans

BLDG. NO. ▶ #5

TOTAL UNITS TREATED 015000

UNIT

○ SF
○ CF
○ LF
○ Bait Stations
○ Each
○ Traps

PROCESSING COPY

CONTROL AGENT

○ Acephate (Orthene)
○ Aldrin
○ Amdro (Combat)
○ Anticoagulants
○ Attractants
○ Avitrol
○ Bendiocarb (Ficam)
○ Boric Acid
○ Brodifacoum (Talon)
○ Bromadiolone (Maki)
○ Calcium Cyanide
○ Carboxide
○ Chlordane
○ Chlorophacinone (Rozol)
○ Diazinon
○ Dichlorvos (Vapona)
○ d-Phenothrin
○ Drione
○ Dursban (Chlorpyrifos)
○ Fenthion (Baytex)
○ Glue Boards
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Methyl Bromide
○ Naled (Dibrom)
○ PBD & Naphthalene
○ Permethrin
○ Propoxur (Baygon)
● Pyrethrum
○ Repellents
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Sulfuryl Fluoride
○ Zinc Phosphide
○ Other Pesticides (add name)

PESTICIDE FORMULATION

○ Emulsion
○ Solution
○ Suspension
● Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT 002.0

UNIT

○ Pounds
○ Ounces
○ Gallons
● Fluid Ounces
○ Each

FINAL CONCENTRATION 000.700

● PESTICIDE EPA REG. NO. 555-1212

CERTIFICATION

Your Installation
INSTALLATION NAME

The Navy Base
ADDRESS

ADDRESS CONTINUED

Some City
CITY

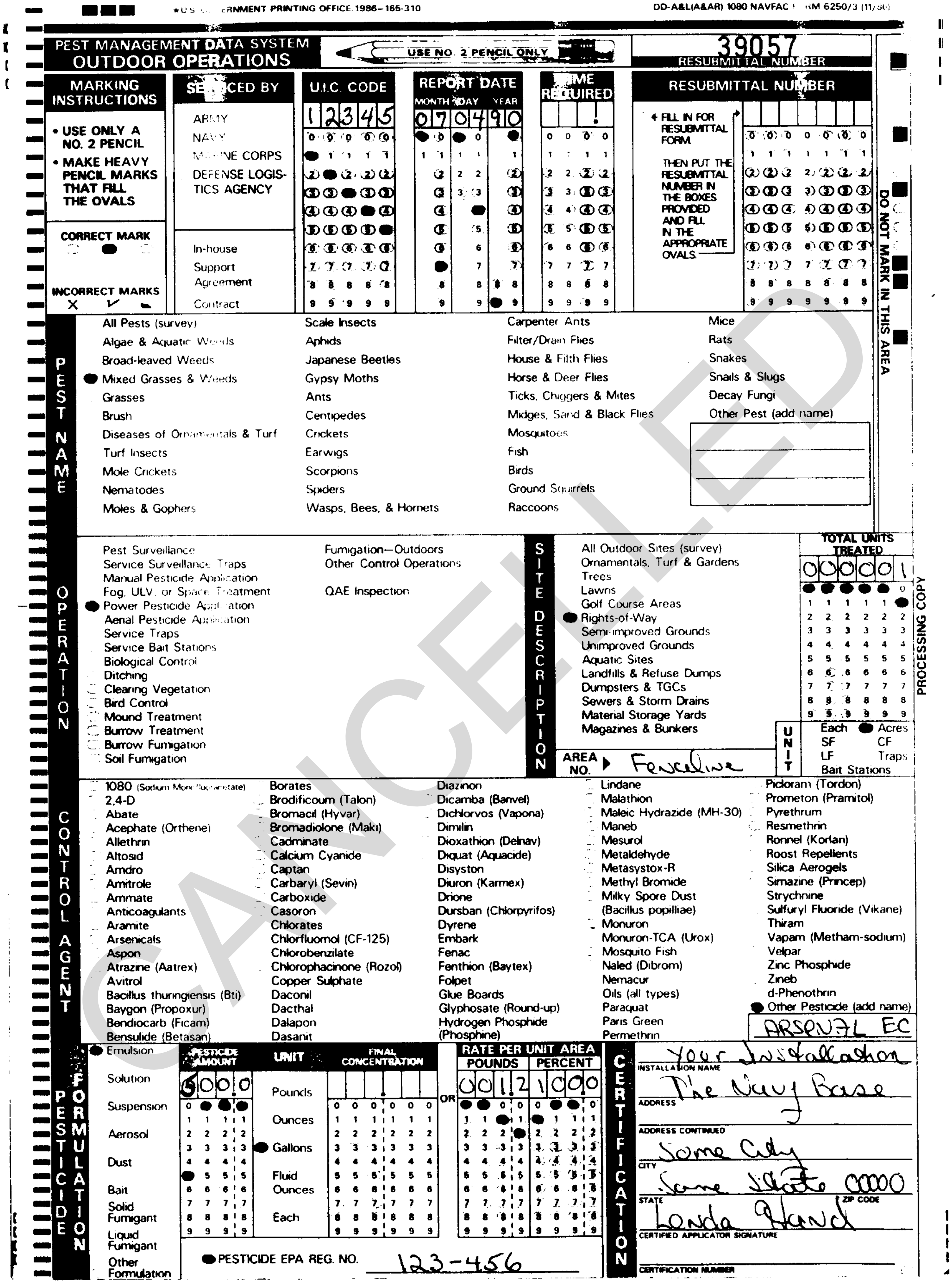
Some State 00000
STATE ZIP CODE

Sal See-it-all, QAE
CERTIFIED APPLICATOR SIGNATURE

CERTIFICATION NUMBER

S/N 0105-LF-062-5020

Answer to Exercise #2



*U.S. GOVERNMENT PRINTING OFFICE 1986–165-310 DD-A&L(A&AR) 1080 NAVFAC FORM 6250/3 (11/86)

PEST MANAGEMENT DATA SYSTEM
OUTDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

39057
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS X ✓ ▬

SERVICED BY

ARMY
NAVY
MARINE CORPS
DEFENSE LOGISTICS AGENCY

In-house
Support Agreement
Contract

U.I.C. CODE 12345

REPORT DATE MONTH DAY YEAR 070490

TIME REQUIRED

RESUBMITTAL NUMBER

FILL IN FOR RESUBMITTAL FORM
THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS.

DO NOT MARK IN THIS AREA

PEST NAME

All Pests (survey)
Algae & Aquatic Weeds
Broad-leaved Weeds
● Mixed Grasses & Weeds
Grasses
Brush
Diseases of Ornamentals & Turf
Turf Insects
Mole Crickets
Nematodes
Moles & Gophers

Scale Insects
Aphids
Japanese Beetles
Gypsy Moths
Ants
Centipedes
Crickets
Earwigs
Scorpions
Spiders
Wasps, Bees, & Hornets

Carpenter Ants
Filter/Drain Flies
House & Filth Flies
Horse & Deer Flies
Ticks, Chiggers & Mites
Midges, Sand & Black Flies
Mosquitoes
Fish
Birds
Ground Squirrels
Raccoons

Mice
Rats
Snakes
Snails & Slugs
Decay Fungi
Other Pest (add name)

OPERATION

Pest Surveillance
Service Surveillance Traps
Manual Pesticide Application
Fog, ULV, or Space Treatment
● Power Pesticide Application
Aerial Pesticide Application
Service Traps
Service Bait Stations
Biological Control
Ditching
Clearing Vegetation
Bird Control
Mound Treatment
Burrow Treatment
Burrow Fumigation
Soil Fumigation

Fumigation—Outdoors
Other Control Operations

QAE Inspection

SITE DESCRIPTION

All Outdoor Sites (survey)
Ornamentals, Turf & Gardens
Trees
Lawns
Golf Course Areas
● Rights-of-Way
Semi-improved Grounds
Unimproved Grounds
Aquatic Sites
Landfills & Refuse Dumps
Dumpsters & TGCs
Sewers & Storm Drains
Material Storage Yards
Magazines & Bunkers

AREA NO. ▶ Fenceline

TOTAL UNITS TREATED 000001

PROCESSING COPY

UNIT

Each ● Acres
SF CF
LF Traps
Bait Stations

CONTROL AGENT

1080 (Sodium Monofluoroacetate)
2,4-D
Abate
Acephate (Orthene)
Allethrin
Altosid
Amdro
Amitrole
Ammate
Anticoagulants
Aramite
Arsenicals
Aspon
Atrazine (Aatrex)
Avitrol
Bacillus thuringiensis (Bti)
Baygon (Propoxur)
Bendiocarb (Ficam)
Bensulide (Betasan)

Borates
Brodificoum (Talon)
Bromacil (Hyvar)
Bromadiolone (Maki)
Cadminate
Calcium Cyanide
Captan
Carbaryl (Sevin)
Carboxide
Casoron
Chlorates
Chlorfluornol (CF-125)
Chlorobenzilate
Chlorophacinone (Rozol)
Copper Sulphate
Daconil
Dacthal
Dalapon
Dasanit

Diazinon
Dicamba (Banvel)
Dichlorvos (Vapona)
Dimilin
Dioxathion (Delnav)
Diquat (Aquacide)
Disyston
Diuron (Karmex)
Drione
Dursban (Chlorpyrifos)
Dyrene
Embark
Fenac
Fenthion (Baytex)
Folpet
Glue Boards
Glyphosate (Round-up)
Hydrogen Phosphide (Phosphine)

Lindane
Malathion
Maleic Hydrazide (MH-30)
Maneb
Mesurol
Metaldehyde
Metasystox-R
Methyl Bromide
Milky Spore Dust (Bacillus popilliae)
Monuron
Monuron-TCA (Urox)
Mosquito Fish
Naled (Dibrom)
Nemacur
Oils (all types)
Paraquat
Paris Green
Permethrin

Picloram (Tordon)
Prometon (Pramitol)
Pyrethrum
Resmethrin
Ronnel (Korlan)
Roost Repellents
Silica Aerogels
Simazine (Princep)
Strychnine
Sulfuryl Fluoride (Vikane)
Thiram
Vapam (Metham-sodium)
Velpar
Zinc Phosphide
Zineb
d-Phenothrin
● Other Pesticide (add name)

ARSENAL EC

PESTICIDE FORMULATION

● Emulsion
Solution
Suspension
Aerosol
Dust
Bait
Solid Fumigant
Liquid Fumigant
Other Formulation

PESTICIDE AMOUNT 500.0

UNIT

Pounds
Ounces
● Gallons
Fluid Ounces
Each

FINAL CONCENTRATION

OR

RATE PER UNIT AREA

POUNDS 001.2

PERCENT 1.000

● PESTICIDE EPA REG. NO. 123-456

CERTIFICATION

Your Installation
INSTALLATION NAME

The Navy Base
ADDRESS

ADDRESS CONTINUED

Some City
CITY

Some State 00000
STATE ZIP CODE

Londa Hand
CERTIFIED APPLICATOR SIGNATURE

CERTIFICATION NUMBER

Answer to Exercise #3.A Part 1

★U.S. GOV ENT PRINTING OFFICE:1986—165-310 DD-A&L(A&AR) 10 AVFAC FORM 6250/3 (11/86)

PEST MANAGEMENT DATA SYSTEM
OUTDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

39056
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS
- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS X ✓ ~

SERVICED BY
○ ARMY
○ NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
○ Contract

U.I.C. CODE
1 2 3 4 5

REPORT DATE
MONTH DAY YEAR
0 7 0 4 9 6

TIME REQUIRED

RESUBMITTAL NUMBER
○ ← FILL IN FOR RESUBMITTAL FORM
THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS.

DO NOT MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Algae & Aquatic Weeds
○ Broad-leaved Weeds
● Mixed Grasses & Weeds
○ Grasses
○ Brush
○ Diseases of Ornamentals & Turf
○ Turf Insects
○ Mole Crickets
○ Nematodes
○ Moles & Gophers
○ Scale Insects
○ Aphids
○ Japanese Beetles
○ Gypsy Moths
○ Ants
○ Centipedes
○ Crickets
○ Earwigs
○ Scorpions
○ Spiders
○ Wasps, Bees, & Hornets
○ Carpenter Ants
○ Filter/Drain Flies
○ House & Filth Flies
○ Horse & Deer Flies
○ Ticks, Chiggers & Mites
○ Midges, Sand & Black Flies
○ Mosquitoes
○ Fish
○ Birds
○ Ground Squirrels
○ Raccoons
○ Mice
○ Rats
○ Snakes
○ Snails & Slugs
○ Decay Fungi
○ Other Pest (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
● Power Pesticide Application
○ Aerial Pesticide Application
○ Service Traps
○ Service Bait Stations
○ Biological Control
○ Ditching
○ Clearing Vegetation
○ Bird Control
○ Mound Treatment
○ Burrow Treatment
○ Burrow Fumigation
○ Soil Fumigation
○ Fumigation—Outdoors
○ Other Control Operations
○ QAE Inspection

SITE DESCRIPTION

○ All Outdoor Sites (survey)
○ Ornamentals, Turf & Gardens
○ Trees
○ Lawns
○ Golf Course Areas
● Rights-of-Way
○ Semi-improved Grounds
○ Unimproved Grounds
○ Aquatic Sites
○ Landfills & Refuse Dumps
○ Dumpsters & TGCs
○ Sewers & Storm Drains
○ Material Storage Yards
○ Magazines & Bunkers

AREA NO. ▶ Fenceline

TOTAL UNITS TREATED
0 0 0 0 0 1

UNIT
○ Each ● Acres
○ SF ○ CF
○ LF ○ Traps
○ Bait Stations

PROCESSING COPY

CONTROL AGENT

○ 1080 (Sodium Monofluoracetate)
○ 2,4-D
○ Abate
○ Acephate (Orthene)
○ Allethrin
○ Altosid
○ Amdro
○ Amitrole
○ Ammate
○ Anticoagulants
○ Aramite
○ Arsenicals
○ Aspon
○ Atrazine (Aatrex)
○ Avitrol
○ Bacillus thuringiensis (Bti)
○ Baygon (Propoxur)
○ Bendiocarb (Ficam)
○ Bensulide (Betasan)
○ Borates
○ Brodificoum (Talon)
○ Bromacil (Hyvar)
○ Bromadiolone (Maki)
○ Cadminate
○ Calcium Cyanide
○ Captan
○ Carbaryl (Sevin)
○ Carboxide
○ Casoron
○ Chlorates
○ Chlorfluornol (CF-125)
○ Chlorobenzilate
○ Chlorophacinone (Rozol)
○ Copper Sulphate
○ Daconil
○ Dacthal
○ Dalapon
○ Dasanit
○ Diazinon
○ Dicamba (Banvel)
○ Dichlorvos (Vapona)
○ Dimilin
○ Dioxathion (Delnav)
○ Diquat (Aquacide)
○ Disyston
○ Diuron (Karmex)
○ Drione
○ Dursban (Chlorpyrifos)
○ Dyrene
○ Embark
○ Fenac
○ Fenthion (Baytex)
○ Folpet
○ Glue Boards
○ Glyphosate (Round-up)
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Maleic Hydrazide (MH-30)
○ Maneb
○ Mesurol
○ Metaldehyde
○ Metasystox-R
○ Methyl Bromide
○ Milky Spore Dust (Bacillus popilliae)
○ Monuron
○ Monuron-TCA (Urox)
○ Mosquito Fish
○ Naled (Dibrom)
○ Nemacur
○ Oils (all types)
○ Paraquat
○ Paris Green
○ Permethrin
○ Picloram (Tordon)
○ Prometon (Pramitol)
○ Pyrethrum
○ Resmethrin
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Simazine (Princep)
○ Strychnine
○ Sulfuryl Fluoride (Vikane)
○ Thiram
○ Vapam (Metham-sodium)
○ Velpar
○ Zinc Phosphide
○ Zineb
○ d-Phenothrin
● Other Pesticide (add name)

ARSENAL EC

PESTICIDE FORMULATION

● Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT
500.0

UNIT
○ Pounds
○ Ounces
● Gallons
○ Fluid Ounces
○ Each

FINAL CONCENTRATION

OR

RATE PER UNIT AREA
POUNDS 001.2
PERCENT 100.0

● PESTICIDE EPA REG. NO. 123-456

CERTIFICATION

INSTALLATION NAME Your Installation
ADDRESS Your Navy Base
ADDRESS CONTINUED
CITY Same City
STATE Same State ZIP CODE 00000
CERTIFIED APPLICATOR SIGNATURE Linda Hand
CERTIFICATION NUMBER

Answer to Exercise #3.A Part 2

*U.S. GOVERNMENT PRINTING OFFICE 1986–165-310 DD-A&L(A&AR) 1080 NAVFAC FORM 6250/3 (11/86)

PEST MANAGEMENT DATA SYSTEM
OUTDOOR OPERATIONS

USE NO. 2 PENCIL ONLY

39058
RESUBMITTAL NUMBER

MARKING INSTRUCTIONS

- USE ONLY A NO. 2 PENCIL
- MAKE HEAVY PENCIL MARKS THAT FILL THE OVALS

CORRECT MARK ○ ● ○

INCORRECT MARKS

SERVICED BY

○ ARMY
○ NAVY
○ MARINE CORPS
○ DEFENSE LOGISTICS AGENCY

○ In-house
○ Support Agreement
● Contract

U.I.C. CODE	REPORT DATE (MONTH DAY YEAR)	TIME REQUIRED
12345	070490	00 1.5

RESUBMITTAL NUMBER

○ ← FILL IN FOR RESUBMITTAL FORM

THEN PUT THE RESUBMITTAL NUMBER IN THE BOXES PROVIDED AND FILL IN THE APPROPRIATE OVALS

DO NOT MARK IN THIS AREA

PEST NAME

○ All Pests (survey)
○ Algae & Aquatic Weeds
○ Broad-leaved Weeds
● Mixed Grasses & Weeds
○ Grasses
○ Brush
○ Diseases of Ornamentals & Turf
○ Turf Insects
○ Mole Crickets
○ Nematodes
○ Moles & Gophers
○ Scale Insects
○ Aphids
○ Japanese Beetles
○ Gypsy Moths
○ Ants
○ Centipedes
○ Crickets
○ Earwigs
○ Scorpions
○ Spiders
○ Wasps, Bees, & Hornets
○ Carpenter Ants
○ Filter/Drain Flies
○ House & Filth Flies
○ Horse & Deer Flies
○ Ticks, Chiggers & Mites
○ Midges, Sand & Black Flies
○ Mosquitoes
○ Fish
○ Birds
○ Ground Squirrels
○ Raccoons
○ Mice
○ Rats
○ Snakes
○ Snails & Slugs
○ Decay Fungi
○ Other Pest (add name)

OPERATION

○ Pest Surveillance
○ Service Surveillance Traps
○ Manual Pesticide Application
○ Fog, ULV, or Space Treatment
○ Power Pesticide Application
○ Aerial Pesticide Application
○ Service Traps
○ Service Bait Stations
○ Biological Control
○ Ditching
○ Clearing Vegetation
○ Bird Control
○ Mound Treatment
○ Burrow Treatment
○ Burrow Fumigation
○ Soil Fumigation
○ Fumigation—Outdoors
○ Other Control Operations
● QAE Inspection

SITE DESCRIPTION

○ All Outdoor Sites (survey)
○ Ornamentals, Turf & Gardens
○ Trees
○ Lawns
○ Golf Course Areas
○ Rights-of-Way
○ Semi-improved Grounds
○ Unimproved Grounds
○ Aquatic Sites
○ Landfills & Refuse Dumps
○ Dumpsters & TGCs
○ Sewers & Storm Drains
○ Material Storage Yards
○ Magazines & Bunkers

AREA NO. ▶

TOTAL UNITS TREATED

UNIT

○ Each
○ Acres
○ SF
○ CF
○ LF
○ Traps
○ Bait Stations

PROCESSING COPY

CONTROL AGENT

○ 1080 (Sodium Monofluoroacetate)
○ 2,4-D
○ Abate
○ Acephate (Orthene)
○ Allethrin
○ Altosid
○ Amdro
○ Amitrole
○ Ammate
○ Anticoagulants
○ Aramite
○ Arsenicals
○ Aspon
○ Atrazine (Aatrex)
○ Avitrol
○ Bacillus thuringiensis (Bti)
○ Baygon (Propoxur)
○ Bendiocarb (Ficam)
○ Bensulide (Betasan)
○ Borates
○ Brodificoum (Talon)
○ Bromacil (Hyvar)
○ Bromadiolone (Maki)
○ Cadminate
○ Calcium Cyanide
○ Captan
○ Carbaryl (Sevin)
○ Carboxide
○ Casoron
○ Chlorates
○ Chlorfluomol (CF-125)
○ Chlorobenzilate
○ Chlorophacinone (Rozol)
○ Copper Sulphate
○ Daconil
○ Dacthal
○ Dalapon
○ Dasanit
○ Diazinon
○ Dicamba (Banvel)
○ Dichlorvos (Vapona)
○ Dimilin
○ Dioxathion (Delnav)
○ Diquat (Aquacide)
○ Disyston
○ Diuron (Karmex)
○ Drione
○ Dursban (Chlorpyrifos)
○ Dyrene
○ Embark
○ Fenac
○ Fenthion (Baytex)
○ Folpet
○ Glue Boards
○ Glyphosate (Round-up)
○ Hydrogen Phosphide (Phosphine)
○ Lindane
○ Malathion
○ Maleic Hydrazide (MH-30)
○ Maneb
○ Mesurol
○ Metaldehyde
○ Metasystox-R
○ Methyl Bromide
○ Milky Spore Dust (Bacillus popilliae)
○ Monuron
○ Monuron-TCA (Urox)
○ Mosquito Fish
○ Naled (Dibrom)
○ Nemacur
○ Oils (all types)
○ Paraquat
○ Paris Green
○ Permethrin
○ Picloram (Tordon)
○ Prometon (Pramitol)
○ Pyrethrum
○ Resmethrin
○ Ronnel (Korlan)
○ Roost Repellents
○ Silica Aerogels
○ Simazine (Princep)
○ Strychnine
○ Sulfuryl Fluoride (Vikane)
○ Thiram
○ Vapam (Metham-sodium)
○ Velpar
○ Zinc Phosphide
○ Zineb
○ d-Phenothrin
○ Other Pesticide (add name)

PESTICIDE FORMULATION

○ Emulsion
○ Solution
○ Suspension
○ Aerosol
○ Dust
○ Bait
○ Solid Fumigant
○ Liquid Fumigant
○ Other Formulation

PESTICIDE AMOUNT

UNIT

○ Pounds
○ Ounces
○ Gallons
○ Fluid Ounces
○ Each

FINAL CONCENTRATION

OR

RATE PER UNIT AREA

POUNDS PERCENT

PESTICIDE EPA REG. NO. ____________________

CERTIFICATION

INSTALLATION NAME: Your Installation

ADDRESS: The Navy Base

ADDRESS CONTINUED:

CITY: Some City

STATE: Some State ZIP CODE: 00000

CERTIFIED APPLICATOR SIGNATURE: Sal-See-It-All QAE

CERTIFICATION NUMBER:

Answer to Exercise #3.B

CHAPTER 11. CLASSIFICATION OF PEST ORGANISMS

Proper identification is the initial and most important phase of a pest management program. An international system of classification and nomenclature has been developed to separately identify every organism. The basic hierarchy of this classification system using the German cockroach as an example is outlined in Figure 11-1. In many instances federal and state legislation require that it be necessary to identify pest organisms to the genus and species level before control measures are initiated. It is beyond the scope of this manual to identify organisms to the species level or lower. Additional reference materials or the assistance of the Command PMC may be necessary.

Classification	**Nomenclature**
Kingdom	Animalia
Phylum	Arthropoda
Class	Insecta
Order	Orthoptera
Family	Blattidae
Genus	<u>Blattella</u>
Species	<u>germanica</u>

Figure 11-1
Hierarchal Classification of Organisms

11.1 IDENTIFICATION OF PEST ARTHROPODS. Insects and related arthropods are the most common pest organisms encountered on military installations. Attachment 11-A1 (8 pages) provides a pictorial key to the identification of some common classes and orders of adult arthropods based on anatomical features.

11.1.1 Anatomical Features.

11.1.1.1 Wings. Adult arthropods can be divided into three categories by wing anatomy:

- wings absent
- 2 wings present (1 pair)
- 4 wings present (2 pair)

ADULT:
TWO WINGS

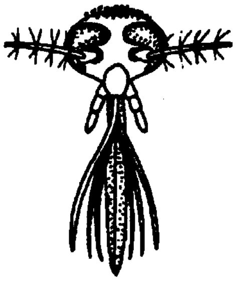
ADULT: FOUR WINGS

Spiders, ticks, and fleas are examples of arthropods without wings. The flies (order Diptera, examples: mosquitos, house flies and midges) have 1 pair of wings. Butterflies, bees, and dragonflies are examples of arthropods with 2 pairs of wings. The number, shape, markings and wing venation are used to classify arthropods.

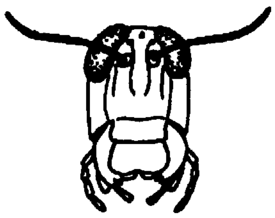
11.1.1.2 Mouthparts. Adult arthropods can be divided into 2 main groups by mouthpart anatomy.

- chewing
- sucking

Mosquitoes, sucking lice, stable flies and aphids have sucking mouthparts. Cockroaches, centipedes, beetles and silverfish have chewing mouthparts. Knowing the type of mouthparts of the pest organism is important in planning pest control strategies.



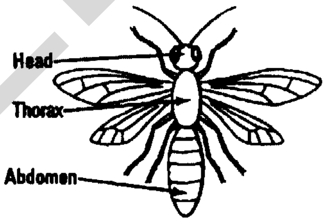
ADULT MOSQUITO'S SUCKING MOUTHPARTS



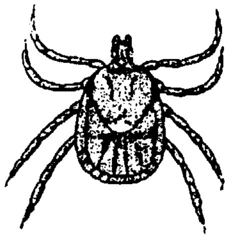
CHEWING MOUTHPARTS OF A GRASSHOPPER

11.1.1.3 Body Regions. Adult arthropods can be classified by the number and type of anatomical body regions.

- three regions (the insects)
  - head
  - thorax
  - abdomen
- two regions (spiders, ticks, mites)
  - cephalothorax (head and thorax combined as one region
  - abdomen
- thorax and abdomen made up of many segments which are not defined as regions (centipedes, millipedes)



INSECTS HAVE 3 BODY REGIONS



TICKS HAVE 2 BODY REGIONS

11.1.1.4 Other Anatomical Characters. Some other anatomical characteristics used in the classification of arthropods are:

- number of legs
  - adult insects have 6 legs
  - adult spiders, ticks, mites and crustaceans have 8 legs
  - adult millipedes and centipedes have more than 8 legs

MILLIPEDES HAVE MANY BODY SEGMENTS

- number and type of antennae
    - adult insects have 1 pair of antenna which differ greatly in shape and function between the insect families
    - ticks, mites, scorpions, and spiders have no antenna
    - crustaceans such as lobsters, crabs, sowbugs and shrimp have 2 pairs of antennae
    - centipedes and millipedes have 1 pair of antenna

11.2 IDENTIFICATION OF PLANT AND VERTEBRATE PESTS. Chapter 18, Vegetation Management, discusses the two broad categories of plants, i.e. broad leaf and grass, and the physical characteristics used to differentiate the two. Botanical features such as reproductive structures, leaf shape and leaf arrangement are used to classify plants. Chapter 19, Vertebrate Pest Management, covers vertebrate pests. Physical features such as respiratory organs, body coverings, physiological features (i.e. warm-blooded versus cold-blooded, the number of heart chambers), and reproductive and behavioral characteristics are used to classify vertebrates.

11.3 LIFE CYCLES. Upon proper identification, the pest manager should study the life cycle of the pest organism to plan control strategies. As discussed in Chapter 18, plants may be categorized as annuals (completing the life cycle in one year), biennials (completing the life cycle in two years), or perennial (having a life cycle greater than two years).

11.3.1 Insect Life Cycles. Insects must shed their external skeleton (molt) in order to grow. The form of the insect between molts is called an instar. The change in development from egg to adult is called metamorphosis. Once an insect becomes an adult it has functional reproductive organs and does not molt again. There are two major types of metamorphosis in insects.

11.3.1.1 Incomplete Metamorphosis. (Figure 11-2) Insects having incomplete metamorphosis have a three stage life cycle: egg, nymph (immature), and adult. The nymphs are very similar to the adult in appearance and occupy similar habitat. The principal changes between stages are in size, the development of ocelli (simple eyes), and the size of the wings. In the wingless orders of insects, the nymphs differ principally in size. Cockroaches, termites, aphids, bristletails, earwigs, and lice are examples of insects which have incomplete metamorphosis.

11.3.1.2 Complete Metamorphosis. (Figure 11-3) Insects having complete metamorphosis have a four stage life cycle: egg, larva, pupa, and adult. The immature form (larva) is different in appearance, and often live in different habitats than the adult. Larva are wingless, generally have different types of mouthparts, and feed on different types of food. Larva enter the pupal stage upon the last larval molt.

Transformation from the larva to the adult occurs during the pupal stage. The pupal stage is usually inactive. Adults emerge from the pupal stage with fully developed reproductive organs and wings, if a winged species. In some species only larvae are pests; in others only adults are pests. In a few species both larvae and adults can be pests, sometimes of different hosts. Beetles, flies, mosquitoes, butterflies, fleas, ants and bees are examples of insects which have complete metamorphosis.

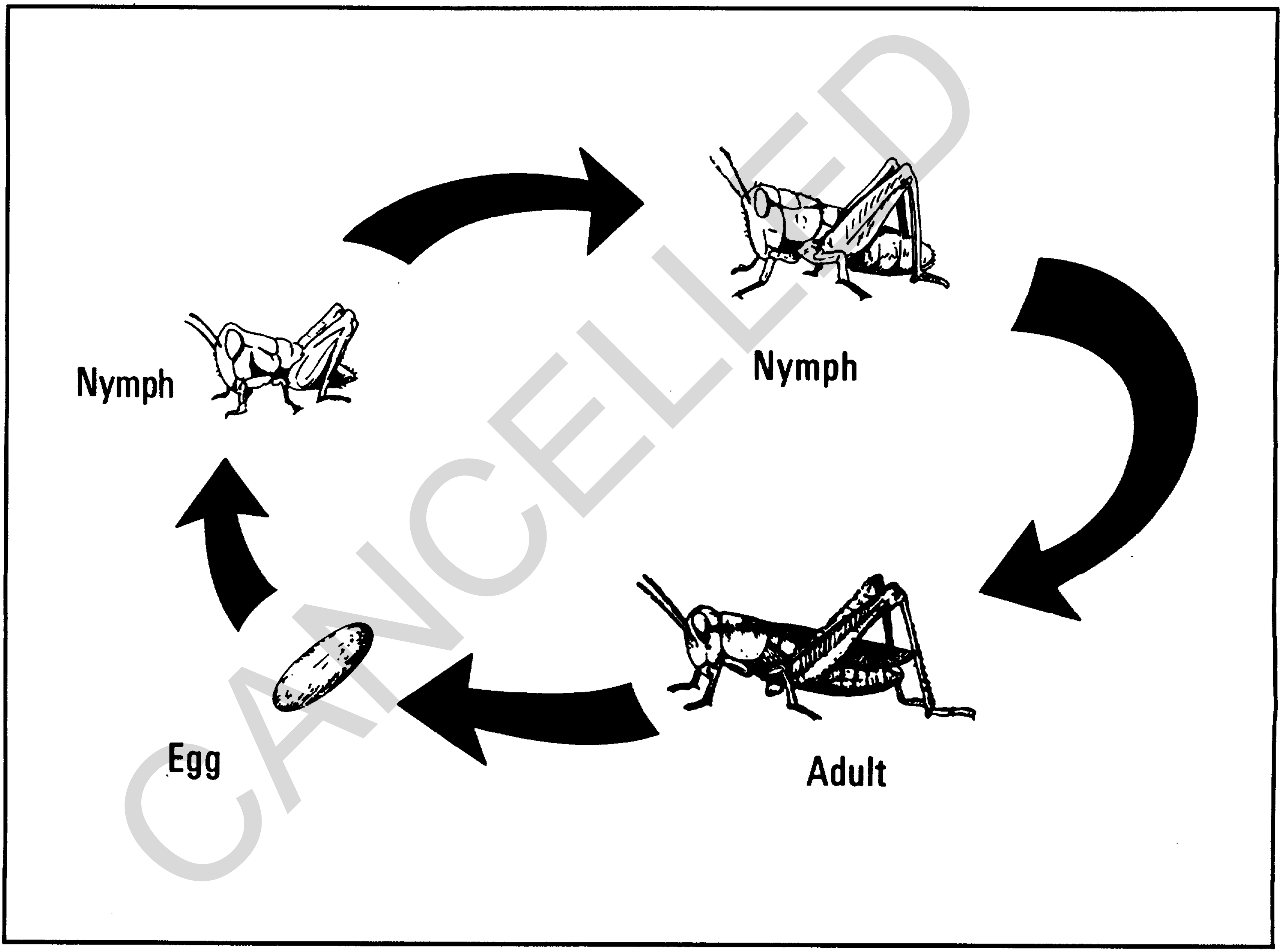


Figure 11-2
Incomplete Metamorphosis

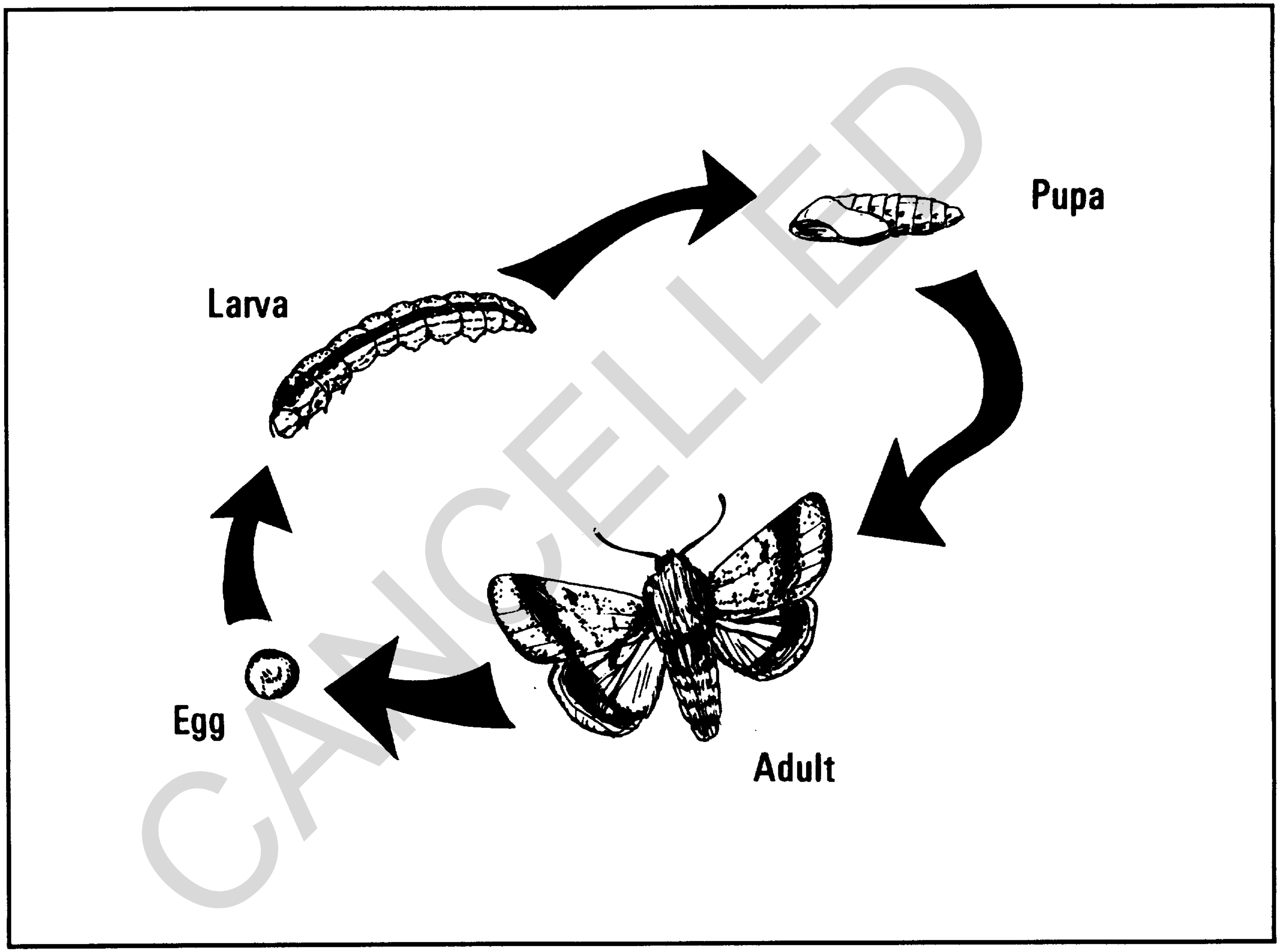


Figure 11-3
Complete Metamorphosis

KEY TO SOME COMMON CLASSES AND ORDERS OF ARTHROPODS

by

H. D. Pratt, C. J. Stojanovich, and K. S. Littig

1. Three or 4 pairs of legs (Figs. 1 A and 1 B)............................... 2

Five or more pairs of legs or swimmerets (Figs. 1 C and 1 D).............. 22

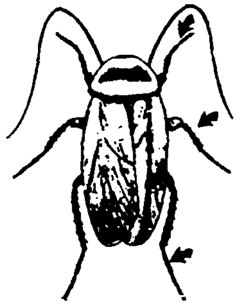


Fig. 1 A

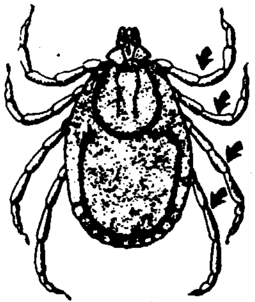


Fig. 1 B

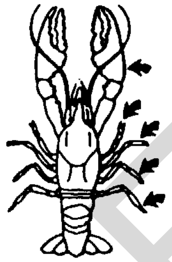


Fig. 1 C

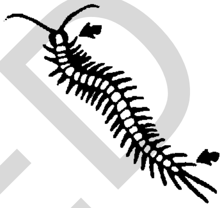


Fig. 1 D

2. Three pairs of legs; antenna present (Fig. 2 A). CLASS INSECTA........... ....INSECTS... 3

Four pairs of legs; antenna absent (Fig. 2 B). CLASS ARACHNIDA....... ....SCORPION, SPIDER, TICK, AND MITE 20

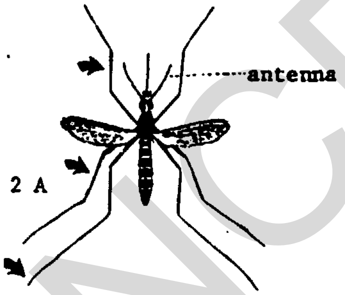


Fig. 2 A

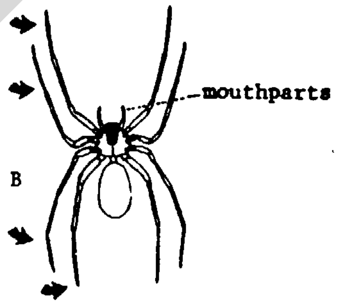


Fig. 2 B

3. Wings present, well developed (Fig. 3 A)................................. 4

Wings absent or rudimentary (Fig. 3 B).................................... 12

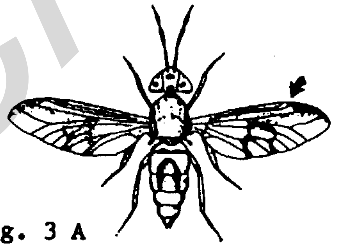


Fig. 3 A

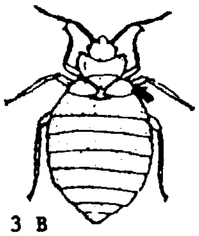


Fig. 3 B

Attachment 11-A1
Key to Some Common Classes and Orders of Arthropods

4. One pair of wings (Fig. 4 A). ORDER DIPTERA 5

Two pairs of wings (Figs. 4 B and 4 C).. 6

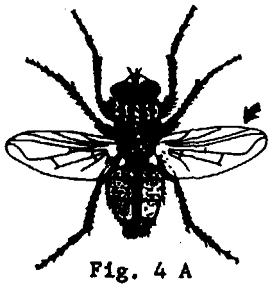


Fig. 4 A

Fig. 4 B

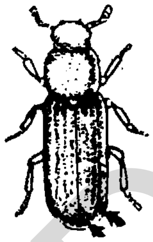


Fig. 4 C

5. Wings with scales (Fig. 5 A). FAMILY CULICIDAE ....MOSQUITO

Wings without scales (Fig. 5 B). OTHER DIPTERA ....FLY

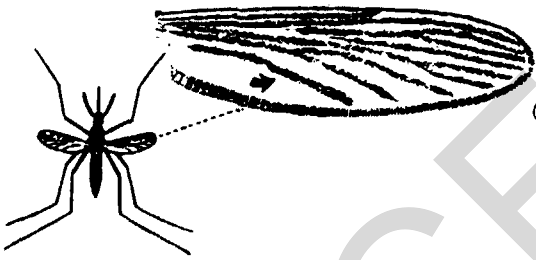


Fig. 5 A

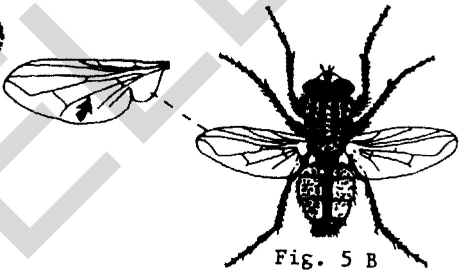


Fig. 5 B

6. Mouthparts adapted for sucking, consisting of an elongate proboscis (Fig. 6 A).. 7

Mouthparts adapted for biting and chewing (Fig. 6 B)....................... 8

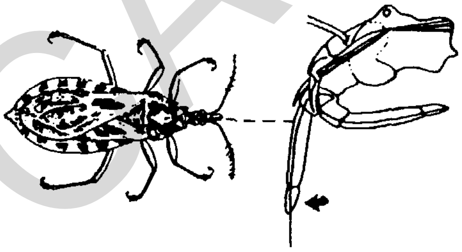


Fig. 6 A

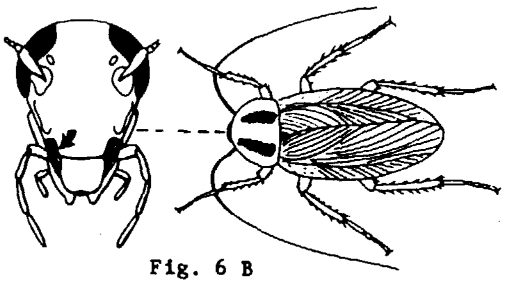


Fig. 6 B

7. Wings densely covered with scales; proboscis coiled up under head (Fig. 7 A). ORDER LEPIDOPTERA ....MOTH AND BUTTERFLY

Wings not covered with scales; proboscis directed backward between front legs when not in use (Fig. 7 B). ORDER HEMIPTERA ....
.... TRUE BUG AND KISSING BUG

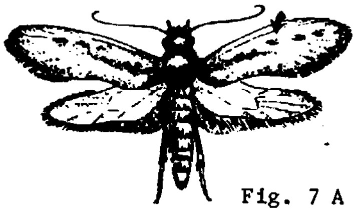


Fig. 7 A

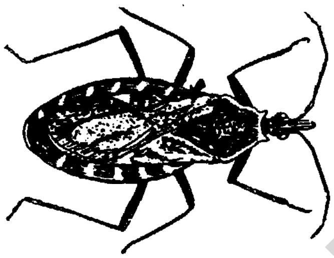


Fig. 7 B

8. Both pairs of wings membranous and similar in structure, though they may differ in size (Fig. 8 A)... 9

Front pair of wings leathery or shell-like, serving as covers for membranous hind wings (Fig. 8 B)....................................... 10

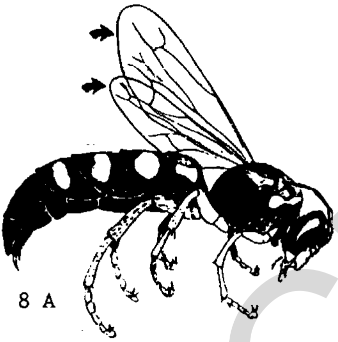


Fig. 8 A

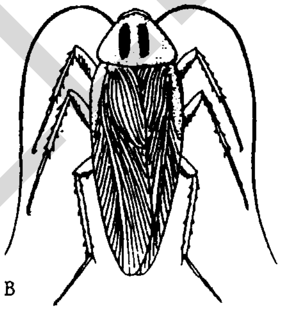


Fig. 8 B

9. Hind wings much smaller than front wings (Fig. 9 A). ORDER HYMENOPTERA....
.... BEE, WASP, HORNET, OR ANT

Both pairs of wings similar in size (Fig. 9 B). ORDER ISOPTERA .... TERMITE

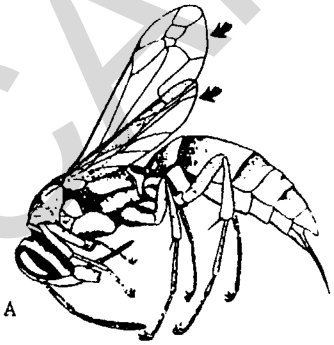


Fig. 9 A

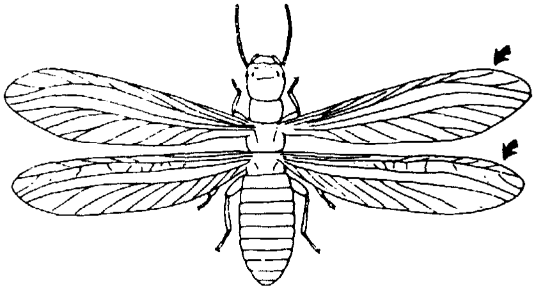


Fig. 9 B

10. Front wings horny or shell-like without distinct veins, meeting in a straight line down middle (Fig. 10 A)................................. 11

Front wings leathery or paper-like with a network of veins, usually overlapping at the middle (Fig. 10 B). ORDER ORTHOPTERA ....
....COCKROACHES, CRICKETS, GRASSHOPPERS

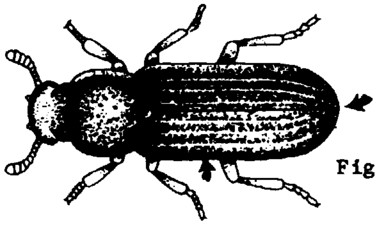


Fig. 10 A

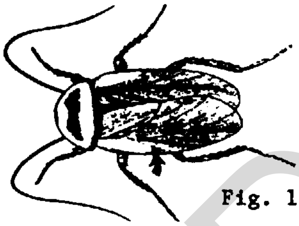


Fig. 10 B

11. Abdomen with prominent forceps; wings shorter than abdomen (Fig. 11 A).
ORDER DERMAPTERA ....EARWIG

Abdomen without forceps; wings typically covering abdomen (Fig. 11 B).
ORDER COLEOPTERA .... BEETLE

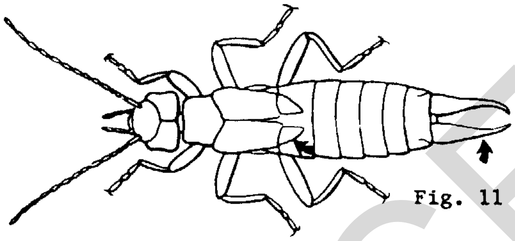


Fig. 11 A

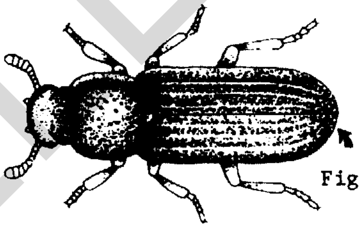


Fig. 11 B

12. Abdomen with 3 elongate, tail-like appendages at tip; body usually covered with scales (Fig. 12 A). ORDER THYSANURA... SILVERFISH AND FIRE BRAT

Abdomen without 3 long tail-like appendages at tip; body not covered with scales (Fig. 12 B)... 13

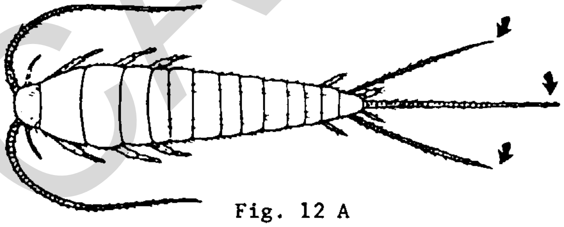


Fig. 12 A

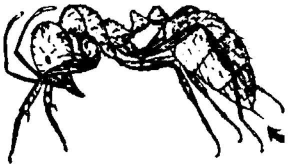


Fig. 12 B

Attachment 11-A1 (Cont'd)
Key to Some Common Classes and Orders of Arthropods

13. Abdomen with narrow waist (Fig. 13 A). ORDER HYMENOPTERA .... ANT

Abdomen without narrow waist (Fig. 13 B)................................. 14

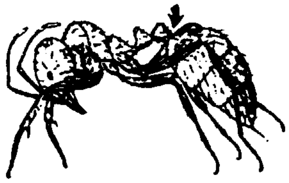


Fig. 13 A

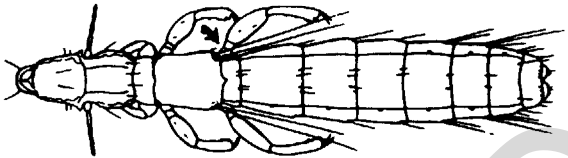


Fig. 13 B

14. Abdomen with prominent pair of forceps (Fig. 14 A). ORDER DERMAPTERA... .... EARWIG

Abdomen without forceps (Fig. 14 B)....................................... 15

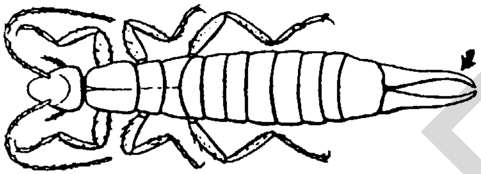


Fig. 14 A

Fig. 14 B

15. Body strongly flattened from side to side; antenna small, fitting into grooves in side of head (Fig. 15 A). ORDER SIPHONAPTERA .... FLEA

Body not flattened from side to side; antenna projecting from side of head, not fitting into grooves (Fig. 15 B)............................. 16

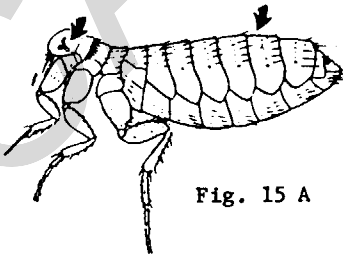


Fig. 15 A

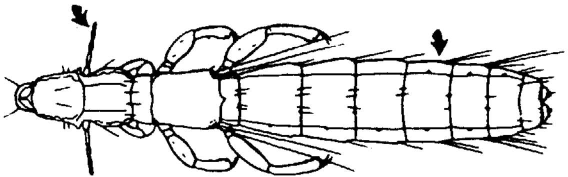


Fig. 15 B

16. Antenna with 9 or more segments (Fig. 16 A)............................. 17

Antenna with 3 to 5 segments (Fig. 16 B)................................ 18

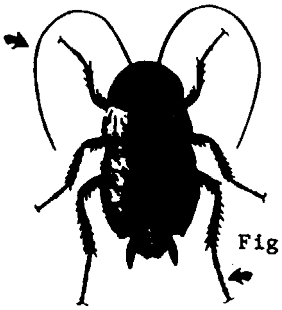


Fig. 16 A

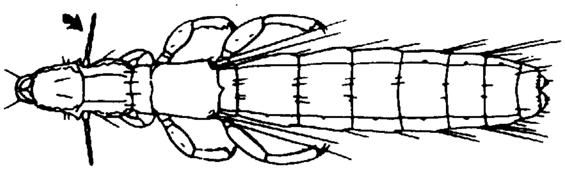


Fig. 16 B

17. Pronotum covering head (Fig. 17 A). ORDER ORTHOPTERA ....COCKROACH

Pronotum not covering head (Fig. 17 B). ORDER ISOPTERA .... TERMITE

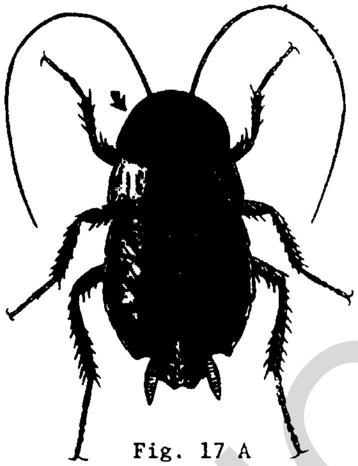


Fig. 17 A

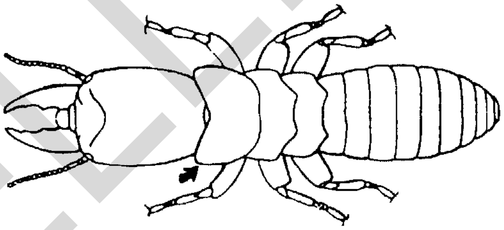


Fig. 17 B

18. Mouthparts consisting of tubular jointed beak; tarsi 3-5 segmented (Fig. 18 A). ORDER HEMIPTERA ....BEDBUG

Mouthparts retracted into head or of chewing type; tarsi 1 or 2 segmented (Fig. 18 B).. 19

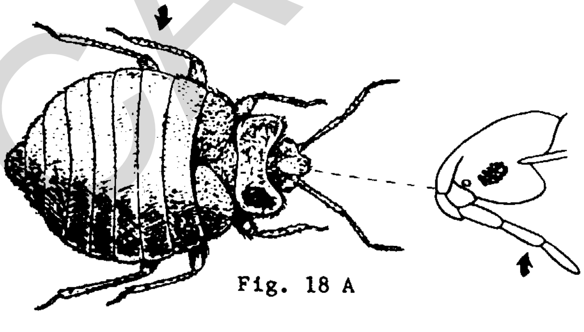


Fig. 18 A

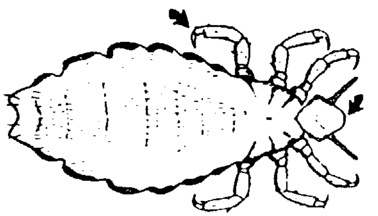


Fig. 18 B

Attachment 11-A1 (Cont'd)
Key to Some Common Classes and Orders of Arthropods

19. Mouthparts retracted into head, adapted for sucking blood (Fig. 19 A); external parasites of mammals ....ORDER ANOPLURA ....SUCKING LOUSE

Mouthparts of chewing type (Fig. 19 B); external parasites of birds and mammals........ORDER MALLOPHAGA ....CHEWING LOUSE

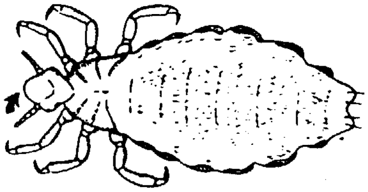


Fig. 19 A

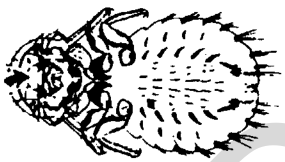


Fig. 19 B

20. Body oval, consisting of a single sac-like region (Fig. 20 A). ....ORDER ACARINA ....TICK AND MITE

Body divided into 2 distinct regions, a combined head-thorax (cephalothorax) and an abdomen (Figs. 20 b, 21 A, 21 B)................. 21

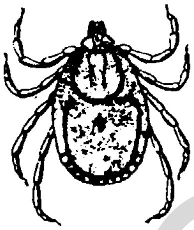


Fig. 20 A

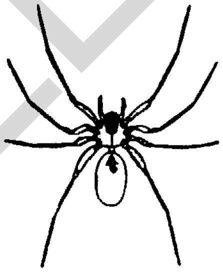


Fig. 20 B

21. Abdomen joined to cephalothorax by slender waist; abdomen with segmentation indistinct or absent; stinger absent (Fig. 21 A)... ....ORDER ARANEIDA ....SPIDER

Abdomen broadly joined to cephalothorax; abdomen distinctly segmented, ending in stinger (Fig. 21 B)....ORDER SCORPIONIDA..................SCORPION

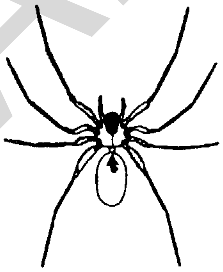


Fig. 21 A

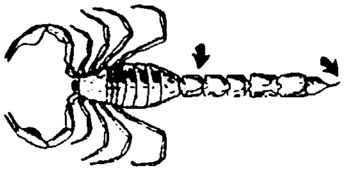


Fig. 21 B

22. Five to 9 pairs of legs in some species, swimmerets in others; 1 or 2 pairs of antennae present; principally aquatic animals (Figs. 22A, 22 B, 22 C). CLASS CRUSTACEA..CRAB, CRAYFISH, SHRIMP, LOBSTER, SOW BUG, COPEPOD

Ten or more pairs of legs; swimmerets absent; 1 pair of antennae present; terrestrial animal (Fig. 23 A, 23 B).................................. 23

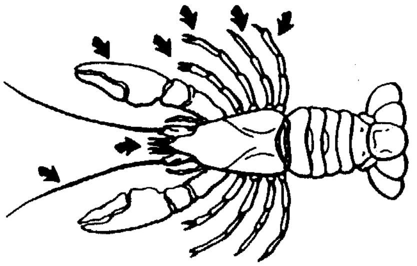


Fig. 22 A

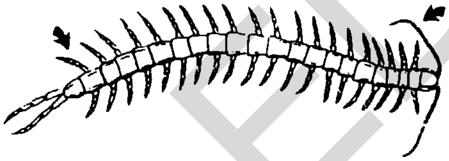


Fig. 22 B

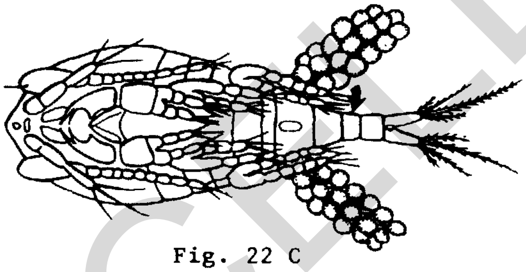


Fig. 22 C

23. Body segments each with only one pair of legs (Fig. 23 A)...........
CLASS CHILOPODA ....CENTIPEDE

Body segments each with two pairs of legs (Fig. 23 B)...............
CLASS DIPLOPODA ....MILLIPEDE

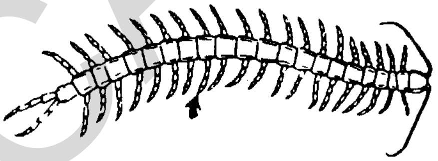


Fig. 23 A

Fig. 23 B

Attachment 11-A1 (Cont'd)
Key to Some Common Classes and Orders of Arthropods

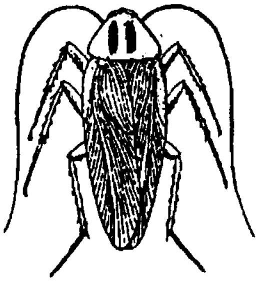
CHAPTER 12. HOUSEHOLD PEST CONTROL

This function is included as Section C.5 of the FAR - PWS. Contractor certification in the EPA Category 7, Industrial, Institutional, Structural and Health Related Pest Control, will be adequate for most of the work in this function. Some states may require separate certification in bird, structural, and rodent control. Assistance in interpreting state categories and ensuring proper contractor certification is available from the Command PMC. Contracts for household pest control usually include Firm Fixed Price and Indefinite Quantity (service calls) items.

12.1 COCKROACHES. Generally, cockroaches are the most abundant and troublesome pests in homes and buildings. Their repulsive appearance, bad odor, and filthy habits make them particularly objectionable. Cockroaches co-exist with man exceedingly well. Because of their extraordinary reproductive potential, a few roaches become a substantial problem in a short while.

12.1.1 <u>Pest Identification.</u> There are several thousand species of cockroaches throughout the world. Four species are of primary economic importance (Figure 12-1). However, seven species are most commonly found in buildings (depending on geographic area: Figure 12-2). The Asian cockroach (a recently introduced species) is being noted with increasing frequency.

12.1.1.1 German Cockroach. The german cockroach is the most common pest in homes, barracks, mess halls, and warehouses. It is a small brownish insect about 5/8 of an inch long and easily identified by two longitudinal black bars on the pronotum (a disc-like plate on top of the head). This roach is most commonly found in places close to food and water such as kitchens, bathrooms, and pantries. They secrete a fluid which leaves a characteristic odor indicative of their presence. German cockroaches can be found in almost all geographical areas in the United States.



GERMAN
COCKROACH

12.1.1.2 Asian Cockroach. Believed to have been introduced to Florida in 1985, the asian cockroach is quickly becoming established. This roach is similar in size and appearance to the german roach. However, it's behavioral patterns are quite different. While the german roach prefers to live indoors and is repulsed by light and man's presence, the asian cockroach lives outdoors in warm climates, is attracted to lights, and takes little notice of man's presence. If the temperature is 70 degrees F. or higher at dusk, they fly towards any light source. They are very good flyers. Their geographical distribution is currently limited to warmer climates, but they have been identified as far north as Michigan.

Cockroach	Immature Stage	Identifying Characteristics	Preferred Habitat	Life Cycle	Control Methods Chemical	Control Methods Other
German Cockroack	Nymph	Two dark longitudinal stripes on pronotum.	Kitchen and bathroom	3 - 4 months.	Residual sprays and dusts; contact sprays; baits.	Sanitation and habitat removal.
American Cockroach	Nymph	Yellow border on the pronotum.	Sewers, basements, alleyways, steam tunnels.	6 months to 2 years.	Residual sprays and dusts; baits	Sanitation and habitat removal.
Oriental Cockroach	Nymph	Male: dark brown with wings extending 2/3 down abdomen. Female: black with wing pads only.	Sewers, basements, crawl spaces, flower beds, under leaf litter.	9 - 15 months.	Residual sprays and dusts; baits	Screens over sewers, habitat removal.
Brown-banded Cockroach	Nymph	Two transverse tan bands at base of the wings	Scattered throughout buildings; found up high in rooms	3 - 6 months.	Residual and contact sprays.	Good housekeeping; habitat removal.

Figure 12-1
Summary of the Most Important Economic Cockroaches

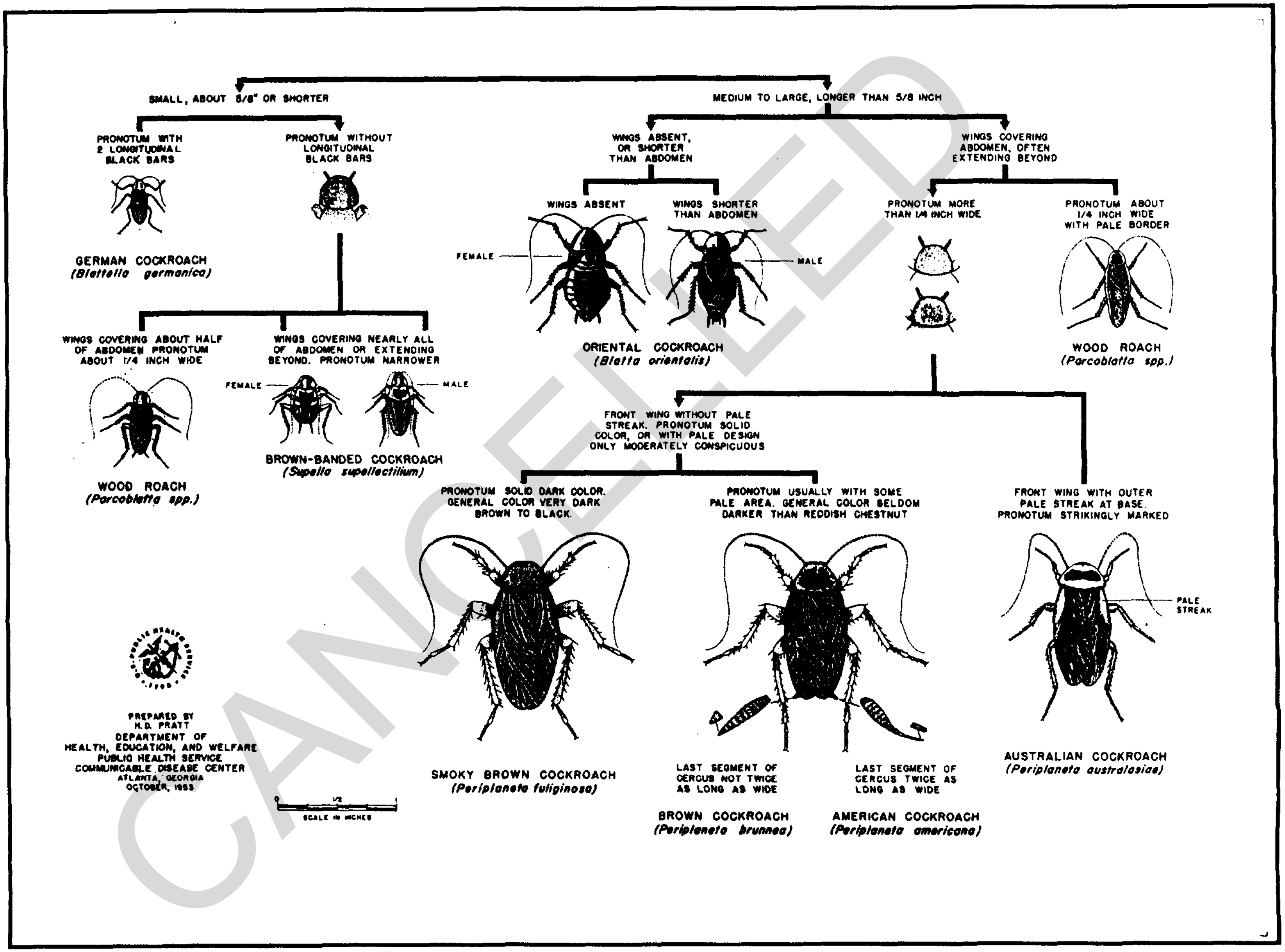
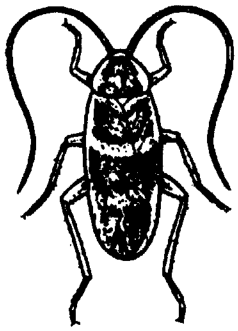


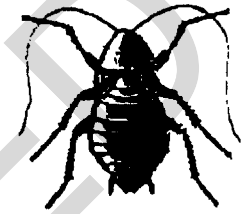
Figure 12-2
Pictorial Key to Some Common Adult Cockroaches



BROWN
BANDED
COCKROACH

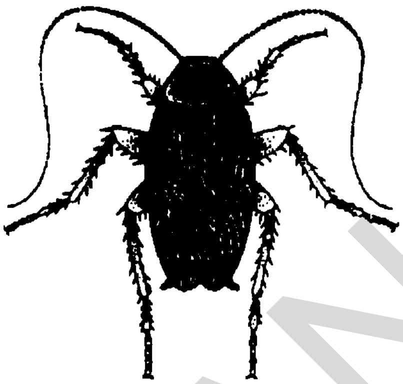
12.1.1.3 Brown-Banded Cockroach. The brown-banded cockroach is a small yellowish to brown species about 5/8 of an inch long with two lighter horizontal bands across the wings and the abdomen. This roach is not as common as the german roach. It prefers to hide in dark, warm places such as electric clocks, radios, and television sets. This species is not limited to moist environments like the german roach. The female frequently glues her egg capsules beneath furniture and behind pictures. The geographic distribution is nationwide.

12.1.1.4 Oriental Cockroach. The oriental cockroach is a medium size black species 3/4 to 1 inch long with wings that appear to be only 1/2 as long as the body. The oriental roach prefers warm, damp places such as cellars and sewers. It is more prevalent in the northern states than in the southern United States. It has a very distinct repulsive odor when found in large numbers. The female of this species appears to be wingless and is often referred to as a "black waterbug".



FEMALE
ORIENTAL
COCKROACH

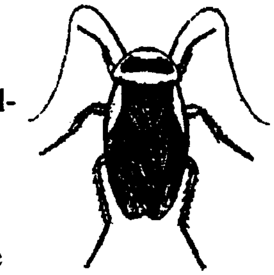
12.1.1.5 American Cockroach. The american cockroach is one of the largest of the seven roaches. It is about 1-1/4 to 1-1/2 inches long with a dark brown to mahogany color with somewhat obscure yellow margins on the pronotum. In the north, the american roach is found in warm, damp places such as sewers, steam tunnels, and damp basements. It lives almost exclusively indoors. In southern climates, it lives more outdoors than in, and is capable of flight.



AMERICAN
COCKROACH

12.1.1.6 Brown Cockroach. The brown cockroach is rapidly becoming a household pest in the southern United States and is frequently more common in these areas than the american cockroach. Most common in the southeastern U.S., it's size and appearance are not easily differentiated from the american cockroach. Also in the same genus as the american and brown cockroaches is the smoky brown cockroach which may be an occasional pest in southern climates.

12.1.1.7 Australian Cockroach. The australian cockroach is slightly smaller in size (about 1" long) but similar in appearance to the american roach. It is a less serious pest than the american roach. It can be recognized by the vivid pale area surrounding the edge of the pronotum. This roach is much more abundant in Florida and California than in more northern, colder climates.



AUSTRALIAN COCKROACH

12.1.1.8 Wood Cockroaches. Wood cockroaches are dark brown, about the same size as the brown-banded cockroach, but have the sides of the thorax and front half of the wings marginate with yellow. Found mostly in the eastern United States, their range can extend into Canada. They are natives of the woods but will occasionally invade homes by coming in with firewood or other items stored outside. They are generally considered a minor pest.

12.1.2 Inspection and Survey. Cockroaches are seldom seen during daylight hours, except when there is a high population level. In colder climates, they will live year round in structures. In warmer climates, once these pests gain entry into buildings they will seek out safe harborages from which they can make their forays, usually during dark periods. Inspection for infestations will normally involve flushing of pests from harborages, sticky traps or inspection for droppings.

12.1.2.1 Visual Sighting. A good flashlight is an essential tool for cockroach inspections. Cracks and crevices should be examined with specific attention near sources of food and water, or in damp areas. Indicators of a heavy infestation is fecal spotting near likely harborages and sighting roaches during the day.

12.1.2.2 Flushing. A short burst of an insecticide labelled as a flushing agent, such as some pyrethroid compounds, is an excellent augmentation to a good flashlight. Inject the flushing agent into suspected cockroach harborages, wait a few seconds, and whatever insect was in the harborage will come crawling out.

12.1.2.3 Trapping. Sticky traps are excellent tools for survey, both before and after pesticide applications. They are inexpensive, non-toxic, and easy to use. Placement of sticky traps near suspected cockroach harborages for 24 hours will provide quantitative results of current infestations. However, catching no roaches does not necessarily mean there are no roaches. Trap catches are proportionate to roach population size and activity in the area where the trap is placed.

12.1.3 Control Methods.

12.1.3.1 Sanitation. Because of cockroach habits, good sanitation is imperative to achieve and maintain good control. In the absence of reasonably good sanitation, chemical control measures cannot be expected to be fully effective.

12.1.3.2 Exclusion. Cockroaches will enter buildings in packages such as groceries, soda, and other beverages. Movement between buildings may be along steam and water lines, or in sanitary and storm drain sewers. In warmer climates where they can live outdoors most of the year, they may simply walk into any structure foraging for food. The use of effective exclusion practices such as caulking and sealing cracks and other possible entrances will do much to augment a cockroach control program.

12.1.3.3 Chemical Control. Several methods of pesticide application may be used to control these household pests. They may be used separately or in combination. The PCQAE should require a copy of the labels and MSDS for all of the pesticides a contractor intends to use. The PCQAE should then ensure that pesticides are used for the intended pests in accordance with label instructions.

- **Residual Treatment.** Residual treatment involves the placement of a pesticide so that it will be effective for a period of time after application. Some pesticides last only a few days while others may be effective for several months. Cockroaches are rather secretive, resting in cracks and crevices rather than in open areas. It is most important that pesticides be placed where the greatest contact with the pests will be made. In food handling establishments, pesticide applications must be concentrated in cracks and crevices of known or suspected harborages. Residual pesticides are usually applied as a liquid, dust or bait.
    - **Liquid Spray Application.** Sprays may be applied as ready mixed solutions, in which the pesticide is dissolved in a light oil, or as an emulsion, in which a concentrate is diluted with water. Wettable powders may also be used. The pesticide is applied with a hand sprayer, usually with an adjustable nozzle tip, that allows the material to be injected into cracks and crevices. When required, and if permitted by label instructions, the contractor may spray pesticide as a spot or general surface spray. Spot treatment generally allows a surface of two square feet to be treated. A general surface treatment does not restrict the amount of area to be treated. Pesticide spray should be applied so that a surface is wetted to the point of run off, but should not be allowed to run or puddle. All drips, puddles, or runs should cleaned up and properly disposed of off station.
    - **Dust Application.** Frequently, small hand operated dusters (either bellows/Getz type duster or bulb dusters) are used with nozzle tips that fit into or against openings into which insects hide or nest. A single rapid squeeze will inject a small puff of dust into the voids. Dusts are most effective where they can remain undisturbed and dry over a long

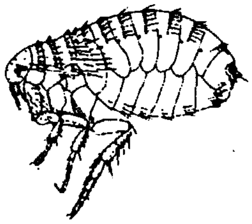
period of time. Dusts generally penetrate deeper into harborages than liquid sprays.

- **Baits.** Several types of baits can be used for the control of household insects. For cockroaches, a common bait is Combat^{R} which is a small plastic bait station containing a small bit of attractant and pesticide. Bait stations are available in different sizes depending on the target pest. Several crack and crevice-applied baits are also available.

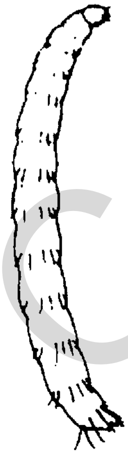
12.2 FLEAS. Generally flea infestations correspond to the current or past presence of a host animal(s). Identification of the host animal and the source of the infestation is an important part of successful flea control. Good housekeeping practices such as frequent vacuuming of carpets and furniture will help reduce organic material on which flea larvae feed.

12.2.1 Pest Identification.

12.2.1.1 Flea Adults. Fleas are small, dark, wingless, bloodsucking insects. They are flattened from side to side which allows them to pass between the hairs of cats, dogs, rats or the feathers of birds. When fleas become numerous in houses they can inflict annoying bites to occupants and their pets. The adult flea may live for weeks and even months without food. The legs of fleas are modified and well developed. The hind legs are enlarged which allows adult fleas to jump up to 50 times their body height or length. A pictorial key to the identification of common flea adults is provided in Figure 12-3.



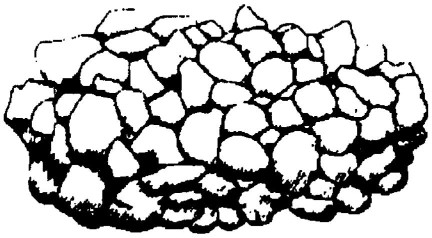
ADULT FLEA



FLEA LARVA

12.2.1.2 Flea Larvae. Flea larvae look completely different than flea adults. The larvae are legless, blind, active and visible if properly looked for. The larvae live in carpets, upholstered furniture, cracks and crevices in the floor or even under loose floor tiles. The larvae do not feed on blood. They eat just about anything but prefer the dried blood found in fecal material generated from the adult fleas.

12.2.1.3 Flea Pupae. Flea larvae spin a cocoon of silk in which to pupate. The cocoon is covered with a sticky substance. The cocoons get covered with whatever debris it comes in contact with. The pupae may look like grains of sand, globs of dirt, or little pieces of animal fur. Flea pupa can remain dormant for long periods of time. Vibrations and the presence of carbon



FLEA PUPA

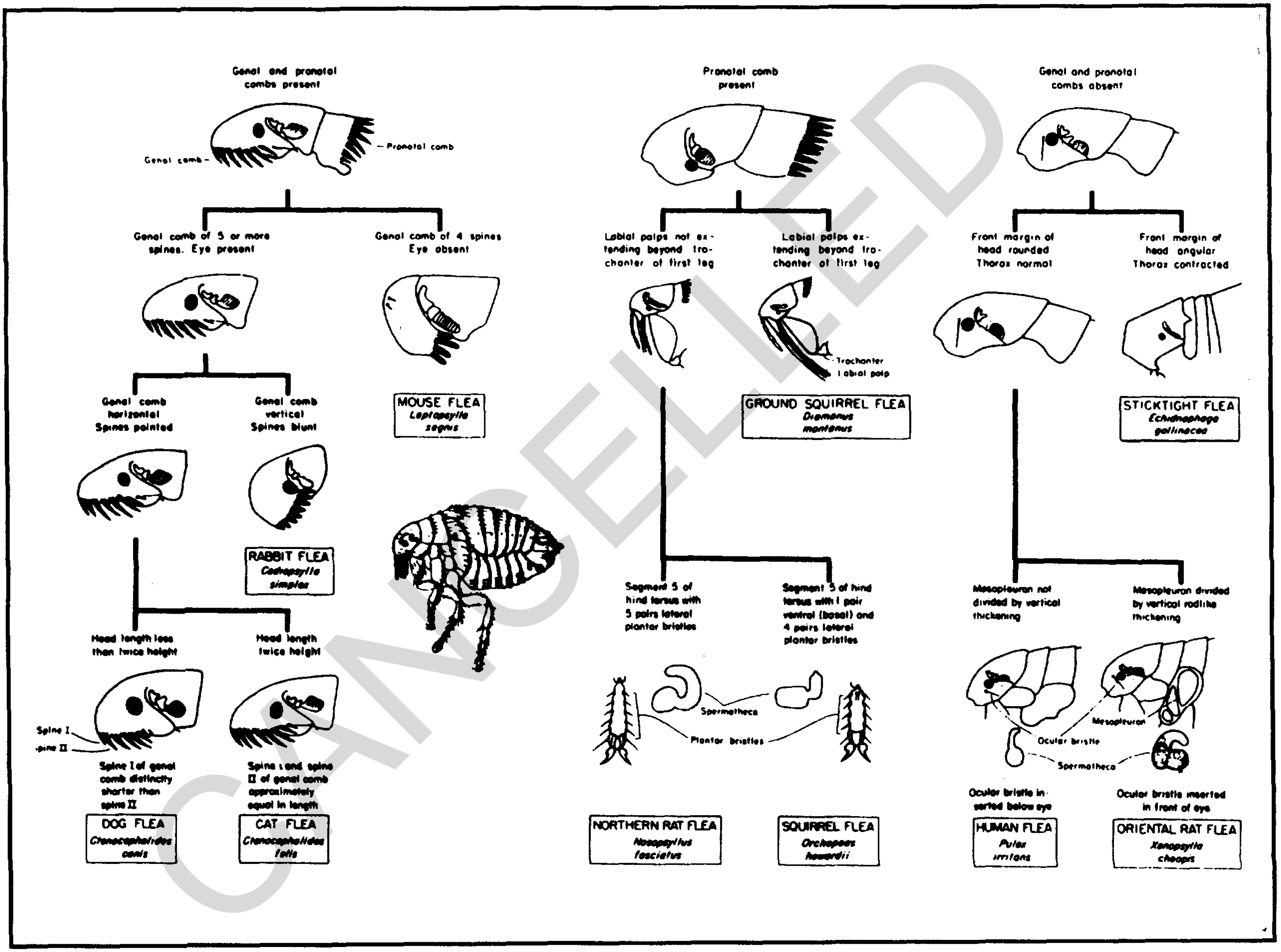


Figure 12-3
Pictorial Key to Some Common Fleas in the United States

dioxide will cue the emergence of adult fleas. Flea pupae are extremely resistive to the effects of pesticide applications because they are physically protected by the cocoon. Quite often, this is the reason for failures in flea control. While the adults and larvae are controlled, the pupae are not.

12.2.1.4 Flea Eggs. Flea eggs are not sticky thus they fall to the ground soon after being laid. The eggs can be found where an animal(s) frequent, such as their bedding area, or favorite resting places. The eggs are cream colored, smooth, spherical to oval in shape and can be seen with the naked eye.

12.2.2 Inspection and Survey. Flea infestations are usually first identified by the customer. Adult fleas can be found near animal resting places such as dog beds or couches where cats may frequent. The larva can be located near these areas in the nap of rugs, or in crevices of upholstered furniture.

Flea pupae may be visible in more out of the way places such as in the crevice between the walls and floor. Flea droppings can be identified by placing suspect dust and debris on a damp paper towel. The dried blood in the droppings will result in red spots on the paper.

Visual identification is very important as pesticides should not be applied without positive identification. Sometimes, customers may think they have fleas, but it may be another biting insect, or even dry itching skin.

12.2.3 Control Methods.

12.2.3.1 Chemical Control Indoors. Flea infestations usually require applications of pesticide to significant areas of the structure. Precautions must be taken to reduce the potential exposure to occupants (particularly children). The occupant must be made aware of post treatment reentry times. Building occupant cooperation in preparing spaces for treatment and completing post treatment cleanup is also essential.

Since pets or animals are usually involved, it is critical that the animals receive a flea treatment concurrent with the pesticide treatment of the structure. If the animal(s) are not treated, they will definitely be a source of reinfestation. Owners should be instructed to treat pets or seek veterinary assistance to control the fleas on their pets.

Several methods of pesticide application may be used to control fleas. They may be used separately or in combination. The PCQAE should require a copy of the labels and MSDS for all of the pesticides a contractor intends to use. The PCQAE should then ensure that pesticides are used for intended pests in accordance with label instructions.

- **Residual Treatment.** Sprays may be applied as ready mixed solutions, in which the pesticide is dissolved in a light oil, or else as an emulsion, in which a concentrate is diluted with water. Wettable powders may also be used. The pesticide is applied with a hand sprayer, usually with a adjustable nozzle tip, that allows the material to be applied as a fan spray, circular spray or pin point spray for crevices at the baseboard-floor junction. Care should be taken to note if the pesticide mixture will stain any carpets, discolor any finishes on the floor, or in any way leave a noticeable residue.
- **Aerosol Applications.** In some cases, it may be necessary to apply pesticides as a space spray generated by a total release aerosol can or ULV aerosol generator. Application of pesticides in this manner is applicable if the flea harborage is considered to be inaccessible to general residual treatments.
- **Pesticide Exposure of Occupants.** Occupants shall never be present in the area during the application of a pesticide for flea control. Occupants should be made aware of post treatment reentry times. The pesticide label will be the final determinant for reentry times.

  Occupants in a different dwelling in the same building may experience irritation. For this reason, it must be noted if air return systems, forced air ventilation systems, or general ventilation systems interconnect between dwellings. Common crawl spaces, or attic spaces may be routes which allow pesticides to migrate from dwelling to dwelling.

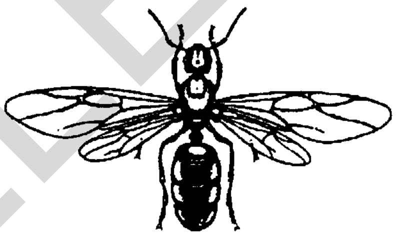
  Symptoms of exposure may range from tearing eyes, sneezing and coughing, to severe headaches. It is recommended that occupants of adjoining dwellings be notified of the application of the pesticide and vacate the premises for at least one hour after completing the pesticide application. Upon returning, the occupants should be advised to aerate the premises in accordance with the product label.

  When broadcast treatments of carpets are made using emulsions or solutions, ventilation at floor level is required to remove pesticide vapors.

12.2.3.2 Chemical Control Outdoors. In conjunction with pesticide application for flea control indoors, it may be necessary for the application of pesticide outdoors surrounding the structure. Quite often, the two operations are performed as one treatment. Generally, a residual treatment is applied as a liquid spray using a power sprayer. Application is performed to the entire perimeter with special emphasis to areas where animals/pets frequent. The pesticide must be labelled for outdoor treatment for fleas.

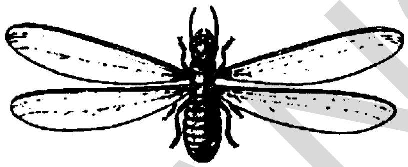
Depending on state or local laws for posting, it may be necessary to post signs that indicate a pesticide has been applied to the grounds. Outdoor applications of pesticides should not be made if any precipitation is expected for that day. Animals/pets should not be permitted to use the treated area until the pesticide is dry or as specified by the label.

12.3 ANTS. Ants are important household pests and are particularly annoying in kitchens and pantries where they forage for food. Outdoors they may interfere with human activities, sting or bite man or his animals.



ANT
REPRODUCTIVE

Ants should not be confused with termites. Both carpenter ants and termites "swarm" at various times of the year. It is not uncommon for a termite complaint to be recorded, but upon identification, ants are identified as the swarmers. In both cases, the flying insects are the reproductive adults. Ants have a thin waist (pedicel), elbowed antennae, and the forewings are distinctly larger than the hind set of wings. Termites have a fat waist (actually, no waist will be evident), the antennae are long and straight, and all four wings are of equal size.



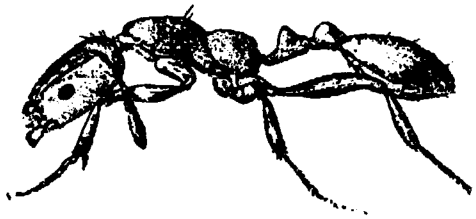
TERMITE
REPRODUCTIVE

12.3.1 **Pest Identification.** Ants are among the most abundant of insect species. They can be divided into three groups based on their relationship to man: (1) species which nest indoors, (2) species which nest outdoors and invade man's structures and (3) venomous ants. The nesting relationship may change as climate changes. A species found almost exclusively in structures in the north may be found both in and out of structures in the south.

12.3.1.1 Species Which Nest Indoors.

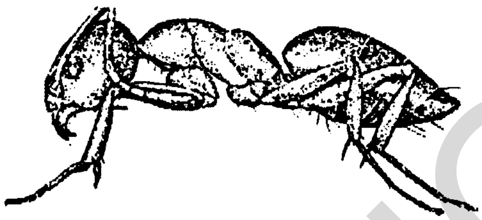
- **Pharaoh Ants.** Pharaoh ants are light yellowish to reddish-brown in color with workers measuring 1/15 to 1/12" long. They are becoming an increasingly common pest. Their nests are located between walls, above ceilings, or under floors. They will eat just about anything.

  They can be a real problem to control because the colony contains multiple queens. If the colony is stressed by pesticides, the queens will leave the old nest and make new ones. The result is many new sub-colonies. Therefore, control techniques must be very effective in the first round, otherwise the problem will probably get worse.



PHARAOH ANT

- **Other House Infesting Ants.** These ants range from 1/15 to 1/4 of an inch in length. There are several different species of small house ants that range in color from a light yellow to a reddish yellow and jet black. These ants will nest in walls, woodwork, and beneath masonry. They will feed on all types of food material, such as sweets, fruits or nuts, and fatty, greasy, or oily materials. The argentine ant is a severe pest in southern climates. The thief ant and the odorous house ant are two more common species which commonly nest indoors.



ODOROUS HOUSE ANT

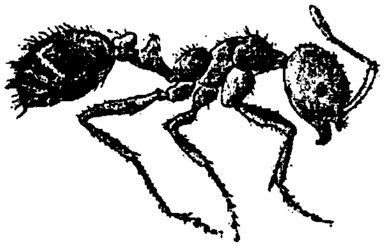
12.3.1.2 Species That Nest Outdoors. There are many species of ants which nest outdoors and will forage indoors for food. The pavement ant prefers to nest under rocks, next to buildings and under cracks of pavements. The large yellow ant (citronella ant) nest near structures with the winged reproductives usually being confused for termites. Field ants tend to nest in open areas building small mounds. They will occasionally invade structures.

12.3.1.3 Venomous Ants. Many of the ants of these species (Solenopsis spp.) are called fire ants because of their venomous sting. The following four species found in the United States are noteworthy as significant threats to man and his animals.

- domestic fire ant
- red imported fire ant
- black imported fire ant
- southern fire ant

Generally, these species are tropical-subtropical in nature and are not found in colder climates.

Fire ants build distinct mounds. Large colonies contain up to 1/2 million workers. Some species have multiple queens. Fire ants exhibit very aggressive behavior when the colonies are disturbed. Their sting will cause intense irritation and may cause sever reactions in sensitive people and animals.



RED IMPORTED
FIRE ANT

12.3.2 Inspection and Survey. The first step in any ant management program is to determine where the ants have been found. An interview of the occupants or workers will generally reveal much useful information.

It is very important to determine which species (one or more may be involved) are present and, if possible the nest locations. Use of non-toxic baits is a very effective tool to find the nest locations. Survey bait items may include, but are not limited to, peanut butter, jelly, hamburger, bacon grease, french fries or honey. The combination of a sweet and a meat/grease is a very enticing combination. Map the premises and note the locations of the baits. A daily record of the ants found at the baits should be kept.

Notations of ant sightings (foraging ants) should be made on the map to try to locate the nests. Specimens can be forwarded to the Command PMC for identification. Ants should be placed in vials containing 70% rubbing alcohol.

12.3.3 Control Methods.

12.3.3.1 Species Which Nest Indoors. Control of foraging ants and worker ants seldom gives permanent control because the queens in the nest will continue to reproduce. For this reason, residual and non-residual liquid pesticide applications around baseboards will provide temporary relief of visible workers at best. This is wasteful and may cause undue pesticide exposure to occupants. The key to control is elimination of the reproductive adults.

Sanitation in itself will not solve the problem. However, it may help a great deal.

- **Toxic Baits.** Toxic Baits are an effective tool for controlling ants. Baits are most useful when the nests cannot be located, or access to them is denied. Baits should be replaced regularly and an ample number should be used. Ants routinely pass food throughout the colony, therefore baits reach and kill the reproductive queen.

  Pharaoh ants are a special problem because their colonies "bud" under insecticidal pressure. Insecticidal baits having delayed actions or growth regulators can be effective in controlling pharaoh ant colonies. However, some growth regulators, such as methoprene, work very slowly. This increases the chance that building occupants will use other pesticides and split the colony before control is achieved.

- **Dusts.** Dusting in very close proximity to the nest with bendiocarb, boric acid, silica aerogel, or diazinon can be effective at reducing ant populations (except for pharaoh ant). Since often the exact location of the nest is miscalculated, the foraging workers will simply utilize alternate routes to and from the nest. Dusts applied directly into the nesting area are effective.
- **Liquid Sprays.** If the nest can be located, injection of pesticides into the nest using a crack and crevice type applicator tip will be effective.

12.3.3.2 Species Which Nest Outdoors.

- **Barrier Treatments.** Barrier treatments are intended to prevent pests from entering the premises. Barrier treatments can be very effective at keeping the protected area pest free for a limited period of time. In southern climates, pharaoh ants may nest outdoors, and invade the premises foraging for food. In this case, the use of residual pesticides may be warranted.
- **Granular Application.** Granular applications are performed outdoors in a band, approximately 3 feet wide , around the foundation of the house. The advantage of granules around foundation plantings is that they can be applied above the plants, and because of their size and weight, they will fall through the foliage onto the ground where they will be most effective.
- **Liquid Sprays.** A liquid residual pesticide may be applied in a band, approximately 3 feet wide around the foundation of the structure. The foundation of the structure may be sprayed, if the label permits, up to 1 foot in height above the ground level. Door sills, window sills and other potential entry points may also be treated if the label permits. Emulsions are most effective for ground sprays while wettable powders or microencapsulated formulations are appropriate for entry points and vertical surfaces.

- **Outdoor Treatments.**
  - **Area Coverage.** When large numbers of ant colonies are scattered about lawn and garden, and quick eradication of all foragers is desired, broadcast applications may be warranted. Either granular formulations or emulsions can be used. The control achieved will

be temporary, as the underground queens will produce more workers.

- **Nest Eradication.** Nest eradication will provide more permanent control of fire ants or other large ant colonies. Drenching the mounds is one technique. A drench of residual insecticide labelled for this application will be fairly effective. Wettable powders or granules applied to the nesting site followed by thorough watering is another technique. For some mound building species, it may be desirable to break up the mound prior to pesticide application.

  Some pesticide applicators have used termite rods to inject the pesticide deep into the nest (fire ant or large colonies of field ant). Extreme caution should be used when treating fire ant because of their aggressive nest defense reactions.

12.4 BEES, WASPS, AND HORNETS. Figure 12-4 provides a key to the identification of stinging hymenoptera. These insects are in the same order as the ants. A common feature is the pinched waist between the abdomen and thorax. A summary of the characteristics of bees, wasps and hornets is provided in Figure 12-5.

Several different species are capable of inflicting severe stings. Some people are so sensitive to the sting of these insects that a single sting will result in death. Actually, more people die annually from an allergic reaction caused by insect stings than from snake bites.

12.4.1 **Pest Identification.** [NOTE: Carpenter bees are covered in Chapter (13) Structural Pests]

12.4.1.1 Honey Bee. The honey bee is a medium sized insect about 1/2 inch long with fuzzy hair. It will build nests in buildings, hollow trees, hollow pillars, as well as in conventional beehives. Honey bees are a highly organized social group of insects with a queen, drones, and hundreds to thousands of workers which are sterile females. In most cases honey bees will not harm individuals unless disturbed and then, because of their large numbers, they can inflict serious stings.

12.4.1.2 Bumble Bee. The bumble bee is a fairly large bee, approximately 1/2 to 1 inch long with the thorax and abdomen covered in yellowish, blackish or brownish fuzzy hairs. Bumble bees normally nest in holes in the ground, and sometimes in boxes or trash, and are frequently found flying about flowers or ornamental plants. Bumble bees can sting repeatedly whereas the honey bee is capable of stinging only once.

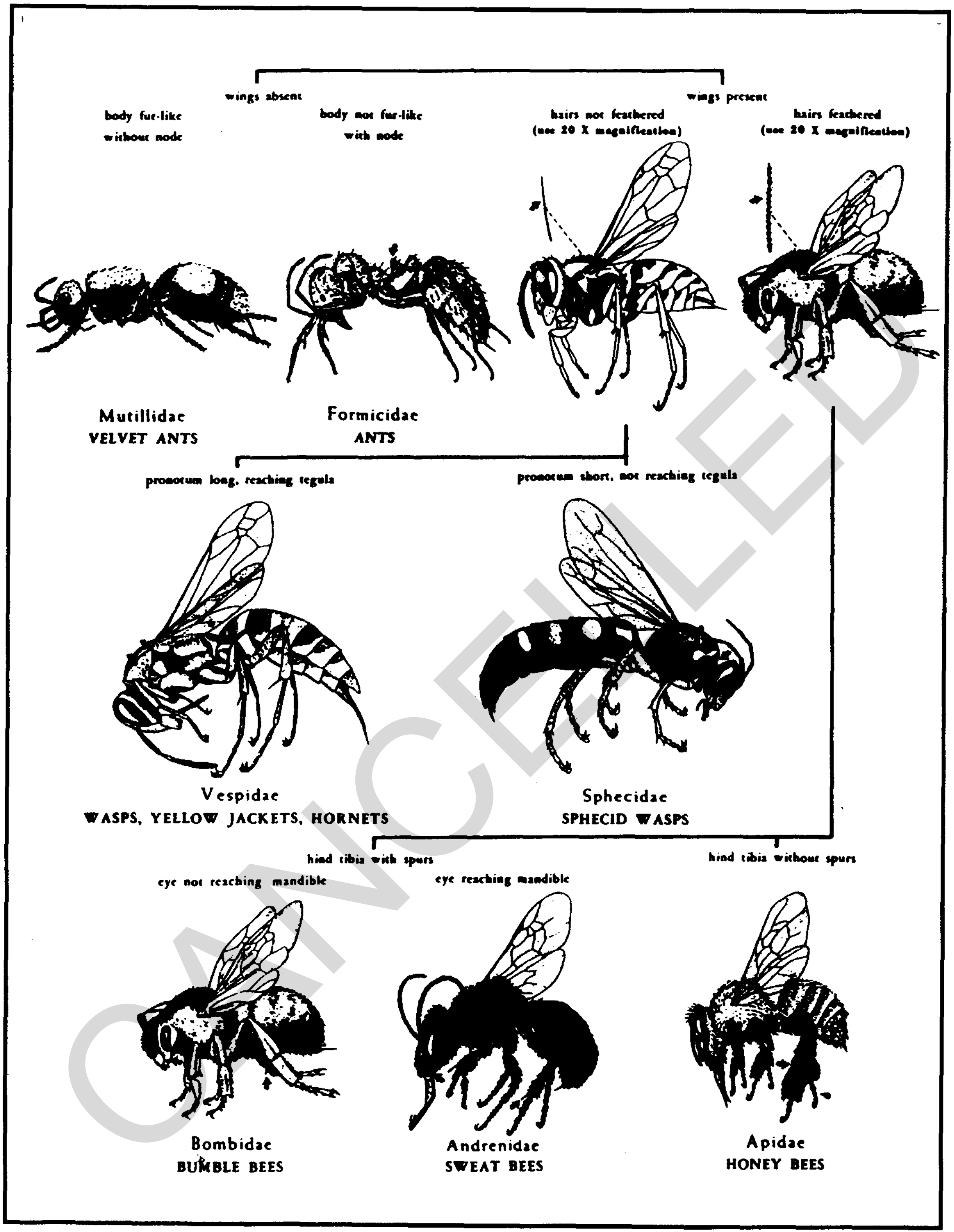


Figure 12-4
Stinging Hymenoptera
Pictorial Key to Some Common United States Families

INSECT PESTS	IDENT CHARACTERS	NEST SITE	LIFE CYCLE	CAN STING?	CHEM CONTROL	OTHER CONTROL
Single Comb Wasps	Species dependent: about 1 cm long, most characteristics important	Build simple nest consisting of one layer of cells: found commonly under eaves and window ledges	April to August	Yes	Contact Sprays, residual sprays and dusts	Remove nests at night
Hornets	Species dependent: largest of the social wasps: nest characteristics important	Large grayish-brown paper structure resembling a bloated football. Multiple layers of cells: hangs in trees and bushes	April to September	Yes	Contact Sprays, residual sprays and dusts	Habitat removal
Yellow Jackets	Species dependent: about 1/2 in length nest characteristics important	Multiple layers of cells: found in underground cavities or in wall voids of structures above ground	April to November	Yes	Contact sprays, residual sprays, dusts and baits	
Cicada Killers	Large 1.5 inches long: black with yellow or orange markings	Burrows in the soil leaving a mound of soil at the entrance	April to August	Females sting only when handled	Residual Sprays and dusts	
Mud Daubers	Black with yellow markings: long thin pedicel	Mud nests of various sizes and shapes found along roof lines, in garages and in attics	April to September	Rarely Stings	REsidual Sprays and dusts: contact sprays	Remove mud nests
Honey Bee	Various shades of yellow, black or brown: about 2/3" long: body covered with light colored hairs	Made up of a number of wax cells: found in wall voids, attic areas, and under slab foundations	4 weeks	Yes	Residual Sprays and dusts: contact sprays	good building practices: contact local bee-keeper for nest removal
Bumble Bee	Black and yellow: about 1" long: body covered with hair.	Made up of a number of cells: found in wall voids, attic areas and under slab foundations.	variable	Yes	Residual Sprays and dusts	Good building practices

Figure 12-5
Summary of the Most Important Bees, Wasps and Hornets

12.4.1.3 Yellow Jackets. Yellow jackets are black and yellow insects about 1/2 inch in length which build paper comb nests in holes in the ground. Some species will nest in wall voids. A colony will grow throughout the summer and have hundreds to thousands of workers by the fall of the year. They can sting viciously and repeatedly.

12.4.1.4 Paper Wasps. Paper wasps build nests of paper-like material. Some species build a single tier, open paper comb beneath eaves, in trees, or in hedges. Paper wasp colonies contain a few to a hundred or more individuals. These wasps can also sting viciously and repeatedly.

Paper wasps overwinter as adults. In the fall, hundreds to thousands of them may congregate on the highest structure available such as airport control towers. They may enter structures around windows and flashing. On warm days these wasps may become active and enter the interior of the structure rather than return to the outside.

12.4.1.5 Mud Daubers. These are solitary wasps that build organ pipe shaped mud nests on the underside of roof and other structural timbers. While these wasps seldom sting, their nests should be approached with caution.

12.4.1.6 Hornets. Hornets build one of the most spectacular and fear provoking aerial nests. They build a large grayish-brown tear-drop shaped paper carton structure which is often seen hanging from a tree or bush or attached to the eve of a dwelling. The nest will enclose many tiers. The insects are relatively large and hearty, brown to black in color with vivid markings on the face. Actually the insects that build these structures are above ground nesting yellow jackets. The bald faced hornet and the European hornet are two common varieties found throughout the United States. They can be very aggressive when disturbed, can sting repeatedly, and should only be handled by experienced personnel.

12.4.2 Inspection and Survey. It is extremely important to note which species of stinging hymenoptera is causing concern. If the species can be positively identified, then the location of the nest can be discerned. These insects are distinctly marked, thus field identification of most species is possible.

12.4.3 Control Methods. Controlling the species is dependent on their lifestyle and habitat. While pesticide applications will provide temporary relief, habitat modification, better building practices, or nest removal will provide a more permanent control. Keep in mind that some people are extremely allergic to the venom of insects, thus control of these insects should be prompt and thorough.

12.4.3.1 A Note on Honey Bee Control. The honey bee is an excellent pollinator of plants and is a valued contributor to our society. Some public interest groups will be troubled if bee colonies are destroyed. Quite often, local bee keepers will gladly come to your facility and remove bee hives at no charge. This should always be the first option. You can find the names of local bee keepers by contacting the cooperative extension service or the highway department in your area.

12.4.3.2 Exterior Nest Control. Control of small nests is best done after dusk when the insects are in their nests. At that time, specially prepared bee and hornet sprays may be injected into the hive. Some wasp sprays may be projected 10-15 feet or more. When the operator is sure that the pests are dead, the nest should be removed and destroyed. If at all possible, honey bees should not be killed. A beekeeper should attempt to remove bees before a pesticide is used.

- **Large Aerial Nests.** These are generally not accessible from the ground. It is not advised to use a power sprayer because the force of the spray will break the nest causing aggressive behavior by the survivors. Aerial nests of hornets or yellow jackets should be approached ONLY when wearing a full bee suit. Special equipment such as a "high boy" may be necessary to reach some aerial nests. The pesticide should then be applied. Some professionals will plug the entrances to the hive and physically remove it intact.
- **Ground Nests.** Generally, control of ground nesting yellow jackets is performed at night, but it can be done during the day. The pest controller should wear a full bee suit. The nest entrance should be plugged. Pesticide, usually in a dust form, should be injected past the plug. Some pest controllers will use other formulations and techniques.

12.4.3.3 Nests in Structures.

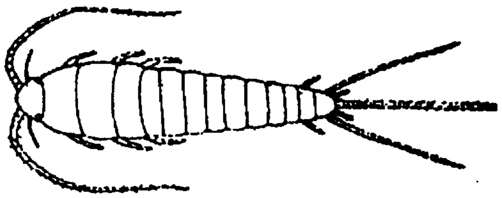
- **General Control.** Once hymenoptera have become established inside a structure, control involves both exclusion and the elimination of the insects. If the exterior entry is isolated and blocked, pesticide application into the nest must be done immediately, otherwise, the insects are likely to enter the building because they can go no where else. Almost any labelled insecticide will control these insects when applied to the nest.
- **Honey Bee Nests in Wall Voids.** Eradication of honey bees in wall voids can be accomplished by the injection of pesticides as noted above. In summertime, the unattended honey and bee larvae will rot causing a very objectionable odor. It may become necessary to remove a portion of the wall to gain access to the nest to remove it after the bees have been eliminated.

12.5 OCCASIONAL OR NUISANCE PESTS. Summarized in Figure 12-6, these pests are normally included as Indefinite Quantity Items.

Pest	Identifying Characteristics	Preferred Food(s)	Life Cycle	Economic Importance	Control Methods	
					Chemical	Other
Clover Mite	Usually bright red: smaller than pinhead; long pair of forelegs.	Many plant species	1 month indoors.	Nuisance; invades in large numbers; stains if crushed.	Residual sprays.	Keep plant-free barrier at foundations
Centipedes	1 pair legs per body segment.	Insects and other arthropods.	Species dependent.	Nuisance.	Residual sprays and dusts.	Habitat destruction.
Millipedes	2 pairs legs per body segment.	Decaying vegetation.	Species dependent.	Nuisance: invade in large numbers.	Residual sprays and dusts.	Habitat destruction.
Pillbugs	Can roll into a ball.	Decaying vegetation.	4 months to 1 year.	Nuisance: invade in large numbers.	Residual sprays and dusts.	Habitat destruction.
Sowbugs	Cannot roll into ball; 2 tail-like appendages at the end of body.	Decaying vegetation	4 months to 1 year.	Nuisance: invade in large numbers.	Residual sprays and dusts.	Habitat destruction.
Slugs	Lack a shell.	Decaying vegetation: some plants.	Species dependent	Nuisance; deface buildings with slime trails.	Residual sprays; baits.	Habitat destruction.
Snails	Have a shell.	Decaying vegetation: some plants.	Species dependent.	Nuisance: deface buildings with slime trails.	Residual sprays; baits.	Habitat destruction.
Crickets	Species dependent: house cricket has 3 dark brown bands on the head.	Many plant and animal materials.	Species dependent.	Nuisance: will feed on clothing, paper products, food products etc.	Residual sprays and dusts: baits.	Habitat destruction.
Earwigs	Forcep-like appendages at end of the abdomen.	Decaying animal and plant matter: some predacious.	Species dependent.	Nuisance: strong odor when crushed.	Residual sprays baits.	Habitat destruction.
Ground Beetles	Variable: most are dark, shiny and somewhat flattened.	Decaying animal and plant matter: some predacious.	Species dependent.	Nuisance.	Residual sprays and dusts.	Habitat destruction.
Black Widow Spider	Female- shiny black with red or yellow hourglass marking on underside of abdomen.	Insects and other arthropods.	2 to 4 months.	Venomous.	Residual and contact sprays.	Habitat destruction.
Brown Recluse Spider	Violin-shaped marking on the cephalothorax.	Insects and other arthropods.	8 months to 1 year.	Venomous.	Residual and contact sprays.	Habitat destruction.
Silverfish	Wingless: body boat-shaped: 3 bristle tails at end of abdomen. covered with silver scales.	Wide variety of foods containing protein and carbohydrates.	Species dependent.	Nuisance: damage fabrics, paper products and food products.	Residual sprays and dusts: contact sprays: baits.	Habitat destruction.
Firebrats	Same as silverfish except scales on body give a mottled gray appearance.	Wide variety of foods high in protein and carbohydrates.	2 to 3 months.	Nuisance: damage fabrics, paper products and food products.	Residual sprays and dusts: contact sprays: baits.	Habitat destruction.
Booklice	Usually small (1 to 2 mm): wingless.	Wide variety of foods	Species dependent	Nuisance; damage paper and food products	Residual and contact sprays.	Habitat destruction: moisture control.

Figure 12-6
Summary of Occasional Invaders and Miscellaneous Pests

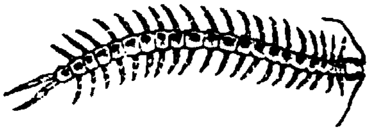
12.5.1 Silverfish and Firebrats. (Figure 12-7) These are wingless insects in which the very young resemble the adults. Some are silvery grey, 1/2 inch or more in length. Others are brownish with very long antennae and tail appendages which result in some of the individuals being called bristletails.


SILVERFISH

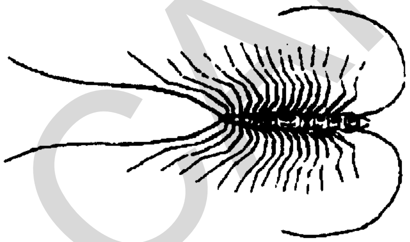
The silverfish (silvery ones) are more often found in attics where they live in boxes or in dusty book files; whereas the firebrats (brownish ones) are more often found in hotter, drier areas such as kitchens and bakeries. These insects are primarily nuisance pests, but will consume small amounts of food, and may damage natural and synthetic fibers, books, and other paper products. Their feeding marks are irregular, do not perforate the paper and may be stained yellow.

12.5.2 Earwigs. (Figure 12-7) These insects are easily recognized by the forceps like appendages at the end of the abdomen. Earwigs have habits similar to cockroaches in that they enter buildings through openings around doors and windows and crawl about at night. Earwigs are primarily scavengers feeding on dead animal and plant material. They will hide during the day beneath stones, boards, or other debris. Earwigs do not pinch or sting.

12.5.3 Centipedes and Millipedes. These are arthropods with many segmented bodies. Centipedes have one pair of legs for each body segment, flattened bodies, well developed mouthparts, can move very quickly and are predators of other arthropods.


CENTIPEDE

The house centipede has many body hairs which makes it seem fuzzy in appearance. All centipedes can inflict a "bite" with their chelicerae (hardened mouthparts), and place a poison onto the open wound.


HOUSE CENTIPEDE

Millipedes, called thousand leggers, have two pairs of legs for each body segment (4 legs per segment). They possess a roundish body shape, undeveloped mouthparts, are slow moving, and eat organic materials.


MILLIPEDE

Generally, both organisms are found in damp places beneath rocks, grass or humus. They occasionally invade buildings usually after heavy rains or storms. The house centipede is an exception to

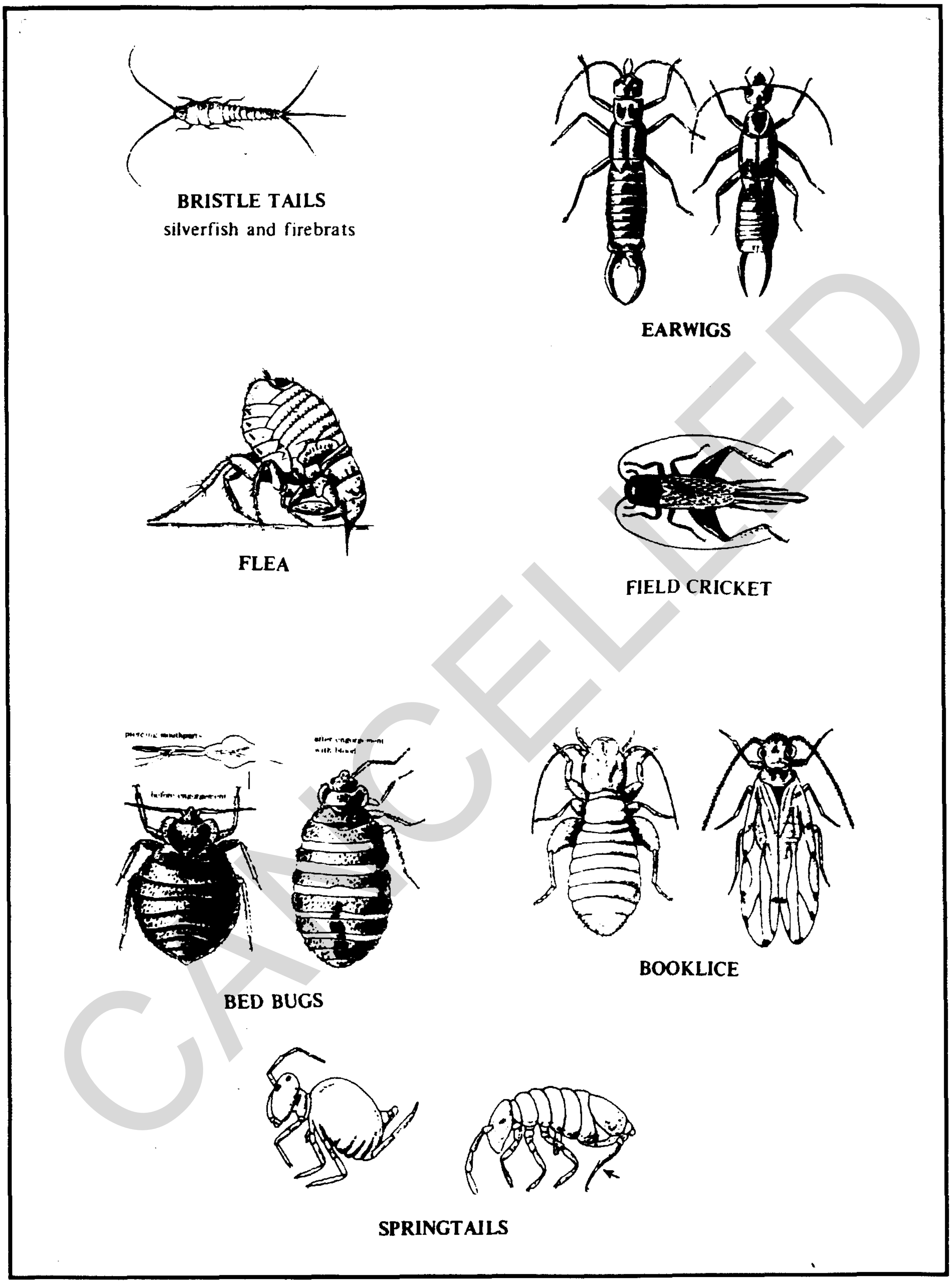
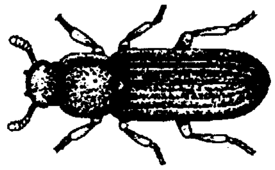


Figure 12-7
Occasional Invaders

this generality by living full time in structures.

12.5.4 **Ground Beetles.** These insects vary greatly in size, shape and color. However, most are dark, shiny and somewhat flattened. Ground beetles live beneath leaves, logs, stones, and other debris. When wandering about for food, ground beetles frequently gain entrance into houses by crawling through small openings around doorways. Ground beetles do little or no damage.



GROUND BEETLE

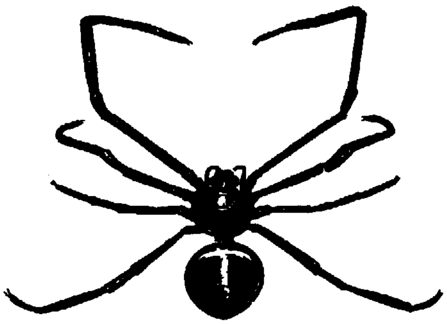
12.5.5 **Crickets.** Crickets commonly invade homes, and when present in large numbers can cause considerable annoyance because of their chirping (Figure 12-7). They will also cause damage to certain fabrics such as linens, rayons, and furs, and will also infest all kinds of food and paper.

12.5.6 **Arachnids.** Spiders, scorpions, ticks and mites are arachnids. The adults have four pairs of legs, no wings and no antennae.

12.5.6.1 **Spiders.** All spiders are venomous but do not "inject" poison into their prey. Like the centipedes, they create an open wound with the chelicerae (fang like mouth parts). The poison sac is located in the chelicerae and the poison is blown through grooves into and onto the open wound. However, with most species of spiders, there is little danger or complication as a result of the bite.

Two genus of spiders [Loxosceles spp. (Brown Recluse: 39 species found in North America) and Latrodectus spp. (Black Widow: 7 species found in North America)] are dangerous to man. Hawaii has 180 described and recorded species of spiders of which 7 have been identified as dangerous.

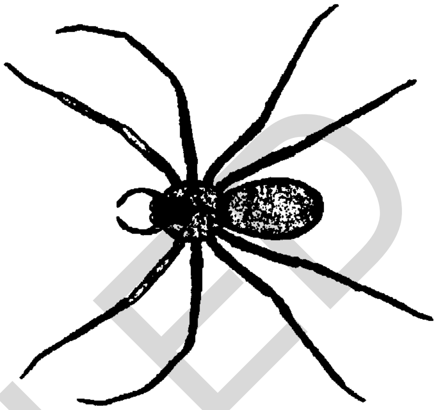
- **Black Widow Spider.** This spider typically is described as having a globular shiny black abdomen with a characteristic red or orange hourglass mark on the underside. However, due to the variations in species markings, only a qualified arachnologist can be relied upon to accurately identify all the widow spiders found in North America. Generally speaking, these spiders are not aggressive and will not attack unless disturbed. Their webs are frequently constructed under stones or boards or across the opening in outdoor privies.



THE HOURGLASS LIKE MARKING MAY BE OBSCURE OR MISSING

The severity of an individual's reaction to this spider's bite depends on the area of the body, the amount of venom absorbed, and the condition of the bitten individual. Bites are seldom fatal except in the young and elderly, however the recipient will likely get very ill.

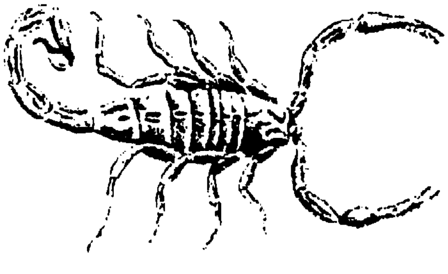
- **Brown Recluse Spider.** This spider is typically described as being a plain brown spider which has a violin shaped mark behind the head. The violin shape is not necessarily distinct. The brown recluse is not aggressive, and as the name implies, preferring habitats which are isolated. They can be found indoors, particularly in closets, bathrooms, basements, and garages. They seem to prefer "tight" areas.



VIOLIN-LIKE SHAPE
BEHING THE HEAD OF
BROWN RECLUSE SPIDER

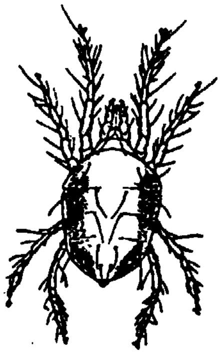
Most bites occur when a person crushes the spider while putting on old clothes which were hanging in a garage, or by accidentally crushing them while cleaning out a closet. Bites from this spider are seldom fatal, however severe problems are created because the venom causes a localized necrosis. Ulcerated sores form around the area of the bite which creates a good possibility of secondary infection.

12.5.6.2 Scorpions. Scorpions have four pair of legs, a pair of crab-like pincers at the front end of the body, and a stinger at the tip of the abdomen. The stinger is frequently curled upward and over the head to sting its victims. Stings by scorpions usually occur when people accidentally encounter them by putting on shoes or slippers in which these individuals were hiding or when boxes or other materials are lifted under which the scorpions have been hiding.



SCORPION

12.5.6.3 Mites. These are extremely small organisms that are found in all environments and can trouble man in a variety of ways. Some mites infest household and outdoor plants. They may weaken the plants or transmit plant diseases. Other mites infest man's stored products such as grain, cheese, and animal hides. Still others parasitize vertebrates causing skin conditions or transmitting disease. If you suspect a mite infestation, contact your Command PMC.



SPIDER MITE

12.5.7 Inspection and Survey.

12.5.7.1 Visual Sighting. Visual sighting is generally the most common survey technique for occasional pests such as crickets, centipedes or scorpions. Generally these sightings will be in response to customer complaints. Some pests visually modify their habitat and provide a characteristic indicator. Examples are the web of a black widow, the raised ant hill of fireants, or the umbrella shaped nests of paper wasps. A flashlight and probing tool, such as a awl, will be helpful in searching known or suspected nesting sites.

12.5.7.2 Flushing. If labelled for the sight, a short burst of aerosol containing a flushing agent (generally pyrethrum) can be injected into suspected harborages. After waiting a few seconds the pests become disturbed by the flushing agent and come crawling out.

12.5.7.3 Trapping. Many of the household pests such as earwigs and ground beetles are nocturnal. Visual sightings are infrequent. With such pests, sticky traps placed in strategic locations will trap them. Sticky traps are also excellent tools for determining if acceptable levels of control have not been achieved.

12.5.8 Control Methods.

12.5.8.1 Non-Chemical Control. For all household pests the primary non-chemical control method is exclusion by limiting the number of places of entry. Another method is to limit the indoor harborage areas by caulking and sealing as many openings as possible. Removing debris such as leaf litter, old mulch, etc. from around foundations reduces their desirable habitat close to the structure.

12.5.8.2 Chemical Control. Several methods of pesticide application may be used to control household pests. They may be used separately or in combination. The PCQAE should require a copy of the label and MSDS for all pesticides a contractor intends to use. The PCQAE should then ensure that pesticides are used for intended pests in accordance with label instructions.

- **Barrier Treatments.** Barrier treatments are covered in this chapter, section 12.3.3.2. Barrier treatments are effective for outdoor occasional nuisance pests which invade dwellings.
- **Residual Outdoor Control.** Control of outdoor pests which occasionally invade homes is covered in this chapter, section 12.3.3.2.
- **Residual Indoor Control.** Residual treatment involves the placement of a pesticide so that it will be effective for a period of time after application. Some pesticides last only a few days while others may be effective for several months. Most household pests are rather secretive and will make their nests and resting places in cracks and crevices rather than in open areas.

  It is most important that pesticides be placed where the greatest contact with the pests will be made. Pesticide applications should be concentrated in cracks and crevices of known or suspected harborages. Residual treatments may be applied in several different formulations. The formulation selection should be dependent on pest and location.

12.6 OCCUPANT CONSIDERATIONS. Household pest control utilizes pesticides in proximity to occupants. This PROXIMITY is cause for concern. The pesticide is generally applied indoors, thus ventilation becomes a big consideration. The chances of human exposure are quite real.

All excessive applications or spills must be dealt with immediately (Chapter 7). It is vital to use the correct equipment for the job (Chapter 9). Food stuffs must not be contaminated.

COMPLETE NOTES including the completion of all report forms (Chapter 10) should be executed. It is inevitable that complaints about odor, or pesticide sensitivity will happen. Your notes will be the best way of finding solutions to these problems.

12.7 RECORDS AND REPORTING. One NAVFAC form 6250/2 (indoor) or 6250/3 (outdoor) should be used for each pest management operation performed at each unit, building, structure, or outdoor area. If more than one pest, procedure, or control agent are involved in a specific pest management operation, then a separate form must be completed for each. After a record is completed the bottom (yellow) copy should be retained at the installation as a daily legal record of pesticide usage, and as a maintenance record. The back of the yellow copy may be used to record additional details about the operation. If a inspection report, graph, and treatment specification is submitted by the contractor, then they shall be permanently attached to the yellow copy. Warranty certificates should also be attached to the yellow copy.

At the end of the month all of the top copies are assembled and submitted to your Command PMC. The PCQAE should review records on a regular basis to ensure that records are completed and submitted in accordance with contract specifications.

CHAPTER 13. STRUCTURAL PEST CONTROL

Section C.6 of FAR - PWS. Control of wood destroying organisms is normally included as indefinite quantity items in Section B of the FAR-PWS. Contractor certification for structural pest control is in EPA Category 7 (Industrial, Institutional, Structural and Health Related Pest Control). Some states may require separate certification in termite control, fumigation or in other categories. Check with your state agency, or Command PMC for correct category certification requirements.

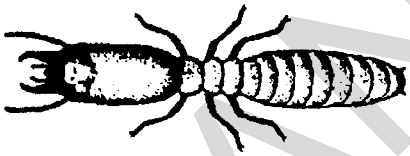
In this chapter, four (4) groups of structural pests will be covered: (1) Termites, (2) Beetles, (3) Carpenter ants and carpenter bees and (4) Wood decay organisms.

13.1 TERMITES. Termites are social insects with a well defined caste system. They are capable of inflicting severe damage to wooden structures. Three different types of termites may be encountered at military installations: (1) subterranean termites, (2) dampwood termites and (3) drywood termites.

13.1.1 Pest Identification.

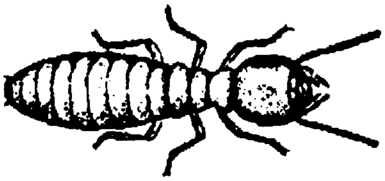
13.1.1.1 Subterranean Termites. These are prevalent throughout the world and include many different species. All subterranean termites have a common need to maintain body moisture because they have a thin exoskeleton and are subject to desiccation, or water loss. Generally this means constant contact with the soil. Sometimes other continuously moist mediums are used.

TERMITE QUEEN



TERMITE SOLDIER

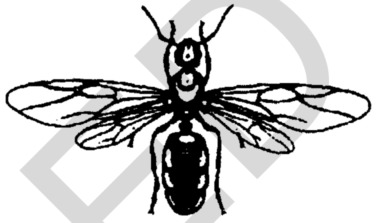
Contact with the soil is usually accomplished by constructing mud tubes or tunnels from the soil to the wood on which they feed. A subterranean termite colony includes a reproductive queen and king, who generally remain underground, soldiers with enlarged heads who defend the colony from invasion by other insects, and workers who will travel back and forth to feed on the wood and return to the colony to care for the remaining members. Termite workers are pearly white. They will normally be found in mud tunnels or sheltered areas working their way in wood but seldom if ever penetrating the surface of the wood. The colony queen continuously lays eggs.



TERMITE WORKER

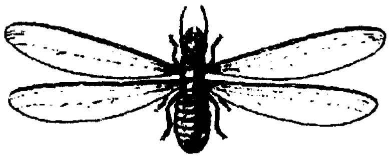
In a well established colony, overpopulation will result in the production of adults which are capable of reproduction. These individuals are commonly called "swarmers". Their mating activities generally occur in the spring. The reproductives are ant-size, black in color, and winged. The new reproductives are capable of a short mating flight during which new colonies may be established if a newly mated female encounters soil and a ready supply of wood nearby.

13.1.1.2 Reproductive Adult Termite Identification. Quite often, termite swarming has been reported only to find that flying ants were really seen. The reproductive termite is distinguished from a flying ant in three different ways (Figure 13-1).



ANT

- The body of the ant has a definite pinched waist. The termite body is straight from the thorax to the abdomen.
- The ant has two pairs of wings in which the front pair are notably larger than the hind pair and are shaped differently. The termite has two pair of wings that are identical in size and shape.
- Ants have antennae that are distinctly elbow shaped, or with a right angle bend. Termite antennae are straight.



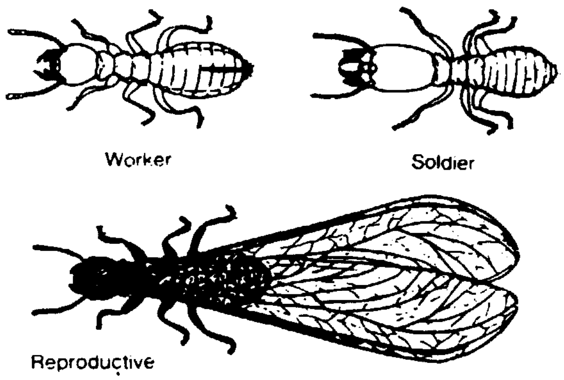
TERMITE

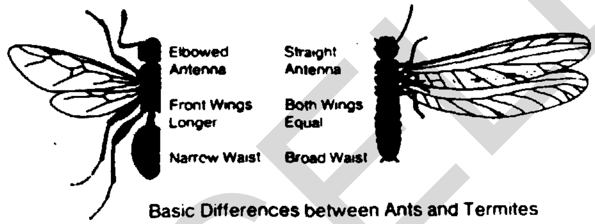
13.1.1.3 The Formosan Termite. Like many introduced pests, this one has gained notoriety in a short time. Being fairly common in Asia and throughout the Pacific Islands, entry into the United States mainland was only a question of time. They are spreading throughout the southern coastal states from California to Florida. The formosan termite is a subterranean termite that will develop aerial colonies in aboveground wood. This termite is capable of developing very large colonies in a very short time.

13.1.1.4 Dampwood Termites. This group contains some of the largest termites. The bodies may be as long as one inch. Unlike the subterranean termites, dampwood termites do not use contact with the soil to maintain body moisture. Wood with a high moisture content is required. They plug the openings of their galleries to keep the humidity high. This termite is found along the Pacific coast from British Columbia to Mexico and on the southeastern seaboard. Generally speaking, this group does minor damage.

13.1.1.5 Drywood termites. These are normally confined to southern coastal regions from North Carolina south to Florida and southwest to Texas, and in the southern part of California. The drywood termite is also found in the Caribbean and Pacific Islands, and in particular, Hawaii. The drywood termite is capable of completing

Subterranean Termites





Basic Differences between Ants and Termites

SUMMARY OF IMPORTANT WOOD-INFESTING INSECTS

Insect Pest	Identifying Characteristics	Damaging Stage	Characteristics of Damage	Preferred Woods	Life Cycle	Control	
						Chemical	Other
Subterranean Termite	4 wings of = size and shape; no x-vein between costa and subcosta veins.	Worker	Softwood layers eaten; galleries plastered with mud.	Softwoods	Species dependent.	Soil, foundation and wood treatment.	Good building practices and mechanical alteration.
Dry-wood Termites	Cross veins between costa and subcosta.	Nymph	Galleries cut across wood grain; large clean chambers connected by small tunnels. Numerous small fecal pellets.	Softwoods	Species dependent.	Fumigation.	Good building practices.

Figure 13-1
Wood-Destroying Pests

its entire life cycle in wood without maintaining any contact with the soil. The reason for this is that they have a lower moisture requirement than the dampwood or subterranean groups. This group of termites has smaller colonies. They are not as destructive as subterranean termites but can do serious damage.

13.1.2 **Inspection and Survey.** Most inspections for wood destroying organisms will involve the use of a flashlight, a wood probing tool such as a screwdriver or awl and a hammer. Likely areas of infested wood should be probed. If the probe enters the wood freely, there is a problem.

Sounding of the wood is performed by striking it sharply, at various locations, with a hammer, to determine if it has a solid, healthy ring. A "punky" sound would indicate interior damage.

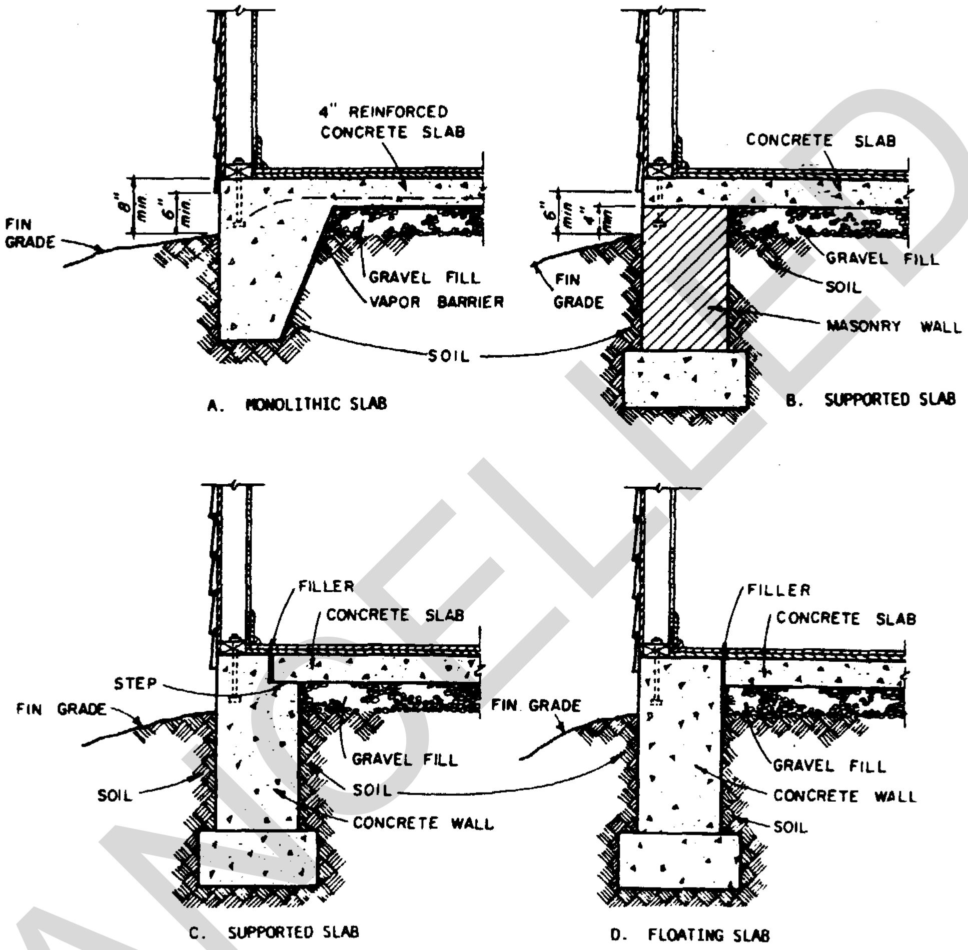
The inspector may use a stethoscope or other high gain electronic auditory device to listen for termites. Visual inspection using a flashlight in conjunction with probing, sounding and auditory devices are an effective means of detecting termite infested wood. Sometimes "background noise" interferes with the use of auditory devices.

The use of a borescope is becoming more popular among pest controllers. This tool allows them to see into cracks, or voids which could otherwise not be inspected.

Moisture meters are frequently used. If wood has a moisture content above 20%, then conditions within the wood are conducive to some beetle and fungal attacks. If the moisture content is below 20%, the list of pests which will invade the wood searching for food and harborage is considerably less.

Termite detecting dogs are sometimes used. They are effective at locating termite infestations on military installations.

13.1.2.1 Subterranean Termite Inspection. Inspect the exterior foundation wall for evidence of termite tunnels emerging from the soil. Inside, the inspection should begin at the lowest level in the structure. With structures constructed on slab-on-grade, the PCQAE should be familiar with the different types of slab (Figure 13-2) to understand possible points of termite entry, and later, for control work. The inspection should include all exposed wood material, especially wood in contact with the structural foundation, and in contact with the soil. The inspection should concentrate on wood near exterior dirt filled porches, near plumbing, and wherever leaks may occur. The inspector should probe and then sound all exposed wood. The inspector should also note if ventilation in crawl spaces is adequate.



Expansion joints of C and D are particularly vulnerable to termite entry (USDA)

Figure 13-2
Concrete Slab-on-Ground Construction

Attachments 13-A1 through 13-A3 show points of structural attack by termites. The inspector should then move upward in the building through living quarters and occupied spaces, checking baseboards and any exposed lumber, then working on up into the attic. The inspector should also look for signs of blistered or peeling paint, or discoloration, which may be indicative of an infestation.

13.1.2.2 Aboveground Termite Inspection. Formosan termites, dampwood termites, and drywood termites are all capable of building nests aboveground. If your activity is in a geographic area where these pests are reported, or your activity borders a known infested area, then thorough checking of aboveground wood structure is necessary. The same principles are used (ie: flashlight, probe, and sounder).

13.1.2.3 Drywood Termites. Drywood termites keep their galleries very clean. They push their debris out of the entrance holes, then replace the moisture-saving plug. The result is a pile of frass and grooved pellets under these entrance/exit holes. The pellets have a very distinct raisin shape.

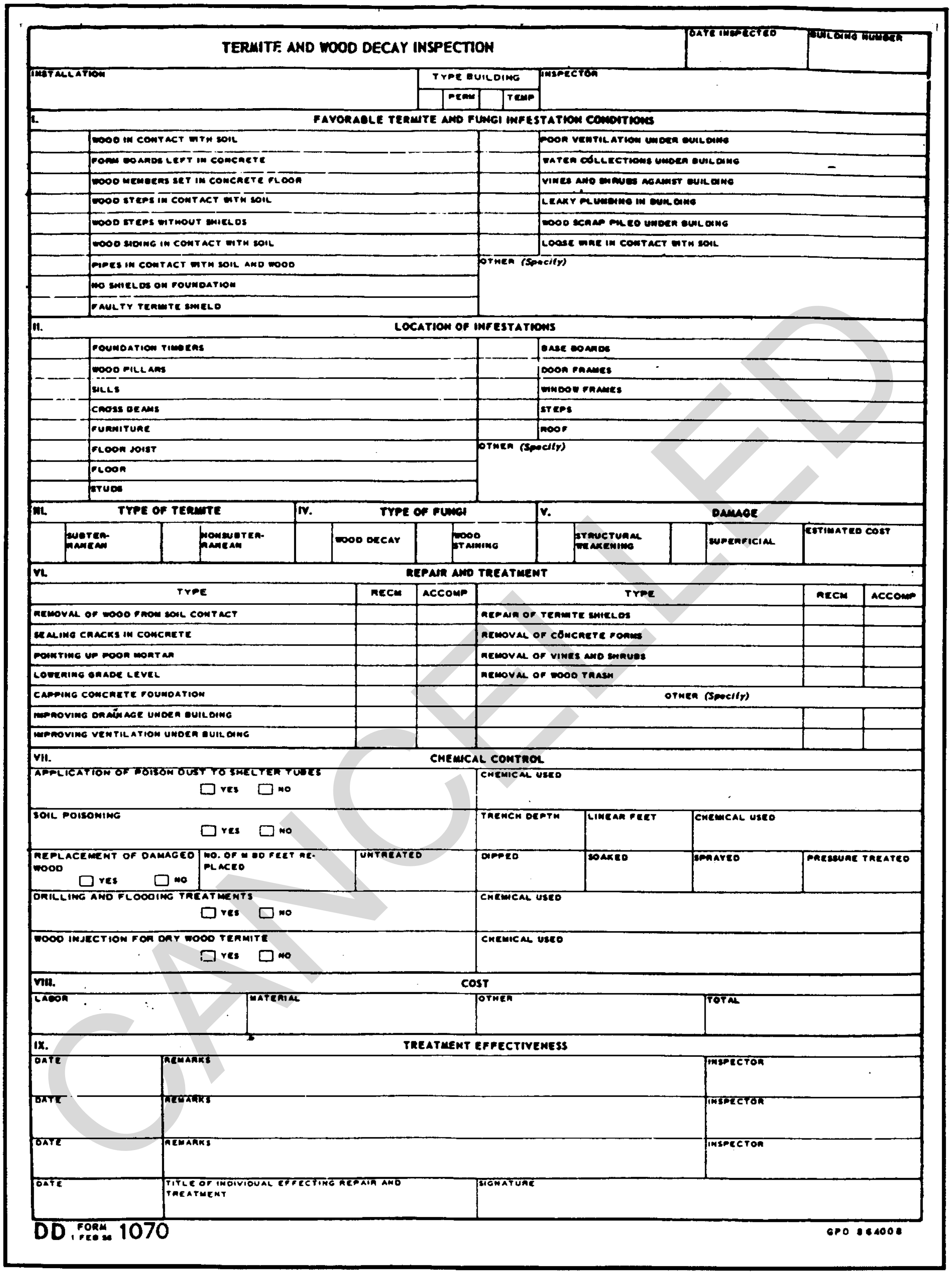
13.1.2.4 Dampwood Termites. Unlike the drywood termite, the dampwood termite has galleries filled with frass. Their pellets can be found throughout the colonies, however some six-sided pellets are ejected. The wood must have a high degree of moisture. Generally, wood decay is present as well because of this high moisture content.

13.1.2.5 Formosan Aboveground Nests. Detection of aboveground nests of the formosan termite is essentially the same as other aboveground nests. Shed wings from reproductives, blistered wood or paint on the wood (indicating galleries underneath) and the plugged exit/entrance holes are indicators to search for.

13.1.3 Inspection Reports. A written report should be made immediately following each inspection. To be of value, the report must include sufficient detail for anyone not present at the inspection to understand exactly what was found. The inspector may use inspection forms such as DD Form 1070 (Figure 13-3) or VA, FHA, or similar reports (Attachment 13-A4). A diagram or graph should accompany the inspection report, indicating all sites where damage and/or pest infestations or decay are located. Attachment 13-A5 is a typical graph indicating points of infestation, damage, and also treatment recommendations. Sometimes the inspection report will indicate treatment methodology as in Attachment 13-A6.

13.1.4 Control Methods.

13.1.4.1 Non-Chemical Control. Various methods are used to reduce the occurrence of wood destroying organisms. The most notable is to reduce the moisture content of wood. This is done by ensuring adequate ventilation and by erecting



TERMITE AND WOOD DECAY INSPECTION	DATE INSPECTED	BUILDING NUMBER

INSTALLATION	TYPE BUILDING		INSPECTOR
	PERM	TEMP	

I. FAVORABLE TERMITE AND FUNGI INFESTATION CONDITIONS

	WOOD IN CONTACT WITH SOIL		POOR VENTILATION UNDER BUILDING
	FORM BOARDS LEFT IN CONCRETE		WATER COLLECTIONS UNDER BUILDING
	WOOD MEMBERS SET IN CONCRETE FLOOR		VINES AND SHRUBS AGAINST BUILDING
	WOOD STEPS IN CONTACT WITH SOIL		LEAKY PLUMBING IN BUILDING
	WOOD STEPS WITHOUT SHIELDS		WOOD SCRAP PILED UNDER BUILDING
	WOOD SIDING IN CONTACT WITH SOIL		LOOSE WIRE IN CONTACT WITH SOIL
	PIPES IN CONTACT WITH SOIL AND WOOD	OTHER *(Specify)*	
	NO SHIELDS ON FOUNDATION		
	FAULTY TERMITE SHIELD		

II. LOCATION OF INFESTATIONS

	FOUNDATION TIMBERS		BASE BOARDS
	WOOD PILLARS		DOOR FRAMES
	SILLS		WINDOW FRAMES
	CROSS BEAMS		STEPS
	FURNITURE		ROOF
	FLOOR JOIST	OTHER *(Specify)*	
	FLOOR		
	STUDS		

III. TYPE OF TERMITE				**IV.** TYPE OF FUNGI				**V.** DAMAGE				
	SUBTERRANEAN		NONSUBTERRANEAN		WOOD DECAY		WOOD STAINING		STRUCTURAL WEAKENING		SUPERFICIAL	ESTIMATED COST

VI. REPAIR AND TREATMENT

TYPE	RECM	ACCOMP	TYPE	RECM	ACCOMP
REMOVAL OF WOOD FROM SOIL CONTACT			REPAIR OF TERMITE SHIELDS		
SEALING CRACKS IN CONCRETE			REMOVAL OF CONCRETE FORMS		
POINTING UP POOR MORTAR			REMOVAL OF VINES AND SHRUBS		
LOWERING GRADE LEVEL			REMOVAL OF WOOD TRASH		
CAPPING CONCRETE FOUNDATION			OTHER *(Specify)*		
IMPROVING DRAINAGE UNDER BUILDING					
IMPROVING VENTILATION UNDER BUILDING					

VII. CHEMICAL CONTROL

APPLICATION OF POISON DUST TO SHELTER TUBES ☐ YES ☐ NO			CHEMICAL USED	
SOIL POISONING ☐ YES ☐ NO		TRENCH DEPTH	LINEAR FEET	CHEMICAL USED
REPLACEMENT OF DAMAGED WOOD ☐ YES ☐ NO	NO. OF M BD FEET REPLACED	UNTREATED	DIPPED	SOAKED
			SPRAYED	PRESSURE TREATED
DRILLING AND FLOODING TREATMENTS ☐ YES ☐ NO			CHEMICAL USED	
WOOD INJECTION FOR DRY WOOD TERMITE ☐ YES ☐ NO			CHEMICAL USED	

VIII. COST

LABOR	MATERIAL	OTHER	TOTAL

IX. TREATMENT EFFECTIVENESS

DATE	REMARKS	INSPECTOR
DATE	REMARKS	INSPECTOR
DATE	REMARKS	INSPECTOR
DATE	TITLE OF INDIVIDUAL EFFECTING REPAIR AND TREATMENT	SIGNATURE

DD FORM 1 FEB 56 1070

GPO 864008

Figure 13-3
Termite and Wood Decay Inspection Form (DD Form 1070)

moisture barriers between the soil and the wood. Termite detection can be enhanced by the use of termite shields.

Most important in the control of termites is to eliminate soil-wood contact, or near contact, by erecting concrete barriers between wood and soil, and removing any wood debris from around the foundation of the structure.

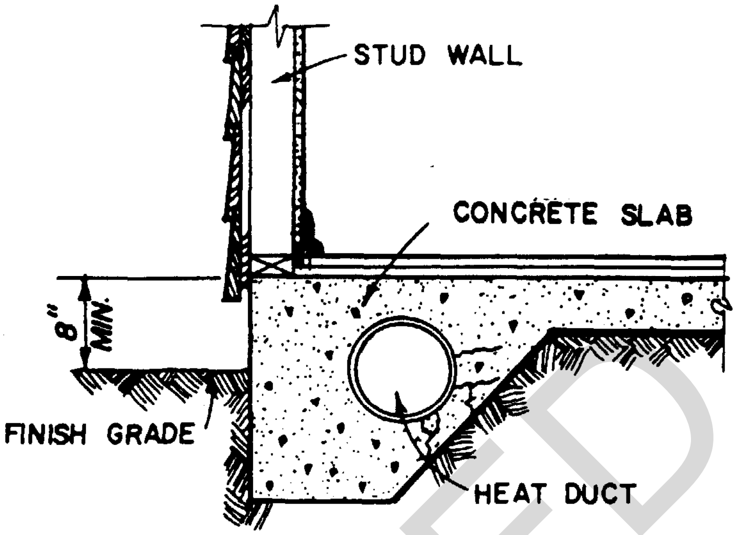
13.1.4.2 Chemical Control. (Note: Chemical control of termites in structures with sub/intra slab heating or ventilation ducts (Figure 13-4) is prohibited by the DoD)

SUBTERRANEAN TERMITES.

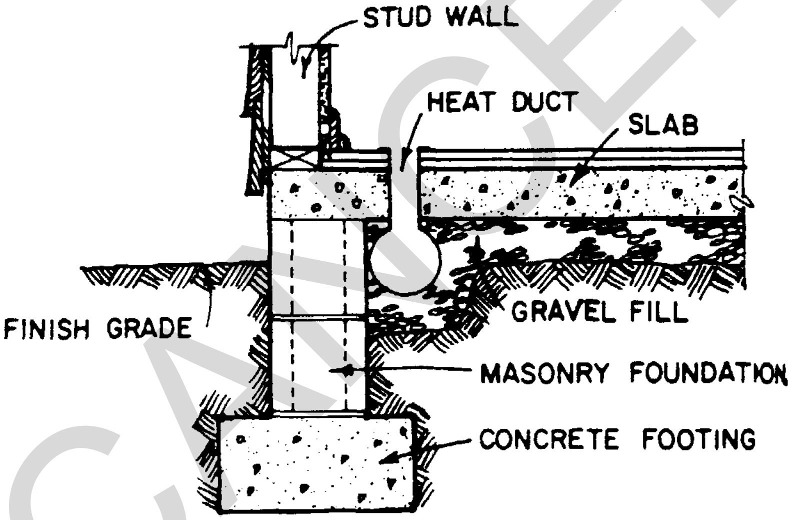
- **Post-Construction.** Termite control requires specialized power equipment to inject pesticide into the soil to establish a chemical barrier between the soil and wood (Attachments 13-A7 to 13-A9). For a termiticide treatment to be effective, it must form a continuous barrier at or near all possible termite entry points. In an existing structure, this may require drilling through concrete wherever termites will enter such as along expansion joints, around foundation piers, and around points of entry for electrical or plumbing conduits. The work may also require drilling into hollow block foundations and in veneer spaces between brick and foundation walls. All drilling through concrete should be done on 8-12 inch centers to allow for continuous spread of termiticide beneath the slab. The termiticide is injected into all void spaces and beneath slab foundations adjacent to the expansion joints and other areas mentioned. Termiticide is also injected into the soil around the outer perimeter of the building adjacent to the structure. Wherever a concrete structure, such as a patio or a porch, adjoins a building it must be drilled approximately every 12 inches. Termiticide is then injected to maintain a continuous chemical barrier around the building.

  Termiticide should be applied in accordance with label directions and the maximum label rate should be used. To ensure a proper rate of application, the contractor must use a flow meter at the nozzle end of the hose line.

  Sometimes a labeled pesticide may be applied as a dust or aerosol into termite tubes or galleries of subterranean termites. Such efforts only provide a minimum measure of control and should not be accepted as a total control method.



A. Heat duct imbedded in monolithic slab with cracks allowing termite entry (NPCA)



B. Heat duct under supported slab where joint around duct opening allows termite entry (NPCA)

Figure 13-4
Sub/Intra-Slab Heating and Air Conditioning Ducts

- **Pre-Construction**. The most effective termite treatment is the application of a termiticide before a structure is constructed, commonly referred to as pre-treatment. Just prior to the pouring of a concrete slab, the operator should apply a termiticide to all of the soil surface to be covered by the slab. In addition, the areas around foundation walls, pipes, and other outlets should be treated thoroughly in accordance with the label. NAVFAC Guide Specification NFGS-02284, Soil Treatment For Subterranean Termite Control, should be used for pre-treatment applications.

ABOVE GROUND TERMITE CONTROL.

- Whenever drywood or dampwood termites are present, or when formosan termites become established above the soil line, structural fumigation is the only acceptable method of control.

13.1.5 Fumigation. Fumigation may involve an entire structure or several items of furniture in a localized chamber. In either regard, fumigation may present considerable hazard to the pest control operator and/or personnel near the area if it is done incorrectly. For this reason, it is essential that the contractor be experienced in the complete fumigation process.

Different fumigants affect different aboveground termite groups differently. Considering the large expense involved in this type of operation, it is essential that the proper fumigant be used. If you are unsure that the contractor is using the proper fumigant, contact your Command PMC.

13.1.5.1 Preparation. Building fumigation entails the encompassing of a structure with a plastic or a plasticized tarpaulin that will be "sealed" at the soil line with sand or water snakes. These are long tubes from 2 to 4 inches in diameter that are filled with sand or water that will weigh the tarp down against the soil. Whenever several tarps are required to cover a structure they may be joined by rolling a seam several times and then fastening the rolled seam with heavy clamps placed at frequent intervals. Another method of sealing is to tape joints with a heavy impervious tape.

In order to keep the tarpaulin from blowing about, the contractor should evacuate as much air as possible by using a fan to exhaust air prior to sealing the tarp to the ground. This will usually suck the tarp against the structure. Just prior to the injection of the gas the QAE together with the certified applicator should inspect the tarp to ensure it will be gas tight. All necessary precautions should also be taken to ensure that all living non-target organisms and other sensitive materials were removed.

13.1.5.2 Gas Application. A fumigant gas, either methyl bromide or sulfuryl fluoride, is then injected into the structure, from a tank outside the structure. While the gas is being introduced into the building, previously installed fans should be running to assist in circulating the gas. These gasses are heavier than air, therefore it should be released at the upper levels and the fans should blow in an upward direction circulating the gas throughout the structure.

NOTE: The gas should only be released by a certified applicator and at the rate specified by the label.

The amount of gas released, in pounds, is indicated by a scale on which the tank has been placed. After the proper amount of gas has been introduced, the contractor should install warning signs on all sides of the structure to keep people from entering the structure. The signs should have the name of the gas, and emergency phone numbers of the fumigator, police and fire departments.

NOTE: All fumigations on military installations should require that the fumigation site be under guard for the duration of the fumigation.

13.1.5.3 Under Guard. The guard's role is to prevent humans or animals from entering the structure while under fumigation. The certified fumigator should issue instructions to the guard. The PCQAE should be present while the instructions are being issued to ensure that the guard understands that absolutely no one is to enter the structure until the certified operator certifies the structure free of gas. The guard should be issued emergency safety equipment, including a gas mask or self-contained breathing apparatus, with instructions for their use, only for emergency purposes if the structure must be entered. The only reason a guard will ever have to enter a building is if someone accidentally entered the structure and must be removed to safety. At no other time, and for no other reason, should a guard enter a building under fumigation.

13.1.5.4 Completion. After the instructions have been completed, the PCQAE's presence is not required until the gas concentration readings are taken. These are usually specified in the contract and the PCQAE should arrange with the certified applicator for the times at which readings will be taken. The PCQAE should arrange to return at all concentration readings to ensure that the correct amount of gas is retained for the entire fumigation period.

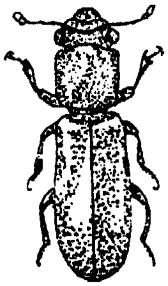
The PCQAE should also be present during aeration of the structure. The PCQAE should be at the site after the tarp has been removed and the building sufficiently aerated at which time the certified operator should make a thorough inspection of the interior of the building, including gas readings. Only the certified operator can certify that the structure is free of the gas. All equipment and debris should be removed and the site should be returned to its original condition to complete the job.

13.2 WOOD DESTROYING BEETLES. There are two groups of beetles which cause structural damage: (1) Powder post beetles and (2) Round headed boring beetles. Attachment 13-A10 is a summary of wood destroying beetles.

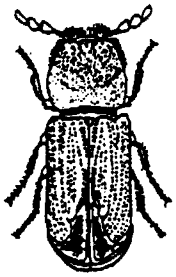
13.2.1 Pest Identification.

13.2.1.1 Powder Post Beetles. These insects include three closely related families of small beetles from 1/12 to 1/5 inch in length which leave round exit holes in the wood they have inhabited. These exit holes, resembling buckshot damage, range from 1/16 to 1/8 of an inch in diameter (Figure 13-5). The life cycle of these beetles is usually completed within a year. The beetles get their common name from the fact that their larvae reduce wood to a powder like substance.

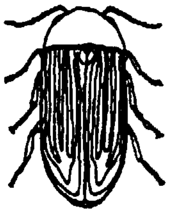
- **Lyctids.** These are the true powder post beetles. The adults lay their eggs in the pores of wood. The larvae bore into the wood as soon as they hatch. The larvae live in the wood, creating galleries as they eat the wood. When the larvae are nearly full grown, they bore near the surface of the wood and pupate. The adults bore to the surface and exit. They push a fine powdery sawdust out of the hole as they exit. Lyctids prefer the sapwood of hardwoods.


LYCTID

- **Bostrichids.** The false powderpost beetles are of lesser economic importance than the other two powder post groups. Most of the woods attacked are not of the grade used for trim, floorboards and woodwork, however they will attack both hardwoods and softwoods. They generally do not infest wood after it is seasoned. The adults bore into the wood to lay their eggs. The larvae grow to be larger than the other two groups , thus the entrance/exit holes are also larger. The holes do not contain frass, but the galleries do.


BOSTRICHID

- **Anobiids.** The furniture and the deathwatch beetles are two representatives of this group. Anobiids lay their eggs in the cracks and crevices of seasoned wood. The larvae tunnel into the wood where they live for a year or more. They end their larval cycle similar to the Lyctids.


ANOBIID

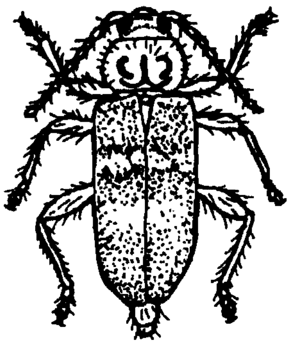
The adult beetles are small (1/4"), with the larvae somewhat larger (up to 1/2"). Anobiids infest all types of seasoned wood, being a more serious pest of softwood sapwood. Thus framing lumber (pine) is a prime target. The frass is characterized by bun shaped pellets within the mass.

Shape and Size (inches) of Exit or Entry Holes	Wood Type	Age of Wood Attacked	Appearance of Frass in Tunnels	Insect Type	Reinfests
round 1/50-1/8 • ●	softwood & hardwood	new	none present	ambrosia beetles	no
round 1/32-1/16 • •	hardwood	new & old	fine, flour-like, loosley packed	lyctid beetles	yes
round 1/16-3/32 • ●	bark/sapwood surface	new	fine to coarse, bark colored, tightly packed	bark beetles	no
round i/16-1/8 • ●	softwood & hardwood	new & old	fine powder and pellets, loosely packed; pellets may be absent and frass tightly packed in some hardwoods	anobiid beetles	yes
round 3/32-9/32 ● ⬤	softwood & hardwood (bamboo)	new	fine to coarse powder, tightly packed	bostrichid beetles	rare
round 1/6-1/4 ● ⬤	softwood	new	coarse, tightly packed	horntail or woodwasp	no
round 1/2 ⬤	softwood	new & old	none present	carpenter bee	yes
round-oval 1/8-3/8 ● ⬤	softwood & hardwood	new	coarse to fibrous, mostly absent	round-headed borers	no
oval 1/8-1/2 ● ⬤	softwood & hardwood	new	sawdust-like, tightly packed	flat-headed borers	no
oval 1/4 ● ⬤	softwood	new & old	very fine powder & tiny pellets, tightly packed	old house borer	yes
flat oval 1/2 or more or irregular surface groove 1/8-1/2 wide	softwood & hardwood	new	absent or sawdust-like, coarse to fibrous;tightly packed	round or flat headed borer, wood machined after attack	no

Figure 13-5
Key to Identification of Wood-Boring Insects

13.2.1.2 Round Headed Boring Beetles.

- **Old House Borer.** The old house borer is the most common structural pest of the round headed borers and the only one which commonly infests houses and other structures. The adult beetle is from 5/8 to 1 inch long and flattened. The Old House Borer is brownish black in color with many gray hairs on its body. The larval stage, which may take 3 - 12 years, is the destructive stage because it feeds on the interior of the wood.



OLD HOUSE BORER

The adults of this group lay their eggs in cracks and crevices of rough-sawn timbers. The larvae hatch and bore into the lumber which then may be used for construction. 2-3 years later, after extensive galleries have been hewn out in the seasoned softwood, the damage may be noted.

The larva comes near the surface when it is ready to pupate. Adults then emerge and leave a large oval shaped hole. The emergence hole may be from 1/8 to 1/2 inch in width. Because the old house borer prefers rough-sawn timber as an egg laying sight, reinfestation usually does not occur because the wood is dry. This insect is found primarily in the Atlantic States, although it has been found as far west as Louisiana and Minnesota.

13.2.2 **Inspection and Survey.** Inspection for beetles uses the same tools as those used for termite inspections (ie: a flashlight, probe, and sounder). Structurally "soft" wood which has been infested by beetle larvae will generally be accompanied by exit/entrance holes, and sawdust/frass leavings. The sawdust will range from a very fine powder to very coarse fragments. The inspector may use a stethoscope to listen for larval beetles feeding in wood. The inspector should move from the basement upwards in the building through living quarters and occupied spaces, checking baseboards and any exposed lumber, then working on up into the attic. The inspector should also look for signs of blistered or peeling paint, or discoloration, which may be indicative of an infestation. The inspector may use a moisture meter to determine moisture content of the wood. Moisture content in excess of 20% will be conducive to fungal development and powder post beetle infestation. The inspector should also note if ventilation in crawl spaces is adequate.

13.2.3 Control Methods.

13.2.3.1 Non-Chemical Control. Reduction of the moisture content of wood is extremely helpful in controlling some beetles as some of them cannot digest cellulose directly and must rely on the help of fungus infestations to break down wood for digestion. Reduction of wood moisture content below 20% is usually sufficient to control powder-post beetle infestations and will also limit the spread of wood destroying fungi. If the infestation is localized (likely with old house borer), then removal and replacement of the infested timber is indicated.

If the wood infesting beetle infestation is small, and it is a species which characteristically does not reinfest seasoned structural timbers or valuable seasoned trim and furniture, then it may be best to let the insect complete it's life cycle without employing any control strategy.

13.2.3.2 Chemical Control.

- **Lyctids.** If inspection has revealed the presence of true powder post beetles, then infestation is basically limited to hardwoods. In this case, a thorough application of a residual insecticide to all hardwood surfaces may be indicated. The difficulty lies in getting the insecticide to the target organisms. If the galleries can be located, then injection of insecticide directly into them will be helpful. If the galleries are not filled with frass, dusts would be effective. Since the larvae may not be reached by the insecticide, and the exit holes will mar valuable hardwood finishes, surface coatings at low pressures may not do the job. Furniture and other finished woods will require oil based products so as to not spot the finish. Unfinished hardwoods will experience better penetration by using water based products. When insecticidal sprays will be ineffective, then fumigation is called for.
- **Anobiids, Bostrichids and Old House Borer.** Generally, it is difficult to establish which species of beetle is causing the damage (if only one) and also the full extent of the infestation. In this case, all woods near the infestation are suspect. Insecticidal sprays to wood surfaces may be effective at controlling species which inhabit structural timber. If the galleries can be located, pesticide injected directly into them will generally yield results. Generally, water based insecticides work better on seasoned softwood because the penetration of the wood by the insecticide is superior to oil based emulsions. A fan spray at low pressure can be used, or the insecticide can be applied using a soft paint brush. Again, it may be necessary to fumigate as described in the termite section of this chapter.

The new borate diffusion products have shown much promise for controlling beetle infestations in unfinished lumber. Drill and injection techniques have also shown much promise at gaining control where drill holes are cosmetically tolerable. Unfinished woods, such as floor joists are ideal for these techniques.

13.3 CARPENTER ANTS AND CARPENTER BEES.

13.3.1 Pest Identification

13.3.1.1 Carpenter Ants. These are relatively large, (1/4 inch or longer), usually black, ants. They have one node (bump) in their pedicel. The reproductive forms may be larger than 1/2 inch long. Carpenter ants build their nests in wood that has begun to rot as a result of moisture and decay. The carpenter ant does not feed on wood, rather it uses it for nesting purposes. They do not require soil contact as do termites. Carpenter ant damage may be distinguished from termite damage in wood by the differences of the galleries. Carpenter ant tunnels are clean looking, as if they had been sanded whereas termite galleries are usually filled with mud or sawdust.

13.3.1.2 Carpenter Bees. Carpenter bees closely resemble a bumble bee except that it has a shiny surface on top of its abdomen. The carpenter bee is a solitary insect that bores into soft untreated or unpainted wood such as pine or fir. The entry hole looks very much as if it were drilled with a bit about as wide as a pencil. Carpenter bees seldom sting people.

13.3.2 Inspection and Survey. The first step is to determine where the ants or bees have been found. An interview of the building occupants will generally reveal much useful information. It is very important to find the nest location(s).

13.3.2.1 Carpenter Ants. The use of non-toxic baits is a very effective tool for carpenter ant survey. Some survey bait items are listed in Chapter 12. Map the premises and note the locations of the baits and how many ants are captured each day. Notations of ant sightings (foraging ants) should be made on the map to try to locate the nests.

Carpenter ant galleries are cut with the grain of the wood and the galleries are kept very clean resulting in conical piles of wood fragments, bits of soil and sand, portions of insects, and other debris located outside the openings to the nest.

13.3.2.2 Carpenter Bees. The entrance hole to carpenter bee galleries is not too difficult to locate. Some common sites are wood siding, eves, soffit, window sills and outside wooden trim. Softer woods which are unpainted or weathered are preferred. Typically, yellowish excrement stains can be seen located under the entrance hole.

13.3.3 Control Methods.

13.3.3.1 Carpenter Ants. Toxic baits are effective for carpenter ant control. Baits should be replaced regularly and an ample number of bait stations should be used. Since ants pass food throughout their colony, toxic baits may reach the reproductive queen and eliminate the nest. Toxic baits are necessary when the nests cannot be located or access to them is denied. If the nest can be located, a labelled insecticide injected into the nest area should gain control. Dusts are often used for nest treatments.

13.3.3.2 Carpenter Bees. Since carpenter bees prefer unpainted or weathered wood, painting of the wood should prevent reinfestation. If the wood is not painted or finished, it is likely that other insects or another generation of carpenter bees will take up residence. If control is required immediately, dusts injected into the galleries, or applications of insecticides to unpainted or weathered wood is usually effective.

13.4 WOOD DECAY ORGANISMS. Wood decay fungi are responsible for causing as much or more damage than insects. There are many different forms of fungi that can damage wood and cause decay. The QAE should realize that moisture is required for the development of fungi. Moisture will accumulate as a result of leaking water fixtures, leaking roofs or water spouts, clogged rain gutters, and even the sweating of metal windows.

13.4.1 Pest Identification. Two major types of fungus can attack wood. These are:

- surface molds, mildews, stain fungi
- rot fungi

If the color of the wood is pink, grey, green, orange or black, the cause is a surface mold. If the color of the wood is bleached out, and the wood is crumbly, then wood rot fungi are the cause. Regardless of the type of fungus, the major contributing factor is high moisture content.

13.4.2 Inspection and Survey. Like the inspections and surveys noted for other wood destroying organisms, the tools required are a flashlight, probe, and sounder. If surface mold is present, then wood may still be sound, but the conditions are conducive for wood rot fungi. The use of a moisture meter is very effective in determining if wood is or **could be** infested with fungus. A moisture content of 20% or higher is an excellent medium for growth of destructive fungal rots.

13.4.3 Control Methods. The prevention of fungal growth in a structure must begin during construction and continue through routine maintenance. The design of a building must preclude features which allow wood to remain wet.

Fungal rot can be stopped by:

- reducing the moisture content of the wood
- thorough ventilation of attics and crawlspaces

- repair of leaking roofs
- repair of leaking pipes and rain gutters
- installation of vapor barriers in crawlspaces

If moisture cannot be controlled, the application of a residual fungicide to wood surfaces is recommended.

13.5 CONTROL HAZARDS.

13.5.1 **Contamination.** Termite control work and fumigation procedures may, if not performed properly, result in contamination of structures or potable water sources. The injection of a termiticide into the soil may result in contamination of the water table that feeds into wells, or into streams, killing fish and other aquatic organisms. Termiticide may be accidentally injected into sub/intra slab heating and air conditioning ducts resulting in contamination of the ambient air. The injection of termiticides beneath slabs may result in a backup or flooding on floor surfaces. Spills must be cleaned immediately and the area decontaminated.

13.5.2 **Other Hazards.** Drilling through slabs may damage water pipes, fuel pipes, or electrical lines. If drills are not properly grounded, a termite technician can be electrocuted. Damaging electrical lines can also interrupt a critical power supply.

13.5.3 **Filling Operation Hazards.** The PCQAE should be notified when filling operations are performed. To prevent overflow, the contractor should never allow tanks to be unattended during filling. A backflow preventer which prevents termiticide from being siphoned back into a water supply must be used during all filling operations. All spills should be handled as discussed in Chapter 7.

13.5.4 **Fumigants Kill.** Fumigants kill because the gas is toxic. Unless the fumigant contains a warning agent such as chloropicrin (teargas), the gas is undetectable because it is colorless and odorless. It is extremely important that all people in the vicinity of the fumigation be made aware of the operation, and that they be warned that there should be no entry into the fumigated structure. A guard should be posted at all times to prevent entry as instructed by the certified fumigator.

13.6 CONTROL EQUIPMENT.

- hand sprayer with tips for injecting into galleries
- hand duster
- power sprayer with the following attachments:
    - rod-like soil injector nozzles

    - sub-slab injector which prevents up-welling of termiticide around the injection site
- pumps fitted with pressure gauges and flow meters
- pressure gauges may be required on the injector attachments
- maintained hoses and tanks, free of visible deterioration
- power dusters for use in crawl spaces or large voids where there is little chance of pesticide contacting occupied areas
- rotohammer drill for drilling concrete
- drill bits
    - carbide tipped
    - 1/2" to 3/4" diameter bits available long enough to drill through concrete slabs
    - smaller bits (1/4") used for drilling mortar between bricks or concrete block

13.7 FUMIGATION EQUIPMENT.

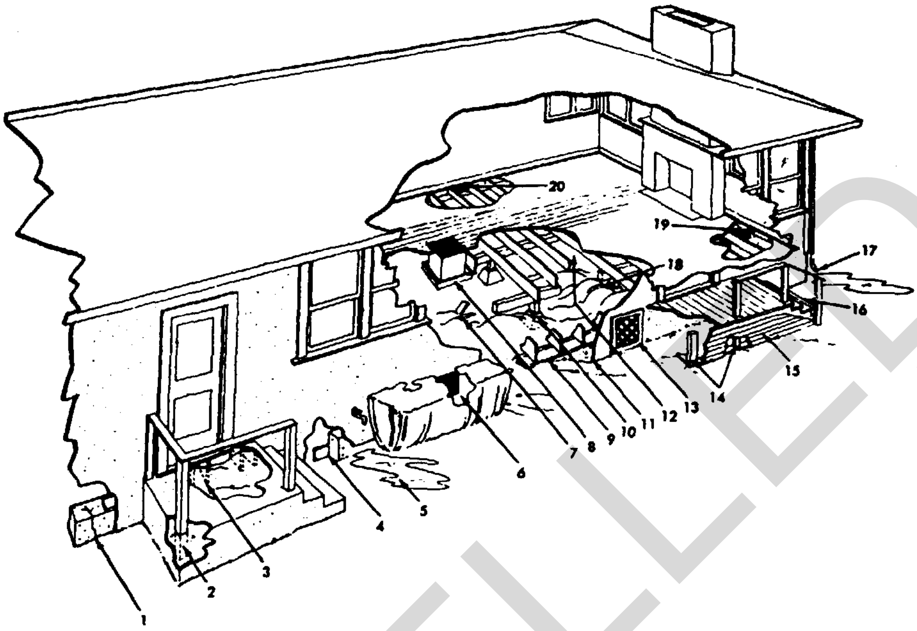
- gas tight tarpaulin of a size adequate to cover the fumigation site
- clamps to seal seams of the tarpaulin
- fumigant impervious tape for sealing seams of the tarpaulin
- sand or water snakes for sealing the tarpaulin to the ground or floor
- fans for circulation
- tubing to distribute the gas if it comes as the compressed, bottled type
- scale to measure fumigant released from bottled tanks
- aluminum pie pans if the gas is generated from pellets
- propane torch for methyl bromide fumigations leak detection
- gas concentration and detection device
- safety equipment
    - SCBA gear or gas masks
    - first aid kit
- warning placards

13.8 RECORDS AND REPORTING.

13.8.1 DD 6250/2. One blue form should be used for each pest management operation performed at each unit, building, or structure. If more than one pest, operation, or control agent is involved in a specific pest management operation, then a separate form must also be completed for each. After a record is completed the bottom (yellow) copy should be retained at the installation as a daily legal record of pesticide usage, and as a maintenance record. The back of the yellow copy may be used to record additional details about the operation. If an inspection report, graph, and treatment specification is submitted by the contractor, then they shall be permanently attached to the yellow copy. Warranty certificates should also be attached to the yellow copy.

At the end of the month all of the top (blue) copies are assembled and submitted to the Command PMC. The PCQAE should review records on a regular basis to ensure that records are completed and submitted in accordance with contract specifications.

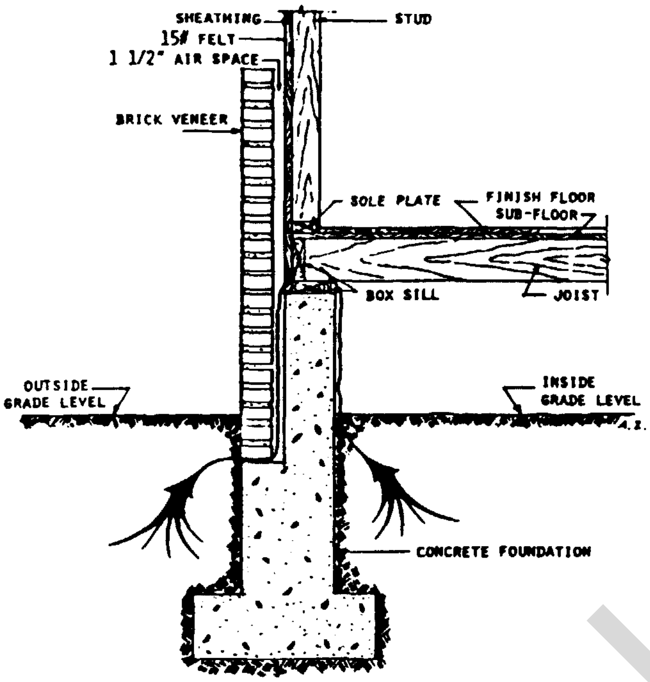
The PCQAE shall complete a separate report for each PCQAE inspection performed, including the time required for the inspection. At the end of the month the PCQAE should submit the blue copies to the Command PMC.



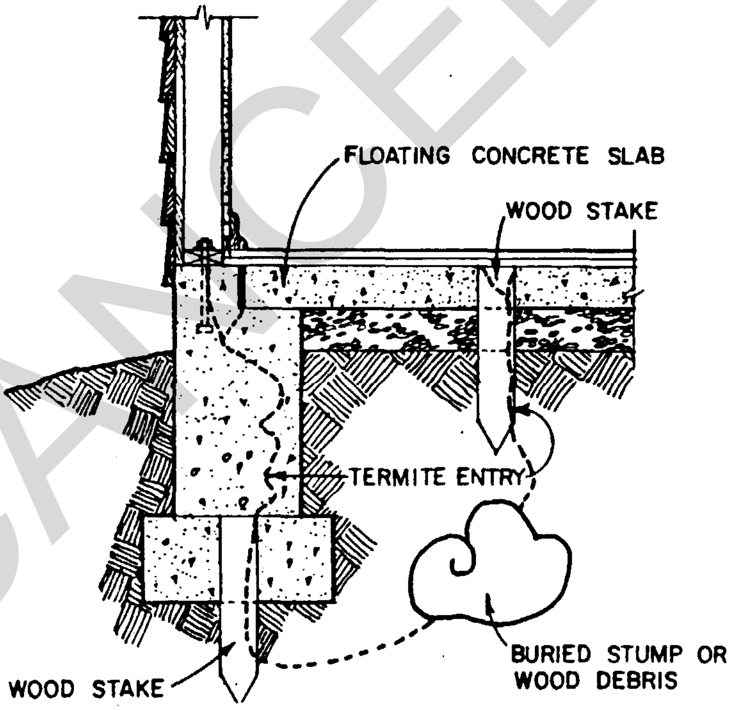
Diagrammatic Sketch of Points of Structural Attack by Termites

1. Cracks in foundation permit hidden points of entry from soil to sill.
2. Posts through concrete in contact with substructural soil. Watch door frames and intermediate supporting posts.
3. Wood-framing members in contact with earthfill under concrete slab.
4. Form boards left in place contribute to termite food supply.
5. Leaking pipes and dripping faucets sustain soil moisture. Excess irrigation has same effect.
6. Shrubbery blocking air flow through vents.
7. Debris supports termite colony until large population attacks superstructure.
8. Heating unit accelerates termite development by maintaining warmth of colony on a year-round basis.
9. Foundation wall too low permits wood to contact soil. Adding top soil often builds exterior grade up to sill level.
10. Footing too low or soil thrown against it causes wood-soil contact. There should be 8 inches of clean concrete between soil and pier block.
11. Stucco carried down over concrete foundation permits hidden entrance between stucco and foundation if bond fails.
12. Insufficient clearance for inspection also permits easy construction of termite shelter tubes from soil to wood.
13. Wood framing of crawl hole forming wood-soil contact.
14. Mud sill and/or posts in contact with soil.
15. Wood siding and skirting form soil contact. Should be a minimum of 3 inches clearance between skirting and soil.
16. Porch steps in contact with soil. Also watch for ladders and other wooden appurtenances.
17. Downspouts should carry water away from building.
18. Improper maintenance of soil piled against pier footing. Also makes careful inspection impossible.
19. Wall girder entering recess and foundation wall. Should have a 1 inch free air space on both sides and end and be protected with a moisture-impervious seal.
20. Vents placed between joists tunnel air through space without providing good substructural aeration. Vents placed in foundation wall give better air circulation.

Attachment 13-A1
Diagrammatic Sketch of Points of Structural Attack by Termites

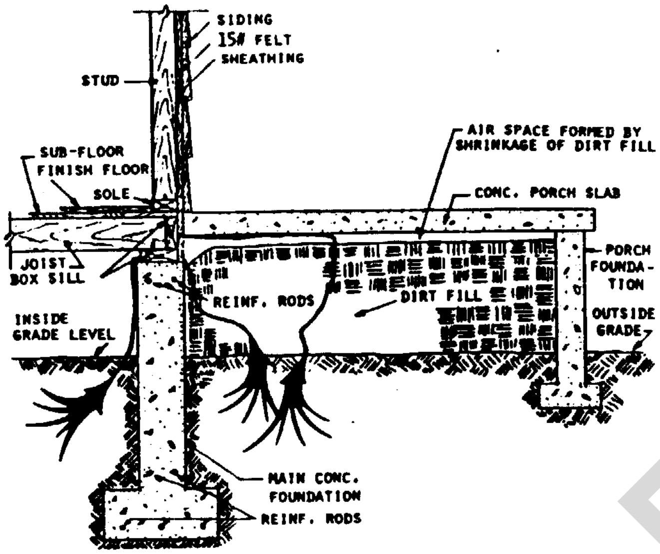


Example of impervious veneer covering wood sheathing, extending below the sheathing and below grade level (NPCA)

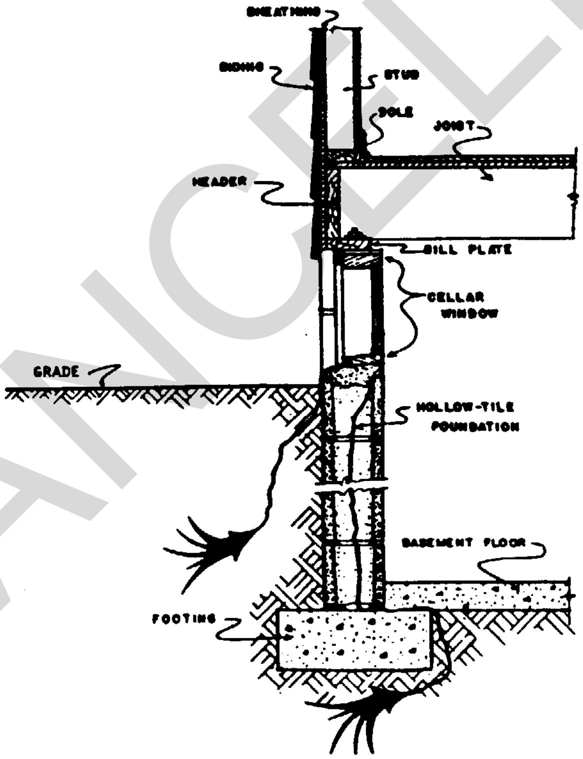


Wooden grade stake left in concrete provides entry to crack in footer

Attachment 13-A2
Conditions That Favor Termite Infestation



Dirt-filled concrete porch attached to frame house (NPCA)



Concrete block foundation with basement window

Attachment 13-A3
Conditions That Favor Termite Infestation

TERMITE INSPECTION REPORT

OWNER______________________________

OCCUPANT___________________________

ADDRESS____________________________

DATE_____________________________

OWNER'S PHONE____________________

JOB PHONE________________________

TYPE OF STRUCTURE

BASEMENT____

CRAWL____

SLAB____

COMBINATION____

FOUNDATION

CONCRETE____

STONE____

BRICK VENEER____

PIERS ONLY____

HOLLOW BLOCK OR TILE____

MULTIPLE BRICK____

SINGLE BRICK____

COMBINATION____

EXTERIOR

WOOD____

BRICK____

STONE____

HOLLOW BLOCK____

STUCCO ON FRAME____

STUCCO ON MASONARY____

PORCHES

WOOD____

MASONARY____

DIRT FILLED____

HOLLOW____

TYPE FLOORING ON MASONARY________

BASEMENT

CEILING FINISHED____WITH____________

WALLS FINISHED_____WITH____________

FLOORS FINISHED_____WITH____________

SLAB

SUPPORTED____

FLOATING____

MONOLITHIC____

WOOD OVER SLAB____

FLOOR COVERED____WITH______________

PLUMBING ACCESSIBLE____

HEATING ACCESSIBLE____

ELECTRIC OR HOT WATER RADIANT HEAT____

BLUE PRINTS AVAILABLE____

GENERAL

PAVING AGAINST FOUNDATION ____FT.

PLANTERS____ SHRUBS & PLANTS____

POWER AVAILABLE?____ WATER____

TYPE SOIL____ DEBRIS____

CLEARANCE IN CRAWL SPACE ____ INCHES

ALL AREAS ACCESSIBLE YES____ NO____

OPENINGS TO BE MADE YES____ NO____

FORM BOARDS YES____ NO____

WOOD SUPPORTS IN CONTACT WITH GROUND OR IMBEDDED IN SLAB YES____ NO____

EXCAVATING NECESSARY YES____ NO____

WELLS OR OTHER SPECIAL PRECAUTIONS

____

INFESTATION FOUND

SUBTERRANEAN TERMITES____

POWDER POST BEETLES____

WOOD BORERS____

KEY TO INTENSITY

H-HEAVY INFESTATION

M-MODERATE INFESTATION

L-LIGHT INFESTATION

EX-EXTENSIVE DAMAGE

P-PROBABLE DAMAGE

LOCATION OF INFESTATION

SILLS____________________________

____

JOIST____________________________

____

SUB FLOOR________________________

____

FINISHED FLOOR___________________

____

INTERIOR TRIM____________________

DOOR FRAMES______________________

WINDOW FRAMES____________________

REMARKS:_________________________

____

____

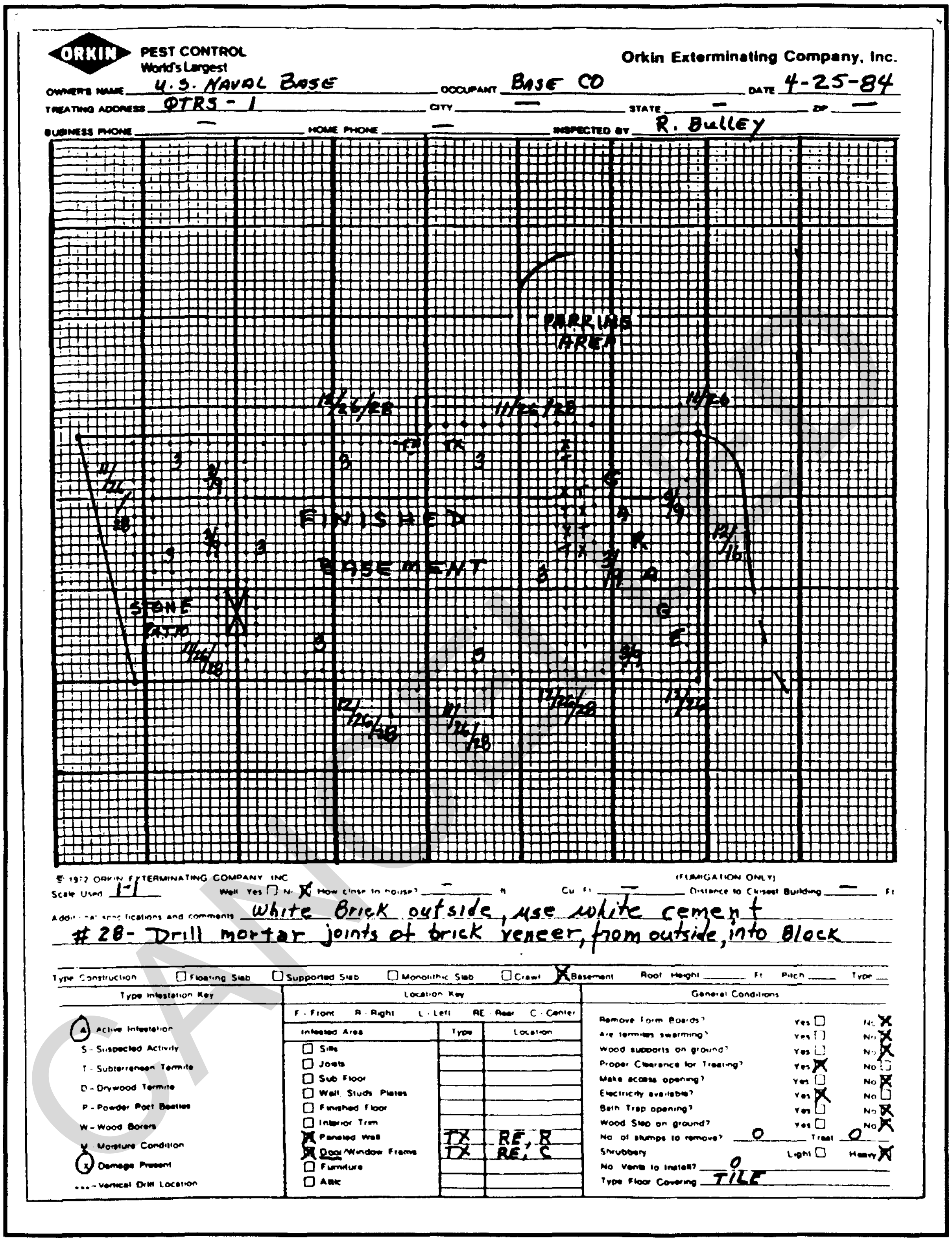
____

____

____

____

Attachment 13-A4
Termite Inspection Report



ORKIN PEST CONTROL
World's Largest

Orkin Exterminating Company, Inc.

OWNER'S NAME U.S. NAVAL BASE OCCUPANT BASE CO DATE 4-25-84
TREATING ADDRESS QTRS - 1 CITY — STATE — ZIP —
BUSINESS PHONE — HOME PHONE — INSPECTED BY R. BULLEY

© 1972 ORKIN EXTERMINATING COMPANY INC
Scale Used 1-1 Well Yes ☐ No ☒ How close to house? — ft (FUMIGATION ONLY) Cu Ft — Distance to Closest Building — Ft

Additional specifications and comments white Brick outside, use white cement
#28- Drill mortar joints of brick veneer, from outside, into Block

Type Construction ☐ Floating Slab ☐ Supported Slab ☐ Monolithic Slab ☐ Crawl ☒ Basement Roof Height ____ Ft Pitch ____ Type ____

Type Infestation Key

- A - Active Infestation
- S - Suspected Activity
- T - Subterranean Termite
- D - Drywood Termite
- P - Powder Post Beetles
- W - Wood Borers
- M - Moisture Condition
- X - Damage Present
- ... - Vertical Drill Location

Location Key

F - Front R - Right L - Left RE - Rear C - Center

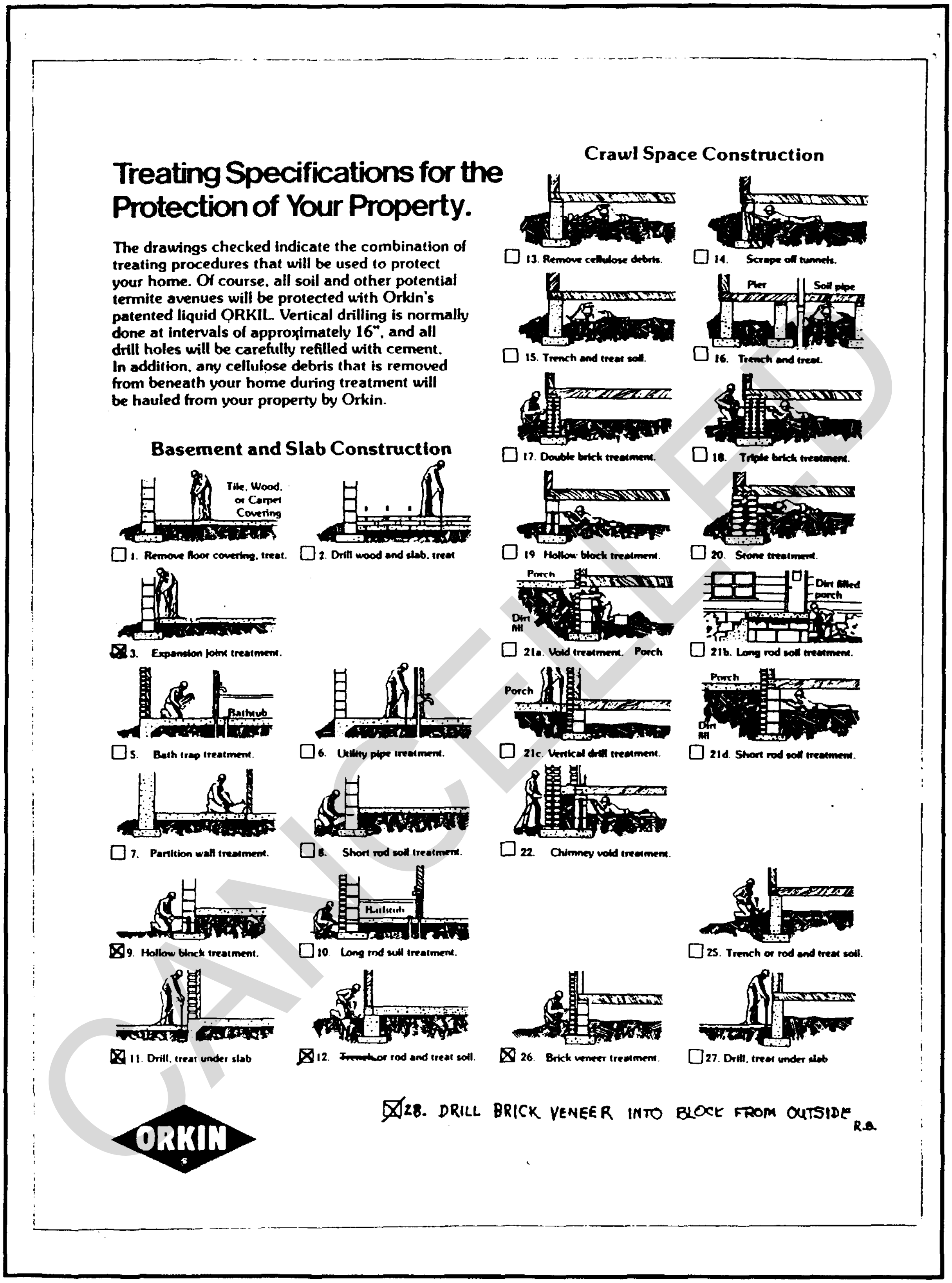
Infested Area	Type	Location
☐ Sills		
☐ Joists		
☐ Sub Floor		
☐ Wall Studs Plates		
☐ Finished Floor		
☐ Interior Trim		
☒ Paneled Wall	TX	RE, R
☒ Door/Window Frame	TX	RE, C
☐ Furniture		
☐ Attic		

General Conditions

Remove Form Boards?	Yes ☐	No ☒
Are termites swarming?	Yes ☐	No ☒
Wood supports on ground?	Yes ☐	No ☒
Proper Clearance for Treating?	Yes ☒	No ☐
Make access opening?	Yes ☐	No ☒
Electricity available?	Yes ☒	No ☐
Bath Trap opening?	Yes ☐	No ☒
Wood Step on ground?	Yes ☐	No ☒
No. of stumps to remove? 0	Treat 0	
Shrubbery	Light ☐	Heavy ☒

No. Vents to Install? 0
Type Floor Covering TILE

Attachment 13-A5
Typical Graph Indicating Points of Infestation, Damage and Recommended Treatment



Treating Specifications for the Protection of Your Property.

The drawings checked indicate the combination of treating procedures that will be used to protect your home. Of course, all soil and other potential termite avenues will be protected with Orkin's patented liquid ORKIL. Vertical drilling is normally done at intervals of approximately 16", and all drill holes will be carefully refilled with cement. In addition, any cellulose debris that is removed from beneath your home during treatment will be hauled from your property by Orkin.

Basement and Slab Construction

Tile, Wood, or Carpet Covering

☐ 1. Remove floor covering, treat.

☐ 2. Drill wood and slab, treat

☒ 3. Expansion joint treatment.

Bathtub

☐ 5. Bath trap treatment.

☐ 6. Utility pipe treatment.

☐ 7. Partition wall treatment.

☐ 8. Short rod soil treatment.

☒ 9. Hollow block treatment.

Bathtub

☐ 10. Long rod soil treatment.

☒ 11. Drill, treat under slab

☒ 12. ~~Trench~~ or rod and treat soil.

Crawl Space Construction

☐ 13. Remove cellulose debris.

☐ 14. Scrape off tunnels.

☐ 15. Trench and treat soil.

Pier

Soil pipe

☐ 16. Trench and treat.

☐ 17. Double brick treatment.

☐ 18. Triple brick treatment.

☐ 19. Hollow block treatment.

☐ 20. Stone treatment.

Porch

Dirt fill

☐ 21a. Void treatment. Porch

Dirt filled porch

☐ 21b. Long rod soil treatment.

Porch

☐ 21c. Vertical drill treatment.

Porch

Dirt fill

☐ 21d. Short rod soil treatment.

☐ 22. Chimney void treatment.

☐ 25. Trench or rod and treat soil.

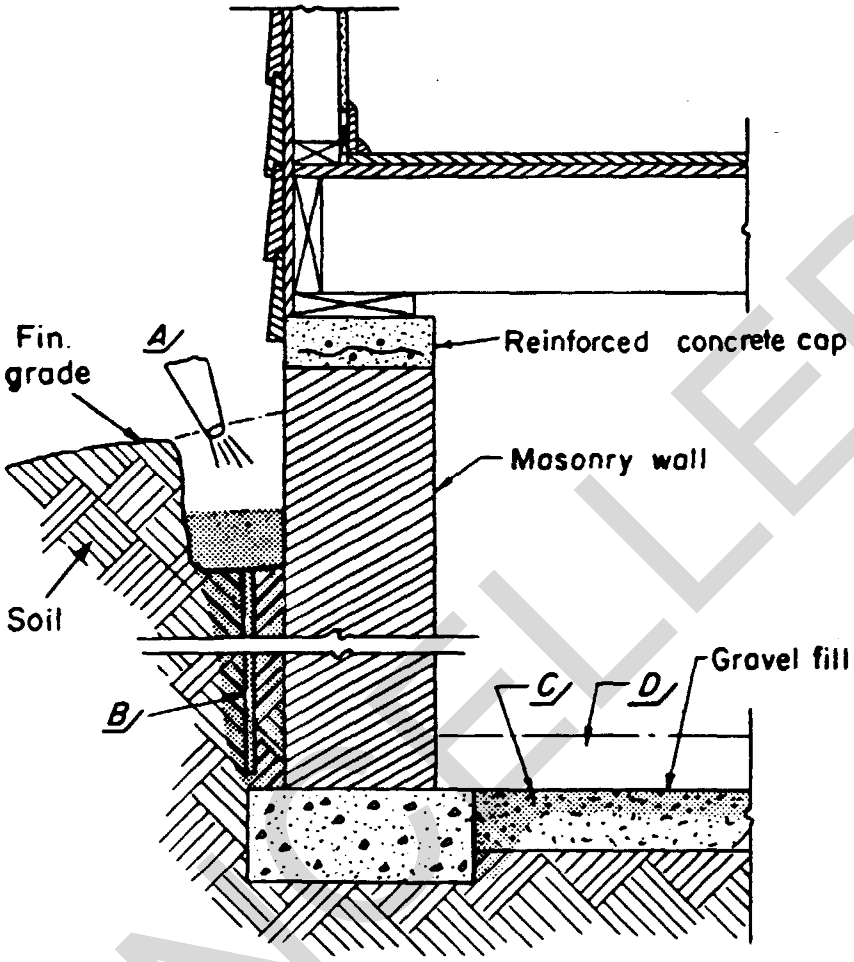
☒ 26. Brick veneer treatment.

☐ 27. Drill, treat under slab

☒ 28. DRILL BRICK VENEER INTO BLOCK FROM OUTSIDE R.B.

ORKIN

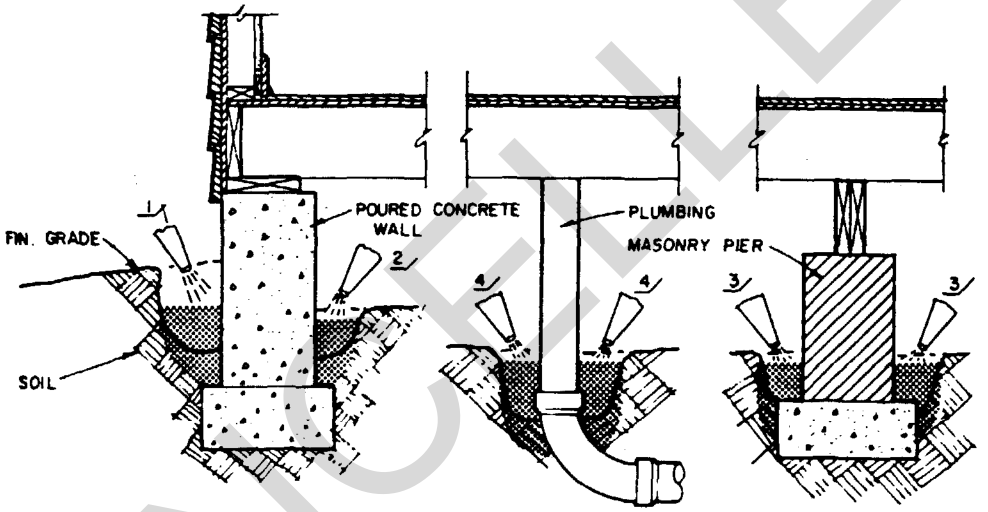
Attachment 13-A6
Treatment Methodology



Application of chemical to the soil in and around a house with full basement. A. Soil treatment along outside of foundation. B. Pipe and rod hole from bottom of trench to top of footing to aid distribution of chemical. C. Treatment of fill or soil beneath a concrete floor in basement. D. Position of concrete slab after after the chemical has been applied.

Attachment 13-A7
Chemical Soil Treatment

APPLICATION OF CHEMICAL TO CRAWL SPACE CONSTRUCTION

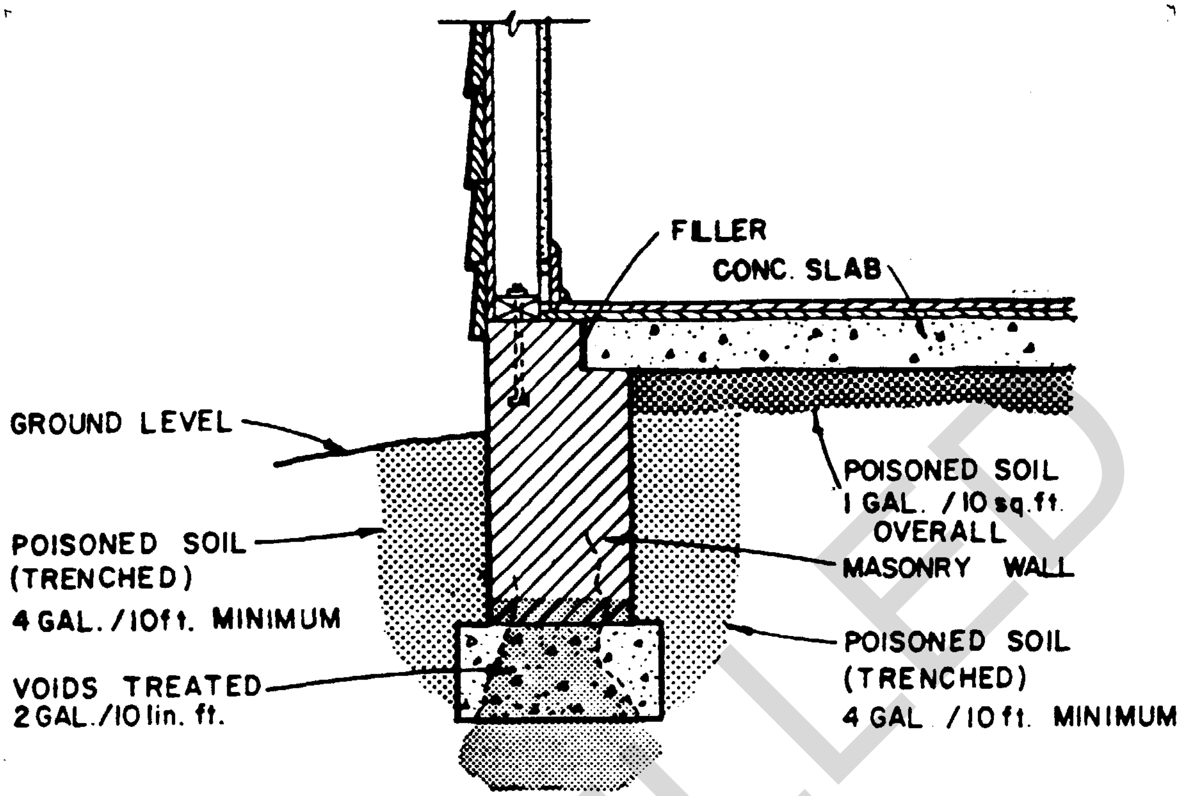


(1) Soil treatment along outside, and (2) inside foundation wall

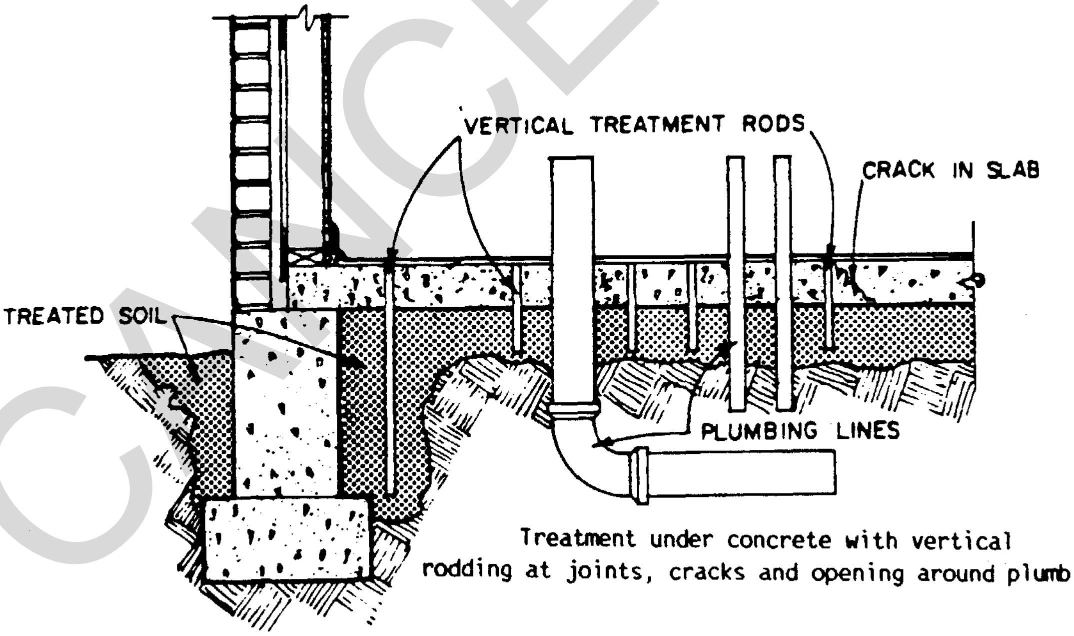
(4) Treatment around plumbing

(3) Treatment around pier

Attachment 13-A8
Chemical Soil Treatment



Application of chemical to slab construction (USDA)



Treatment under concrete with vertical rodding at joints, cracks and opening around plumbing

Attachment 13-A9
Chemical Soil Treatment

Insect Pest	Identifying Characteristics	Damaging Stage	Characteristics of Damage	Preferred Woods	Life Cycle	Control	
						Chemical	Other
Old-house Borer	**Adult: 3/4 in. long; dark colored with white patches on elytra. Larva: body peg shaped, 1 inch long.**	Larva	Exit holes oval, 1/4 inch diameter; frass tunnels filled with tightly packed powdery dust mixed with pellets.	Sapwood of seasoned softwood.	3 to 12 years.	Residual sprays; fumigation.	
Wharf Borer	**Adult: 1/2 inch long; light brown with tips of elytra black; four striae on each elytron. Larva: 1 to 1 1/2 inches long with swellings on dorsal meso- and metathorax and on ventral first two abdominal segments.**	Larva	Exit holes round and 1/4 inch in diameter; frass shredded and moist.	Sapwood and heartwood of seasoned softwoods.	1 year or more.	Wood preservatives.	Replace damaged wood with pressure-treated lumber.
Metallic Wood Borers	**Adult: hard-shelled, boat-shaped with bright metallic color. Larva: body flattened from top to bottom with a conspicuous widening of the thorax just behind the head.**	Larva	Exit holes oval (3 times as broad as tall); galleries tightly packed with frass.	Sapwood and heartwood of dead or dying trees.	1 year or more.	None necessary.	Use non-infested wood.
Lyctid Powder-post Beetles	**Adult: somewhat flattened; head visible from top; last two antennal segments enlarged to form a club. Larva: with 8th pair spiracles on abdomen enlarged.**	Larva	Exit holes round, 1/32 -1/16 inch diameter; frass flour-like and packed in tunnels.	Sapwood of seasoned hardwoods.	4 to 12 months.	Residual sprays; fumigation.	Use wood treated with a preservative.
Anobiid Powder-post Beetles	**Adult: body cylindrical, covered with fine hairs; head not visible from top. Larva: with rows of small spines on top.**	Larva	Exit holes 1/16-1/8 inch in diameter, round in shape; frass pellet shaped, gritty and loose in tunnels.	Sapwood of seasoned softwoods.	1 year or more.	Residual sprays; fumigation.	Use wood treated with a preservative.
Bostrichid Powder-post Beetles	**Adult: thorax roughened; head not visible from top; last 3 segments of antennae enlarged to form a club. Larva: no spines on body; 8th abdominal spiracles not enlarged.**	Larva	Exit holes 1/32-3/8 inch in diameter, round; frass fine to course, tends to stick together and is tightly packed in the tunnels.	Sapwood of seasoned hardwoods.	1 year or more.	Residual sprays; fumigation.	Use wood treated with a preservative.
Carpenter Ants	Hind wings smaller than forewings; workers wingless; black to red, 1/4 to 3/8 inch in length.	Worker	Galleries are entirely clean with no debris and have a sandpapered appearance.	Softwoods that are usually unsound or moist.	Variable.	Residual sprays, dusts, baits.	Avoid moisture problems.
Carpenter Bees	Similar to bumble bees, but shiny black abdomen without yellow hairs on top.	Adult	Entrance hole across grain of the wood for about 1 inch; then it turns to run with the grain for about 6-12 inches; galleries with about six cells.	Softwoods that well-weathered or unpainted.	1 year	Residual sprays or dusts.	Keep outdoor surface of wood well painted.

Attachment 13-A10

Summary of Important Wood-Infesting Insects

CHAPTER 14. STORED PRODUCTS PEST CONTROL

Section C.7 of FAR - PWS. Stored products pest control operations may be included as firm fixed price items or as indefinite quantity items. The inclusion as an indefinite quantity item is infrequent. Contractor certification for stored products pest control is usually in the category called "Industrial, Institutional, Structural and Health Related Pest Control" (EPA category #8). Some states may require separate certification for rodent control and for fumigation operations. Assistance in interpreting state categories and ensuring proper contractor certification is available from the Command PMC.

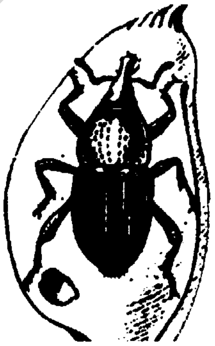
14.1 STORED PRODUCT PEST RECOGNITION.

A number of small beetles and several small moths commonly infest cereal and grain products. (Figure 14-1 and 14-2)

14.1.1 Beetles That Infest Foods.

Both larval and adult beetles feed on stored products. Figure 14-3 is a pictorial key to common beetles associated with stored foods.

14.1.1.1 Weevils. Some species, such as the rice weevil or granary weevil feed inside the grain as larvae. They are called internal feeders. The rice weevil is the most important whole grain infesting insect in the world. The adult is 1/8" long with an elongated snout. The female will deposit from 50 to 400 eggs in her lifetime. There are 6-8 generations per year. The larvae and the pupae spend their entire life stage within the food. Only whole grain or pieces of grain large enough for larval development are attacked.

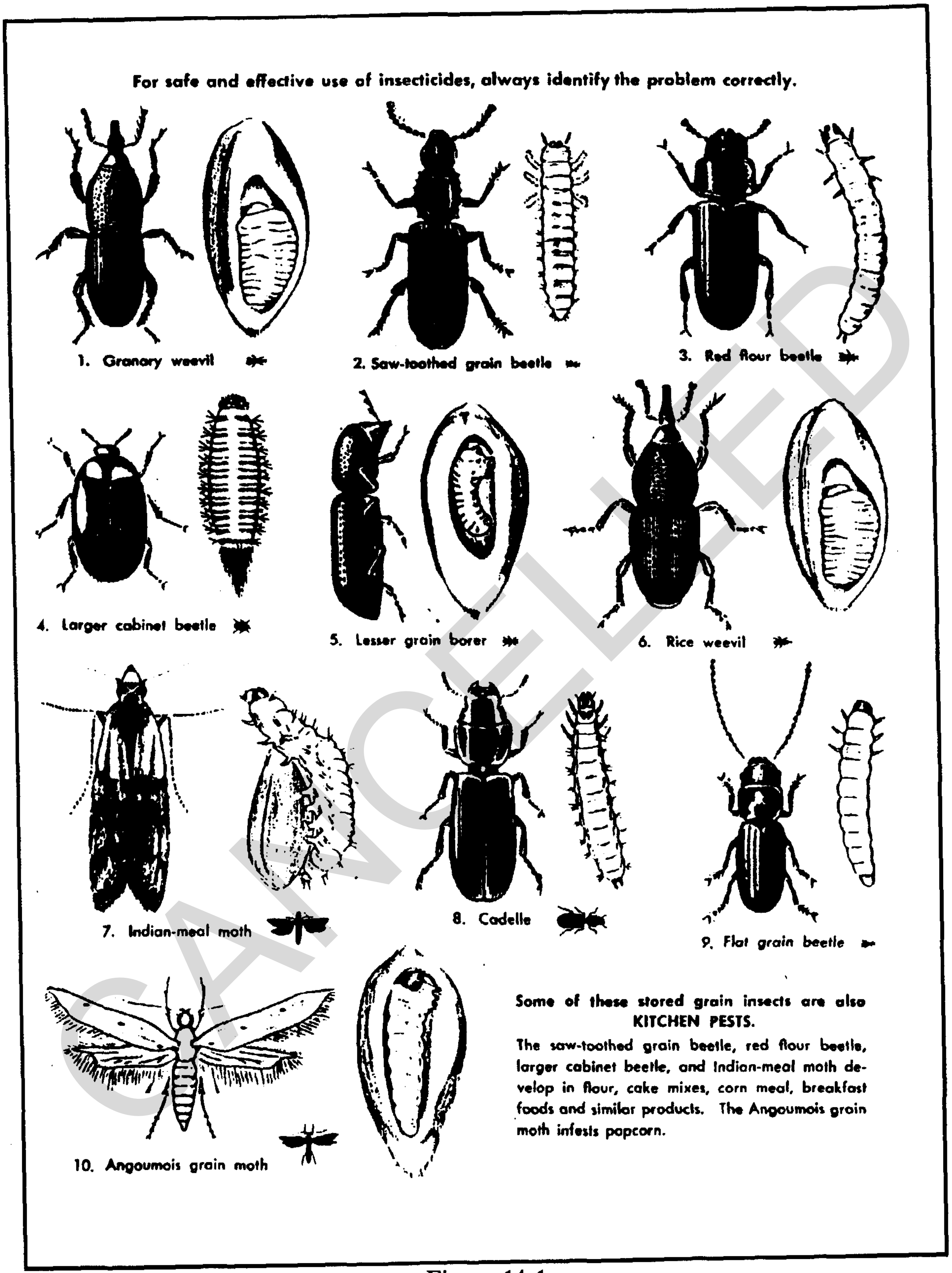


GRANARY
WEEVIL

14.1.1.2 Other Beetles. The confused flour beetle and the red flour beetle are similar in shape and size. They are difficult to tell apart in larval and adult forms. The adults are about 1/8" long, flattened and shiny reddish-brown. These beetles are usually brought into the home in flour. The female deposits about 400 eggs in her lifetime. There are 6-7 generations per year. These insects will also infest cereals, nuts, chocolate, spice, peas, and many other products.

CONFUSED
FLOUR
BEETLE

CONFUSED FLOUR
BEETLE LARVA


For safe and effective use of insecticides, always identify the problem correctly.

Some of these stored grain insects are also KITCHEN PESTS.

The saw-toothed grain beetle, red flour beetle, larger cabinet beetle, and Indian-meal moth develop in flour, cake mixes, corn meal, breakfast foods and similar products. The Angoumois grain moth infests popcorn.

Figure 14-1
Principal Stored Grain Insects

SUMMARY OF INSECTS INFESTING STORED GRAIN AND CEREAL PRODUCTS*

Insect Pest	Identifying Characteristics	Food Preference	Type of Feeder	Life Cycle
Red Flour Beetle	1/8 inch long; flattened; shiny reddish brown; 3 apical segments of antennae enlarge abruptly to form a distinct club.	Flour and cereal products.	Scavenger	6 weeks
Confused Flour Beetle	1/8 inch long; flattened; shiny reddish brown; antennae gradually enlarged to form a club.	Flour and cereal products.	Scavenger	6 weeks
Rice Weevil	1/8 inch long; elongate snout; 4 light red or yellow spots on wing covers.	Whole grain.	Internal	6 weeks
Granary Weevil	1/8 inch long; elongate snout; lacks spots on wing covers.	Whole grain.	Internal	6 weeks
Saw-toothed Grain Beetle	1/8 inch long; flattened; dark brown; 6 saw-toothed projections on each side of thorax.	Cereal products and grains.	Scavenger	3-4 weeks
Foreign Grain Beetle	1/16 inch long; reddish brown; slight projections or knobs at front angles of thorax.	Cereal products and grains.	Scavenger and secondary feeder.	3-4 weeks
Lesser Grain Borer	1/8 inch long; cylindrical; head nearly hidden by thorax when viewed from above.	Cereal products and grains.	External	2 months
Cadelle	1/3 inch long; shiny black; pronotum is separated from wing bases by a strong constriction.	Cereal products and grains.	External	6-12 months
Drugstore Beetle	1/8 inch long; reddish brown; elytra with parallel lines.	Many dried plant and animal products.	External	6-8 weeks
Cigarette Beetle	1/8 inch long; reddish brown; elytra smooth.	Many dried plant and animal products.	External	6-8 weeks
Trogoderma spp.	1/8 inch long; dark elytra with areas of red and orange.	Cereal products and grains.	External	Variable
Golden Spider Beetle	1/8 inch long; oval shaped; spider-like in appearance.	Cereal products and grains.	External	Variable
Mediterranean Flour Moth	3/4 inch wing-spread; front wings gray and with wavy transverse bars; when at rest head and thorax raised.	Flour, wheat, chocolate, nuts, dried fruits etc.	Scavenger	3-4 months
Indian Meal Moth	3/8 inch wing-spread; basal 1/2 forewing grayish with outer 1/2 copper colored.	Same as Mediterranean flour moth.	External	1-2 months
Angoumois Grain Moth	1/2 inch wing-spread; hindwings are gray and pointed at end resembling a pointed finger.	Whole grains	Internal	1-2 months
Black Carpet Beetle	1/8 inch long; dull black.	Wide variety of of stored products.	Scavenger	6 weeks to 3 years

* Control measures for all of the above insect pests include: sanitation, residual and contact sprays and fumigation.

Figure 14-2
Insects Infesting Stored Products

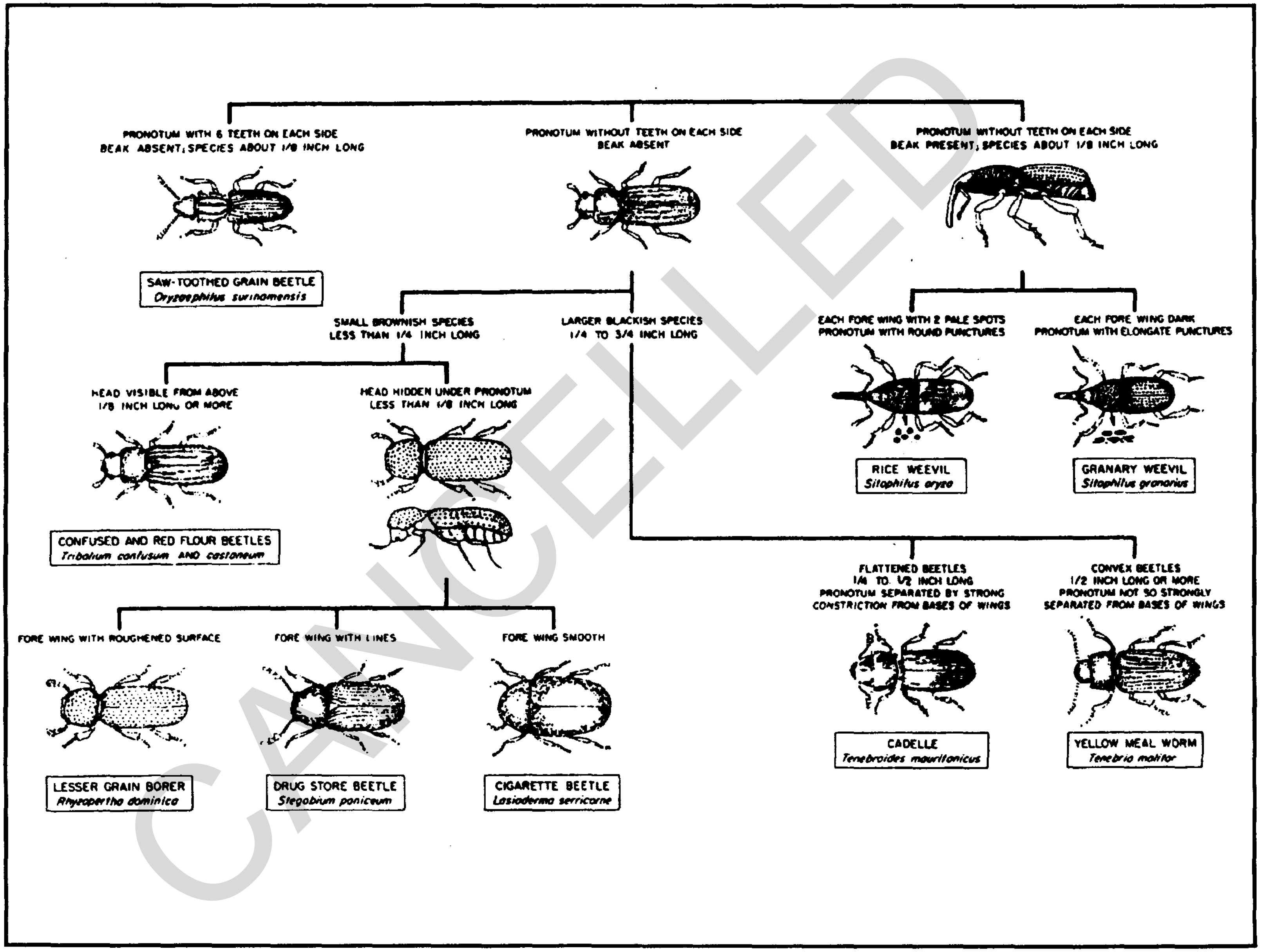
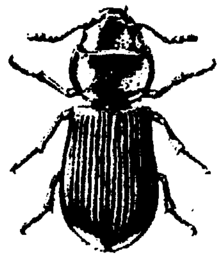


Figure 14-3
Pictorial Key to Some Common Beetles and Weevils
Associated with Stored Foods

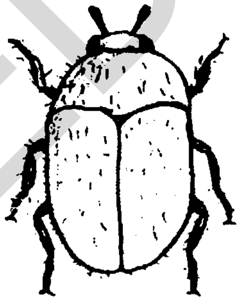


CADELLE BEETLE

The cadelle beetle is about 1/3" long, flattened, and has a shiny black color. The pronotum is distinctly separated from the wing bases by a strong constriction. This beetle feeds on cereal products and grains. It is an external feeder in the larval stage. There are 6-7 generations per year in ideal living conditions.

Drugstore beetles (the most common pantry pest in the United States), cigarette beetles, the foreign grain beetle and many other species are pests of stored products. It is important to remember that the larval forms look vastly different than the adults.

Trogaderma spp. beetle (called the Kharpa beetle or cabinet beetle) adults are about 1/8" long, reddish brown and have smooth elytra. Both the larva and adult forms eat many dried plant and animal products. They are external feeders. The life cycles will vary greatly.

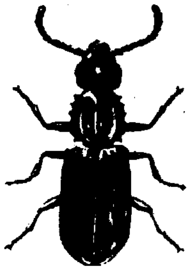


Trogaderma

KHARPA LARVA

Kharpa beetles are of medical significance. The larval forms have, on the last 3 or 4 abdominal segments, dense clumps of dark colored setae (stiff hairs) which have very distinctive spear shaped tips. If these larvae are inadvertently swallowed, they will cause extreme distress in the individual. The presence of Kharpa beetles will result in quarantine of the food products.

The saw-tooth grain beetle is a scavenger. These beetles will attack grains that have been previously damaged. The adult is 1/8" long, flattened and dark brown. The name is derived from the "saw-tooth" like projections on the thorax. The female deposits 50-300 eggs in her lifetime. There are 8-9 generations per year.



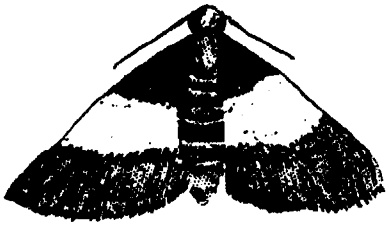
SAW-TOOTH GRAIN BEETLE

14.1.2 **Moths That Infest Foods.** Adult moths do not feed on food material. It is only the larvae (caterpillars) which consume edibles. However, the adults cannot be overlooked as a pest because they are the ones which deposit the eggs on the stored food.

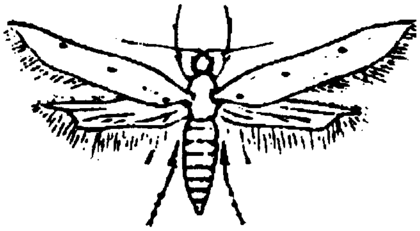
INDIAN MEAL MOTH LARVA

The Indian meal moth is small (about 3/8" wing span). The wings have distinct markings. The part closest to the body is gray while the outer 1/3 of the wings are copper colored. The female lays 40-400 eggs in her lifetime. In favorable conditions, there will be 6 generations per year.

The caterpillars spin large amounts of silk in and over the food. They will infest wheat, bran, nuts, chocolate, beans, and dried fruits. The Indian meal moth is the most common food infesting moth found in the home and grocery store.



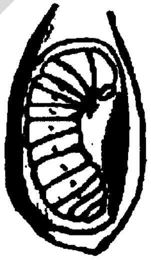
INDIAN MEAL MOTH



ANGOUMOIS GRAIN MOTH

The angoumois grain moth is a very important pest in the South. The larval form mainly attacks whole grain. The adult has a 1/2" wing span, with the hind wings being gray and resembling a pointed finger. The female deposits between 40-400 eggs. There may be up to 7 generations per year.

The larval stage is spent entirely within the host material. When found in the home, they have probably emerged from decorative corn.



ANGOUMOUS GRAIN MOTH LARVA

The mediterranean flour moth is the largest adult of the stored pest moths. The adult has a 3/4" wing span, with the front wings being gray in a wavy transverse bar design. Viewed from the side and at rest, the head and thorax are raised. The female will deposit 350-600 eggs in her lifetime. There are 3-4 generations per year.

MEDITERRANEAN FLOUR MOTH

The caterpillars are scavengers (external feeders). They spin large amounts of silk in and over the food. They typically leave the food area to pupate. These moths prefer flour, but will infest wheat, bran, nuts, seeds, chocolate, beans and dried fruits.

14.1.3 **Food Infesting Rodents.** Norway rats, roof rats and house mice frequently infest stored food material (see Chapter 16, Rodent Control, for identification keys). In addition to consuming food materials, rodents damage food by contaminating it with their feces or urine.

14.1.4 **Insects That Infest Fabrics.** The fabric pests (Figure 14-4) include several species of small moths, of which the larva is the destructive stage, and several species of beetles.

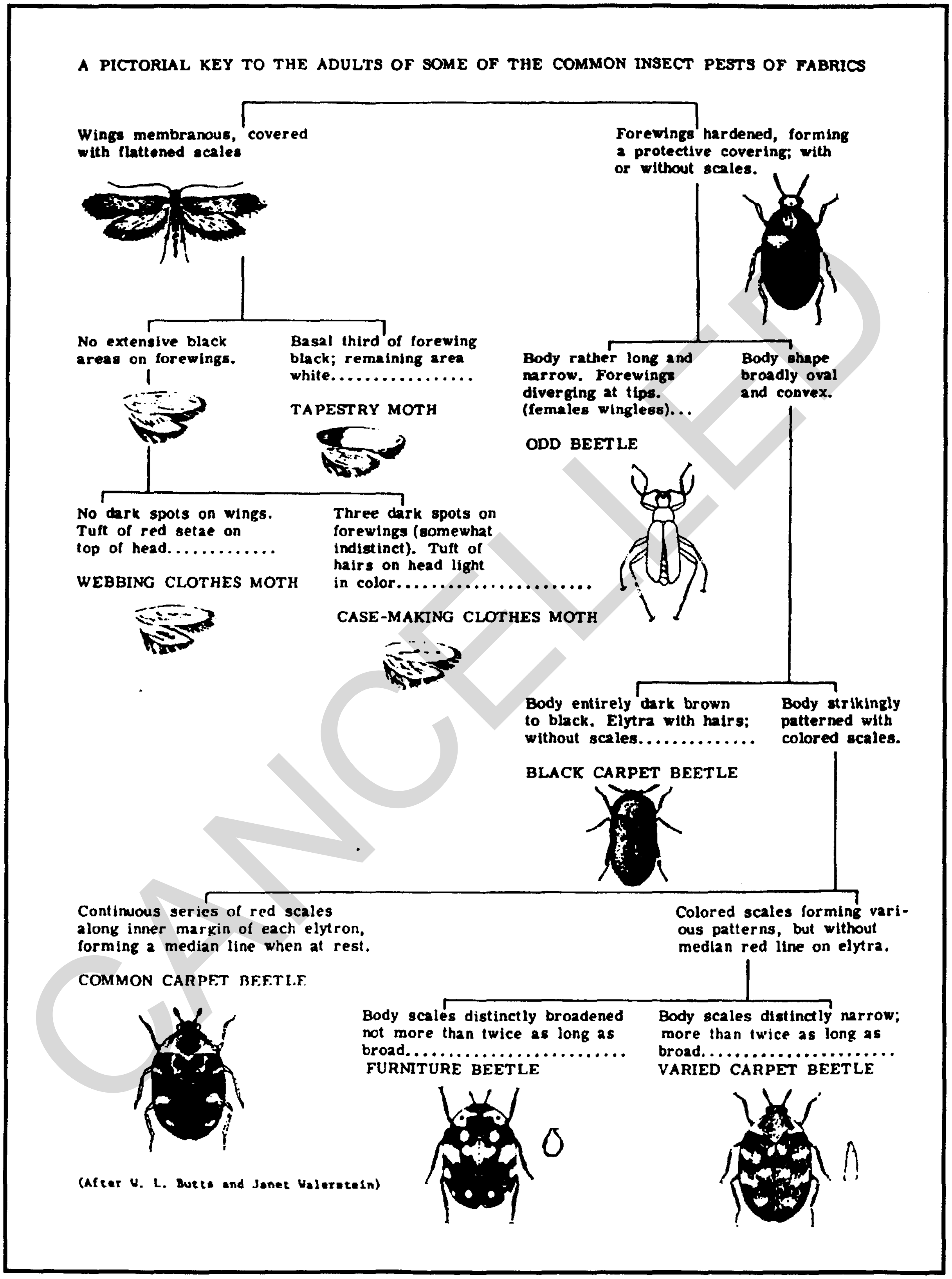
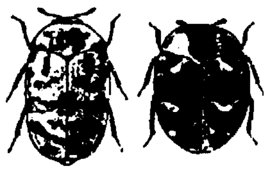


Figure 14-4
Fabric Pests

14.1.4.1 Fabric Moths. Clothes moths or fabric moths are small, usually golden to golden brown colored, with dark markings. A characteristic of clothes moths is the erratic flight patterns of the adults. They are relatively poor fliers. Figure 14-5 provides identification characters for both the adults and larval damage.

CASE MAKING
CLOTHES MOTH

14.1.4.2 Fabric Beetles. The carpet beetles (black, furniture carpet, common carpet, varied carpet) (Figure 14-6) are scavengers in their feeding habits. The adults are 1/8 - 1/4" long, and generally dull in color. Their life cycle varies from 6 weeks to 3 years. The adult beetles may be dark brown/black or have a variegated color pattern ranging from grey to a mottled pink.



CARPET
BEETLES

The larval stage of the beetle is its most damaging stage. Beetle larvae are easily recognized by their hairy bodies with bristly tails.

Figure 14-7 is a summary of the important fabric pests.

14.1.5 Fabric Damaging Rodents. Rodents cause considerable damage to fabrics, mainly in their attempt to get at food material. They may also collect fabric fibers for nest material. Rodents generally do not attack fabrics themselves except if they are attracted to food or beverages that were spilled on the fabric. General information on rodents and their control can be found in Chapter 16.

14.2 STORED PRODUCT PEST MANAGEMENT.

The concept of stored product pest management is firmly based on the principles of integrated pest management. Because pest infestations usually are not noticed until large populations have developed, good practices in sanitation, storage, and inspection are required. Prevention is the key to successful control.

14.2.1 Sanitation. A sanitation program should be documented and continually updated to insure the removal of product residues that attract stored product pests. Food storage areas should be clean of crumbs, food particles, and exposed food. Packaging should be inspected to insure that containers are not broken or unsealed. Insect-proof containers such as glass, heavy plastic, or metal should be used in small scale storage.

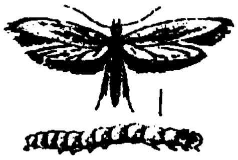
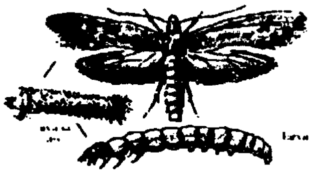
Species	Larval Feeding Damage
 Webbing clothes moth Tincola bisselliella **Adults** Wings uniformly golden or buff colored.	Larvae spins webs freely over feeding surface and produces tunnels or tubes for protection. Copious amounts of fecal material scattered throughout feeding area.
 Case making clothes moth Tinea pellionella **Adults** Brown with 3 dark spots on each forewing.	Entire larval stage spent in case, case dragged behind larvae as new feeding areas sought. Case covered with fecal pellets or bits of woolen fiber.
 Carpet moth Trichophaga tapetzella **Adults** Basal 1/3 forewings black, outer portion mottled white, black and gray.	Similar to webbing clothes moth. Feeding damage frequently extend deeper into materials.

Figure 14-5
Identification of Clothes Moth

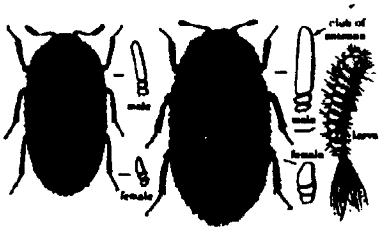
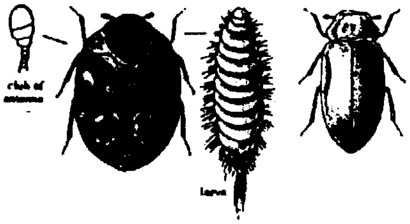
Species	**Diagnostic Characteristics**
 Black carpet beetle Attagenus megatoma	Adults distinctly oval, dark brown to black, about 1/6 inch long. Larvae carrot-shaped with long tail bristles. Shiny brown to black.
 Varied carpet beetle Anthrenus verbasci	Adults slightly oval shaped and mottled with white, brownish, and yellowish scales. No cleft at tip of wings. Larval body wedge-shaped with rear broader than head. Three tufts of hair on either side of rear end.
 Furniture carpet beetle Anthrenus flavipes	Adults mottled with yellow, black and white, more rounded than varied carpet beetle, cleft at tip of wings. Larvae torpedo-shaped, head wider than rear, darker than varied carpet beetle.
 Carpet beetle Anthrenus scrophulariae	Adults round-oval, about 1/8 inch long, black with orange red scales, scalloped band of orange down center of back. Larvae reddish brown, hair extending outward from entire body.

Figure 14-6
Identification of Carpet Beetles

Insect Pest	Adult Characteristics	Larval Characteristics	Life Cycle	Chemical Control	Other Controls
Webbing Clothes Moth	1/2 inch wing span; buff colored; reddish hairs on top of head.	Spins silken feeding tubes throughout fabric.	2 to 3 months.	Mothproofing; residual and contact sprays.	Sanitation.
Casemaking Clothes Moth	Brown with 3 dark spots on each forewing.	Spins a silken case around itself that is carried everywhere the larva goes.	2 to 3 months.	Mothproofing; residual and contact sprays.	Sanitation.
Black Carpet Beetle	3/16 inch long; shiny black.	Carrot-shaped; long tail bristles.	6 weeks to 3 years.	Mothproofing; residual and contact sprays.	Sanitation.
Varied Carpet Beetle	1/16 inch long; colored scales on body-white, brown, yellow; scales broadened.	Broader at rear end than at front giving a "hippy" appearance.	About 1 year.	Mothproofing; residual and contact sprays.	Sanitation.
Common Carpet Beetle	1/16 inch long; orange red band of scales down middle of back.	Elongate, oval and covered with dark hairs.	3 to 4 months.	Mothproofing; residual and contact sprays.	Sanitation.
Furniture Carpet Beetle	1/16 inch long; heavy coat of yellow scales on the femur of legs; scales on body narrow.	Torpedo-shaped with head region wider than the rear.	4 to 8 months.	Mothproofing; residual and contact sprays.	Sanitation.
Larder Beetle	Pale yellow band across the front 1/3 of wing covers; 6 dark spots on the yellow band.	Two curved spines on the upper side of the posterior end of the abdomen.	3 months to 1 year.	Residual sprays.	Sanitation.

Figure 14-7
Summary of Important Fabric Pests

14.2.2 Storage. Facilities which store large quantities of infestable commodities should be pest-proofed to the greatest extent possible. This includes:

- sealing holes and cracks in walls
- the use of screening over windows and other openings
- installing air doors or plastic curtains

Proper stock rotation, inspecting incoming materials, and storing infestible commodities together are essential practices in monitoring for and controlling stored product infestations.

14.2.3 Inspection and Survey. Periodic visual inspection of food material and fabrics is required to determine the presence of live pests, their damage, or signs of their presence. Signs of insect activity include:

- dead insects
- insect feces
- silken webbing (moths)
- cast insect skins
- holes bored into packaging

Adult fabric beetles and many other insects are attracted to light and may be located around windows or light sources. Light traps are used to monitor stored products pests. These must be cleaned periodically to prevent insect infestations in the dead insects in the collection pan.

Commercially available species-specific pheromone (chemicals involved in insect communication) traps for stored products insects are extremely useful monitoring devices.

Storage areas should also be inspected for signs of rodent activity. Fecal droppings, rub marks, gnawing damage, and other rodent signs identified in Chapter 16 indicate the presence of rodents. Rodents constantly urinate around feeding areas, and a black light may be used to detect urine stains.

14.3 CONTROL METHODS.

14.3.1 Non Chemical Control. Sanitation, proper storage practices and survey are the keys to successful control. Non-chemical controls comprise trapping for both rodents and insects. Regulating storage temperature through refrigeration or heat can be effective in controlling food pests. Structural modifications to exclude pests will be helpful in limiting infestations. The use of pest resistent packaging helps to protect certain food materials, yet is usually not under the PCQAE's or store manager's control.

14.3.2 Chemical Control. Control of stored product pests may be accomplished by several methods, either alone or in combination. (Note: For DLA stored "Meal Ready to Eat" (MRE) combat rations, control procedures shall be in accordance with DLA Regulation No. 4145.31 Stored Products Pest Management)

14.3.2.1 Residual Treatment. Residual treatment involves spray applications of a residual insecticide on surfaces or cracks/crevices as directed by the label. The insecticide should not come into contact with food materials or food preparation equipment.

14.3.2.2 Aerosol or Space Treatment. Space treatment is very effective against flying or crawling insects. Aerosol droplets may be dispensed by "aerosol bombs" for small spaces, and by ultra-low volume (ULV) equipment, such as the Microgen, in large spaces. The pesticides used for space treatments have little residual activity. The PCQAE needs to be aware of security requirements, notification requirements, and re-entry times if applicable.

14.3.2.3 Baits. Baits are primarily used for rodent control (see Chapter 16, Rodent control).

14.3.3 Fumigation. In cases of severe infestation, fumigation may be required. Fumigation is a potentially hazardous operation due to the high toxicity of the materials. Fumigation should be performed and inspected only by trained and experienced personnel. With stored products, fumigation may be done in a number of ways.

14.3.3.1 Stack Fumigation. A common type of fumigation is stack fumigation. This requires stacking of infested material in a isolated area and covering it with a gas tight tarpaulin. The tarp is sealed to the floor with sand snakes or water snakes. Stack fumigations are sometimes performed in airtight vans, trailers, or rail cars. The most common fumigant for food products is aluminum phosphide which converts to phosphine gas upon exposure to moisture in the air.

14.3.3.2 Vault Fumigation. Vault fumigation uses a chamber constructed specifically for fumigation purposes. The chamber is tightly sealed and uses an exhaust system for rapid evacuation of air or fumigant. Vault fumigations require less exposure time because the air is removed as the gas is introduced. Thus the fumigant gas is more concentrated. Upon completion of the exposure time, the gas can then be rapidly exhausted. Large storage facilities or warehouses may have fumigation chambers.

14.3.3.3 Structural Fumigation. Structural fumigation entails covering an entire building with a gas tight tarp and fumigating the entire building and contents. Structural fumigation is discussed in detail in Chapter 13.

14.3.3.4 Fumigation Procedures. Since fumigation uses extremely toxic chemicals, it is essential that the contractor be experienced in the complete fumigation process.

- **Preparation**. Both stack fumigation and structural fumigation entail the covering of the stored product or building with a gas tight tarpaulin (usually plastic) that will be "sealed" at the bottom with sand or water snakes. These are long tubes from 2 to 4 inches in diameter that are filled with sand or water that will weigh the tarp down against the floor or ground. Whenever several tarps are used they may be joined by rolling a seam several times and then fastening the rolled seam with heavy clamps placed at frequent intervals. Another method of sealing is to tape joints with a heavy fumigant impervious tape. Areas where stack fumigation are performed should, at a minimum, be roped off with highly visable materials to warn warehouse personnel.
  - In a structural fumigation, the contractor should keep the tarpaulin from blowing about by evacuating as much air as possible by using fans prior to the introduction of the fumigant. This will usually suck the tarp against the structure. Just prior to the introduction of the gas, the PCQAE together with the certified applicator should inspect the tarp to **ensure it will be gas tight**. All necessary precautions should also be taken to ensure that all living organisms and other sensitive materials are removed.
- **Gas Application**. Fumigants are introduced by directly releasing gasses or by pellets which liberate gasses. **NOTE: Gas or pellets should only be introduced by a certified applicator and at the rate specified by the label.** With aluminum phosphide, the amount of gas which will be generated is dependent on the number of pellets which are put under the tarp.
  - After the proper amount of gas/pellets have been introduced, the contractor should install warning signs on all sides of the structure or stack. The signs should have the name of the pesticide, and emergency phone numbers of the fumigator, the police and the fire department. **All structural fumigations on military installations should require that the fumigation site be under guard for the duration of the fumigation.**
- **Under Guard.** If a guard is used, the guard's role is to prevent humans or animals from entering the fumigated structure. The certified fumigator should issue instructions to the guard. The PCQAE should be present while the instructions are being issued to

ensure that the guard understands that absolutely no one is to enter the structure until the certified operator certifies the structure free of gas.

  - The guard should be issued emergency safety equipment, including a gas mask or self-contained breathing apparatus, with instructions for their use. The only reason a guard will ever have to enter a building is if someone enters the secured area and must be removed to safety. At no other time, and for no other reason, should a guard enter a building under fumigation.

- **Completion**. After the gas/pellets are introduced, gas concentration readings must be taken. The frequency of these readings are usually specified in the contract and the PCQAE should arrange with the certified applicator for the times at which readings will be taken. The PCQAE should arrange to return at all concentration readings to ensure that the correct amount of gas is retained for the entire fumigation period.
  - The PCQAE should also be present during aeration of the structure or stack. The PCQAE should be at the site after the tarp has been removed and the stack/building sufficiently aerated at which time the certified operator should make a thorough inspection of the area including the taking of gas readings. Only the certified operator can certify that the structure/area surrounding the stack is free of the gas. All equipment and debris should be removed, and the site should be returned to its original condition to complete the job.

Warning signs must be posted during all fumigations, and local laws and regulations must be adhered to. Armed Forces Pest Management Board Technical Information Memorandum # 11: Hydrogen Phosphide Fumigation with Aluminum Phosphide provides specific instructions for performing aluminum phosphide fumigations.

The PCQAE should be available to check:
-final sealing
-release of the gas
-periodic gas concentration checks
-aeration
-instructions to security or building personnel
-critical phases of the fumigation are performed only by
 the certified operator in charge

14.4 CONTROL EQUIPMENT.

- hand sprayers for residual applications
- aerosols; either cans or power generators
- power sprayers (for residual applications to large areas)
- traps
    - rodent traps
    - pheromone traps
    - others as recommended by the Command PMC
- Bait stations
    - rodent
    - others as recommended by the Command PMC

14.5 CONTROL HAZARDS. The PCQAE must be concerned with the accidental contamination of food materials, by spills or direct contact, and during space treatment with a ULV. The PCQAE should ensure that the contractor maintains correct calibration on all ULV and monitoring equipment. The PCQAE should be aware of security requirements, notification requirements, and posting for all pesticide applications, especially space treatments and fumigation. Fumigation hazards are the same as those discussed with structural fumigation.

14.6 RECORDS AND REPORTING. One Form 6250/2 (indoor) should be used for each pest management operation performed at each unit, building, or structure. If more than one pest, operation, or control agent is involved in a specific pest management operation, then a separate form must also be completed for each. After a record is completed the bottom (yellow) copy should be retained at the installation as a daily legal record of pesticide usage, and as a maintenance record. The back of the yellow copy may be used to record additional details about the operation.

At the end of the month all of the top (blue) copies are assembled and submitted to the Command PMC. The PCQAE should review records on a regular basis to ensure that records are completed and submitted in accordance with contract specifications.

The PCQAE shall complete a separate report for each PCQAE inspection performed, including the time required for the inspection. At the end of the month the PCQAE should submit the blue copies to the Command PMC.

CHAPTER 15. CONTROL OF PESTS OF MEDICAL IMPORTANCE

This function is included in Section C.8 of FAR - PWS. Generally, pesticide applications in this function will be included as indefinite quantity items. Surveys may be fixed price.

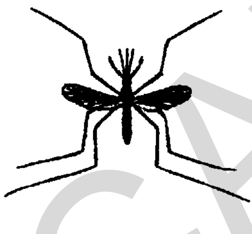
The discussion of pests of medical importance in this section shall be limited to mosquitoes, flies, ticks, lice and urticating (venomous) caterpillars. Spiders, scorpions, bees, wasps, centipedes and other venomous arthropods found around the home are covered in Chapter 12, Household Pest Control.

15.1 MOSQUITOES. Mosquitoes are related to flies. Mosquitoes have four distinct stages in their life cycle : Egg, larva, pupa and adult.(complete metamorphosis) Normally, only a few species in any locality are responsible for a mosquito problem, and survey and control personnel should learn to recognize these mosquito species.

15.1.1 Identification. Three genera of mosquitoes are most commonly found on North American military bases.

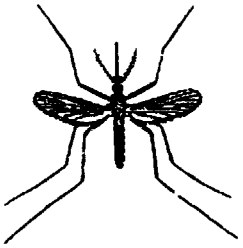
- Aedes spp.
- Culex spp.
- Anopheles spp.

However, many more species may be encountered. Attachment 15-A1 is a pictorial key to some common adult female mosquitoes of the U.S. There are over 1600 described species of mosquitoes.

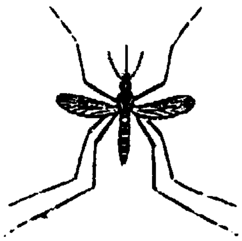


Anopheles spp.
ADULT

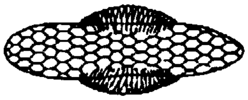
15.1.1.1 Adults. Adult mosquitoes have 1 pair of wings, as do other flies. Both the male and female adults feed on nectar of flowers but only the female sucks blood. Mosquitoes exhibit a wide variety of habits and capability in respect to flight, biting preferences, disease transmission, and abundance.



Culex spp.
ADULT



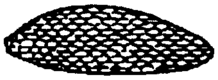
Aedes spp.
ADULT



Anopheles spp.
EGG

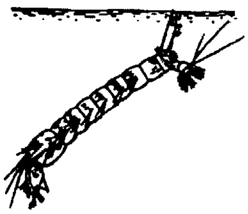
15.1.1.2 Eggs. The eggs of the different mosquitoes are laid in, or near water. Anopheles eggs are laid singly with "floats" on either side. Culex eggs are laid in clusters while Aedes eggs

Culex spp.
EGG
RAFT

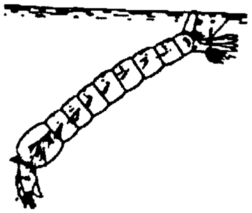


Aedes spp.
EGG

are laid singly. The eggs hatch into larvae which are sometimes called "wrigglers".



Culex spp.
LARVA



Aedes spp.
LARVA

15.1.1.3 Larva. The larvae and pupae (immature stages) of all mosquitoes develop in water. Many species are adapted to particular types or locations of water.

Anopheles spp.
LARVA

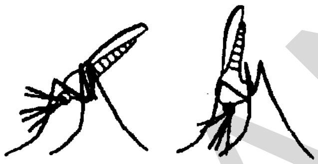
The larva feed on minute forms of animal and vegetable life and on decaying organic matter in the water. The larvae, which are heavier than water, require air and have tubes that break the surface of the water to obtain oxygen. The surface tension on the tubes keeps the larvae afloat while breathing. Attachment 15-A2 is a pictorial key to U.S. genera of mosquito larvae.

15.1.1.4 Pupa. The pupal, or resting stage, does not feed, however mosquito pupa are active and mobile. This is a time of transformation from larva to the adult mosquito. With the pupa floating at the surface, the emerging adult pulls itself out of it's skin. Soon after emerging the adult is ready to fly.

15.1.2 Mosquito Behavior. Mosquito behavior varies with the species. They exhibit a wide variety of habits and capabilities in respect to their flight, biting preferences, disease transmission, and abundance. Some species of mosquitoes are fierce biters and will make areas (such as swamps) uninhabitable and threaten nearby operations. Some mosquitoes are active at night while others will be active during the daylight hours. In addition to annoying bites, the mosquito is most feared for its ability to transmit serious diseases such as malaria, dengue, yellow fever, and encephalitis. Attachment 15-A3 is biological data on some important species of mosquitoes found in North America

BITING
POSITION OF
CULEX ADULT

BITING
POSITION OF
AEDES ADULT



BITING
POSITION OF
ANOPHELES
ADULT

15.1.3 <u>Inspection and Survey.</u> Mosquito surveys are necessary to determine:

- the species present
- their abundance
- the potential hazard of disease transmission

- information on which to base an efficient control program

Surveys should be a continuing part of a control program. A wide variety of collecting equipment is used (Attachment 15-A4). A good map (Figure 15-1) should be developed noting areas of mosquito breeding sites.

Routine surveys are usually conducted by Preventative Medicine Technicians (PMT's) but sometimes may be contracted. Therefore, it is essential that the PCQAE become familiar with the principles involved in mosquito surveillance and coordinate survey information with base preventive medicine personnel.

15.1.3.1 Larval Survey. Larval surveys involve regular dipping stations which should be selected and noted on the map. These sites should be inspected periodically throughout the breeding season. In areas where mosquito control is conducted, random larval sampling should be made to check the effectiveness of the control program.

LARVAL DIPPING SITE

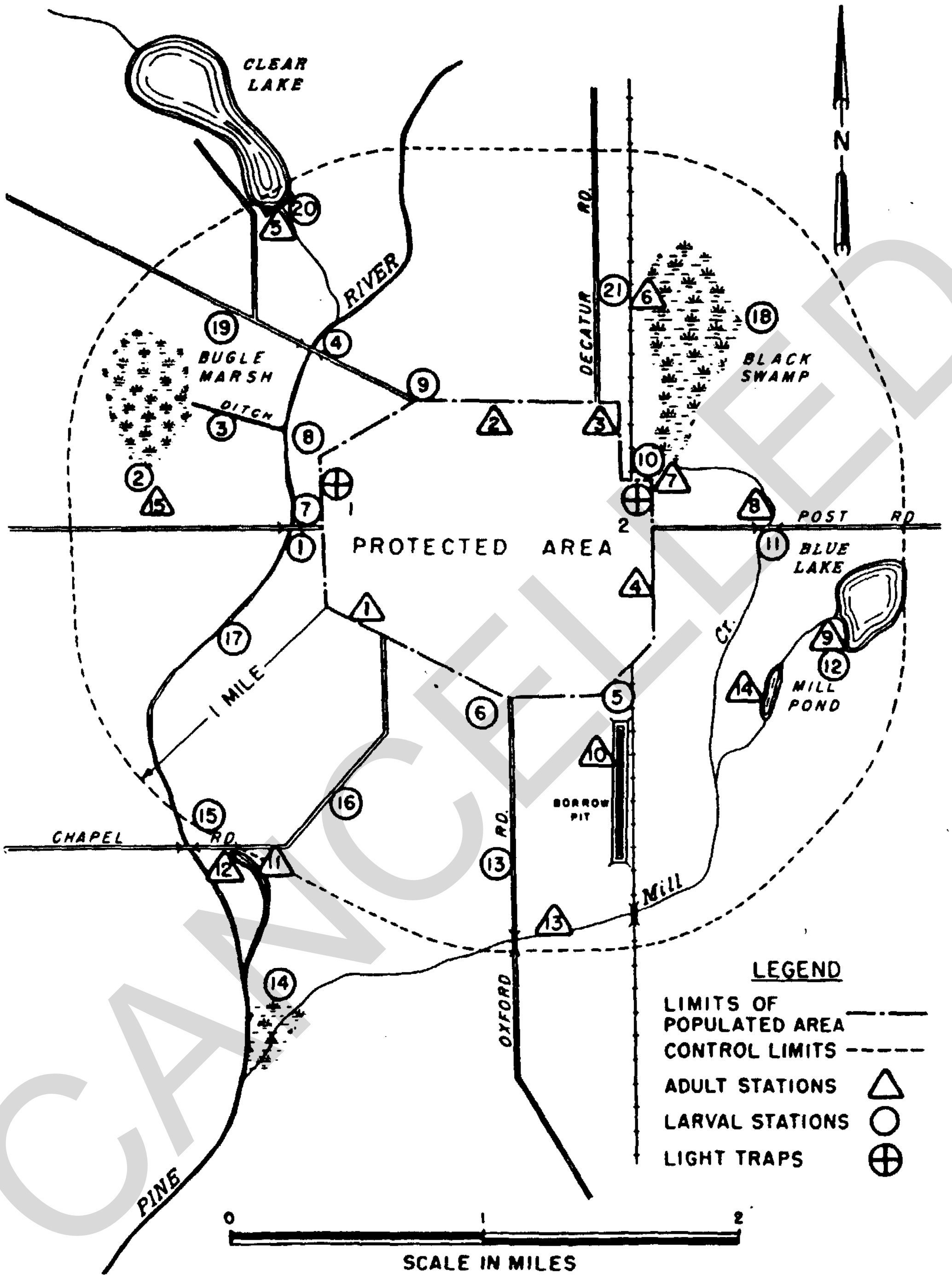
Larval stations can range from:

- tree holes
- artificial containers such as tin cans or barrels
- small pools in wooded areas
- edges of lakes and ponds
- any type of environment where water can accumulate

Most larval collecting is done with a white enamel dipper. The number of larvae taken at each station is recorded by counting the number of larvae per dip. The number of larvae recorded for each dip and the total number of dips are used to calculate the larval index for that station. The larval index is the mean number of larvae per dip for the station.

When sampling or dipping is required in small areas such as tree holes or in leaf axils, large bulb pipettes or siphons (similar to a turkey baster) may be used. Larval surveys are important in that they show us exactly where mosquito breeding occurs.

15.1.3.2 Adult Survey. Survey of adult mosquitoes is carried out by conducting biting and/or landing counts, collecting mosquitoes from resting sites, and using light traps. Methods depend upon the habits of the mosquito species in a particular area. It is desirable to use a combination of methods wherever possible. The



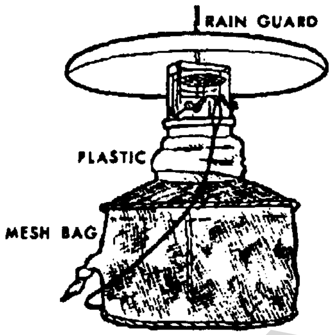
Schematic Map Showing Mosquito Sampling Stations

Figure 15-1
Schematic Map Showing Mosquito Sampling Stations

three most common adult survey methods are:

- **Biting or Landing Counts.** Biting or landing counts are performed by collecting mosquitoes as they bite or alight on humans or animals for a given amount of time. (For example: 1 minute, 5 minutes or 30 minutes) The method should be standardized to compare biting rates at different locations. Selected sites are sampled at intervals of 1 or 2 weeks depending on the species present and the control measures taken.

  Collections are made at the same time of day or night using the same host. Mosquitoes are collected with mechanical or mouth-suction type aspirators from a standard area on the body.
- **Resting Stations.** Resting stations are areas where mosquitoes alight during their inactive periods. Generally they are cool, dark, and damp. These secluded places are usually in stables, sheds, culverts, caves, or similar shelters. The survey of resting stations provides a list of prevalent species in an area.
- **Light Traps.** Light traps should be installed between the breeding sites and the areas of concern. Light traps are operated three or four nights a week, usually from dusk to dawn. The contents should be removed as soon as possible on the morning following collections to avoid damage to the specimens.



CDC LIGHT TRAP

The collections should be sorted according to the species, and the numbers of each species collected at each station. A weekly index for each station should be established by averaging the collections taken over each night.

The Command PMC, Disease Vector Ecology Control Center (DVECC) personnel, or Environmental and Preventative Medicine Unit (EPMU) personnel are available to provide appropriate keys and other information on the identification and habits of local species and to assist in establishing survey programs.

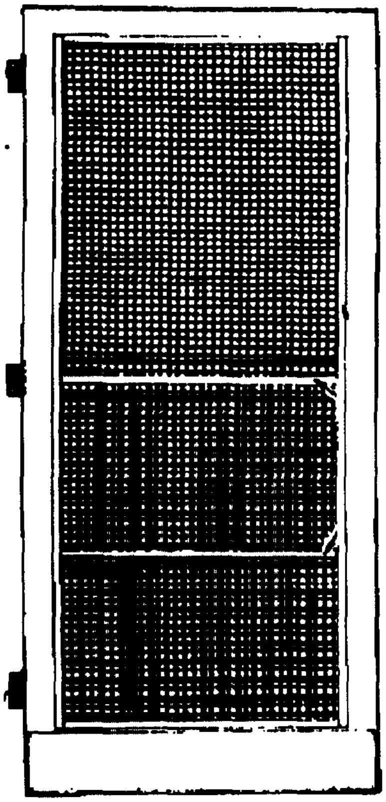
15.1.4 Control. Mosquito control methods are permanent or temporary in nature and may be directed against larvae or adults. The PCQAE should discuss current control methods and review any questions or concerns regarding control of medically important pests with the Command PMC before PCQA plans are developed.

15.1.4.1 Non-Chemical Methods. Because of the importance of the pests discussed in this function, considerable efforts are being expended to develop new and better methods of control. Some methods have been used successfully for centuries, and others will be added to the control arsenal. An installation should make use of every practical method possible to reduce reliance on chemical applications. The Command PMC can provide assistance on effective control procedures.

- **Permanent Control Methods.** Permanent methods designed to eliminate or control the water in which mosquitoes breed can effectively reduce mosquito populations. The initial cost of permanent control methods such as ditching, trenching, and grading as well as their maintenance, is considerably higher than most of the temporary or chemical methods. Such costs must be weighed against the effectiveness and longevity of these temporary measures.

  Permanent control measures should not be initiated until surveys and plans have been examined and reviewed by personnel in the regional Engineering Field Division (EFD).

- **Personal Protection.** Indoors, the use of screens is recommended to exclude mosquitoes. In regions of severe infestation and medical problems, mosquito bed netting is effective, and the use of repellents and repellent impregnated clothing provide effective personal protection.



SCREENED ENTRANCES KEEP FLIES OUT

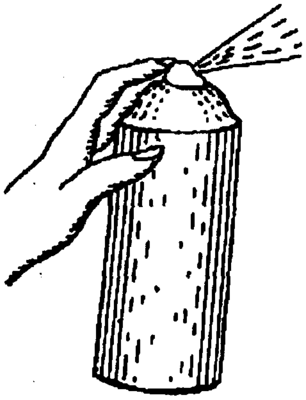
15.1.4.2 Chemical Control. Chemical control methods are usually referred to as temporary control measures because they will provide only immediate and temporary relief from the mosquitoes. Although pesticides can reduce large populations of mosquitoes in a relatively short period of time, there is little residual effect, and repeated applications may be required throughout a breeding season.

These temporary measures involve the use of chemical larvacides, and growth regulators. Several types of growth regulators have been successful in the control of certain species of mosquito, and several types of predacious fish and arthropods have been introduced to mosquito breeding waters to decrease mosquito populations.

- **Larval Control.** Larval control involves the use of specific materials applied to breeding areas. Larvacides may be applied by simple hand equipment to tree holes or puddles, by backpack sprayers to ponds or by power sprayers mounted on boats and aircraft to large bodies of water. Some larvacides, like oil, will cover the surface to suffocate the wrigglers, and others may kill the larvae or prevent completion of their growth cycles.

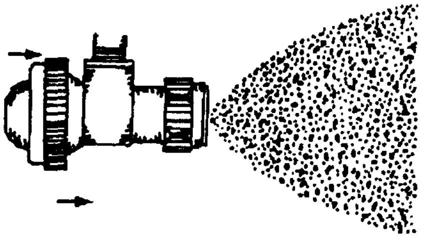
Command PMC's will provide recommendations for the most effective control methods and methods for PCQAE surveillance.

- **Adult Control.**



AEROSOL APPLICATION

  - **Indoor.** Indoor control involves space sprays with aerosol cans for individual rooms or power pesticide dispersal equipment for large areas. People should not be allowed to return to treated areas for at least one hour after a treatment or according to the label directions for re-entry. While watching aerosol or ULV application, the PCQAE should wear appropriate eye and respiratory protection.
  - **Outdoor.** Outdoor control involves fogging with Ultra Low Volume (ULV) equipment, or barrier treatments using residual pesticides. Outdoor equipment may include hand-held sprayers, backpack sprayers, vehicle mounted or trailer mounted equipment for ground applications (or aircraft mounted equipment for large scale application and for application to inaccessible areas). In areas of heavy mosquito breeding, or because of migratory species, repetitive treatments may be required. Mosquito surveys which resulted in the establishment of threshold levels determine the timing of applications.

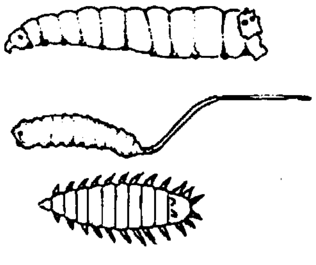


AERIAL ULV MISTING NOZZLE

15.1.4.3 Pesticide Exposure to Humans. PCQAEs should be extremely careful that operators on vehicle driven foggers do not direct fog into occupied buildings and that children are not allowed to trail in the fog behind moving vehicles. Because large areas are usually involved, the PCQAE should verify the contractor's calculations to determine the area of coverage and the speed at which the vehicle must travel to dispense the required pesticide volume. The PCQAE should discuss surveillance methods with the Command PMC at the time when PCQA plans are being developed.

15.2 FLIES. Flies and mosquitoes belong to the same order of insects. They have one pair of wings and four stages of development (egg, larvae, pupae, adult). Fly larvae are called maggots. There are many species of flies, but the ones of concern in public health are limited in number. Flies of public health importance are divided into two main groups:

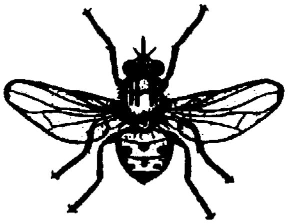
- biting flies
- filth flies or non-biting flies



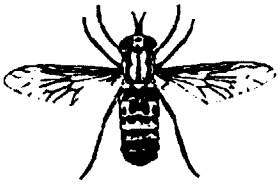
MAGGOTS

15.2.1 Identification. Attachment 15-A5 is a pictorial key to adult common domestic flies.

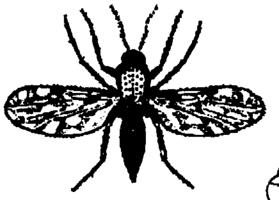
15.2.1.1 Biting Flies. Biting flies include horseflies, deerflies, stableflies, black flies, sandflies and biting midges (called punkies or "no-see-um's"). The mouth parts of the biting flies are modified for piercing or cutting the skin of man and animals to induce bleeding so that they can then ingest (suck) the blood. The biting flies can range in size from the larger stable and deer flies to the very small black flies and biting midges which are difficult to see.



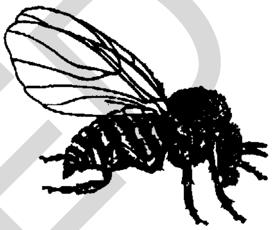
STABLEFLY



DEERFLY



BITING MIDGE (Culicoides)



BLACKFLY

15.2.1.2 Filth Flies or Non-biting Flies. The filth flies or non-biting flies are medically important because they may be potential mechanical vectors of disease. The eggs are deposited by the adult flies in fecal material, rotting grain, or other organic material. The adult flies may then come in contact with humans or the food that we eat.

Examples are the ordinary house fly, green and blue bottle flies, cluster flies, and filter flies. In addition, several fly species are parasitic on animals such as the screwworm fly. Non-biting flies have their mouth parts adapted for consuming liquified food. This is accomplished by the adult fly regurgitating on food material, and then with it's sponge-like mouth parts ingesting this food material.

BOTTLE FLY

HOUSE FLY

15.2.2 Inspection and Survey. Accurate survey of flies is dependent on knowing their general biology, so that preferred host materials and resting sites can be watched. Figure 15-2 lists the biology of some domestic flies (flies intimate with human habitat). Attachment 15-A6 is a summary of important domestic biting and filth flies.

15.2.2.1 Adult Biting Flies. Adult biting flies can be surveyed by conducting biting or landing counts (as covered in 15.1.3.2), sweep netting or examining resting sites. This involves collecting in or near breeding areas or observing the number

Species	Life Cycle	Adult Occurance	Preferred Host Material
House fly Musca domestica	200-2000 eggs per female. Egg to adult in 7 to 45 days.	Prefer warm but not too hot weather. May occur year around but most abundant in Sept. and Oct.	Larvae almost always occur in man-made sources, animal waste, culled fruits and vegetables are preferred.
Little house fly Fannia canicularis	180-560 eggs per female. Egg to adult in 18 to 24 days.	Males typically hover in protected locations such as garages, porches and inside houses. Less abundant during summer and winter.	Larvae develop in almost all kinds of decaying organic matter. Chicken manure usually the source of large infestations. Other types of manure also favored.
Green blow fly Phaenicia (2 species)	3000 eggs per female. Egg to adult in 9 to 18 days.	Fequently most common flies in urban situation. Common during summer months.	Garbage cans common source during summer months. Dog droppongs also preferred.
Blue blow fly Eucalliphora and Calliphora	500-700 eggs per female. Egg to adult in 15 to 21 days.	Usually first flies to appear in spring.	Decaying carcasses of birds and mammals. Also found in garbage dumps.
Black blow fly Phormia regina	200-400 eggs per female. Egg to adult in 10-25 days.	Most common blow fly in wild areas. Active in relatively cool temperatures in spring and summer.	Decaying carcasses. Also lays eggs in open wounds of animals.
Stable fly Stomoxys calcitrans	200-400 eggs per female. Egg to adult in 13 to 40 days.	Common around dairies. dairies. Occasionally attracted to and bite dogs in large enough numbers to be a problem.	Manure, especially when mixed with straw. Lawn clippings and animal feed waste also preferred.
Vinegar flies Drosophila (several species)	400-1000 eggs per female. Egg to adult in 8 to 11 days.	Most abundant around larval source and during fall, but can be present year around.	Larvae foundin decaying fruit and vegetables. Gargabe cans frequent source.
False stable fly Muscina stabulans	140-220 eggs per female. Egg to adult in 15 to 30 days.	Most abundant in early spring prior to peak house fly emergence. Occur in many situations.	Manure and decaying plant waste such as culled fruit.
Flesh flys (several genera)	Female deposits 30 to 60 larvae instead of eggs. Eggs held in female until they hatch. Larvae to adult 8 to 18 days.	Year around, more common in warm months.	Garbage cans, manure (especially untrampled) animal carcasses including snails.

Figure 15-2
Biology of Domestic Flies

of flies at resting sites.

15.2.2.2 Adult Filth Flies. Adult non-biting flies can be surveyed by use of:

- sweep net counts
- examination of resting sites
- cone traps
- fly grids
- sticky traps

Cone traps use a cone shaped mesh screen with a bait placed in the center. The cone shape allows the flies to enter easily, but escape is difficult. A fly grid can be used to count the number of flies landing or resting on a portion of the grid, usually in a one minute time period.

15.2.3 Control.

15.2.3.1 Non Chemical. Sanitation is still extremely important in the control of biting and non-biting flies. All accumulation of organic matter that could act as breeding media should be removed. The use of screens on structures is still a very good mechanical method of excluding flies. Two old fashioned indoor methods should not be neglected: (1) sticky tapes which are hung from ceilings that trap resting flies and (2) the fly swatter.

In areas where doors must be kept open such as warehouses and loading platforms, air screens which move air down and out of the entrance will act as a barrier to flies. Hanging plastic strips in entrances will deter many flies from entering a structure.

Biting fly traps are effective at controlling some species. A device is constructed which acts as an attractant to the fly. This trap may resemble an animal, or it may contain the correct colors which are attractive. Many flies prefer to attack the underbelly of the animal. This knowledge can be used to advantage by constructing the traps underbelly as a funnel trap. The flies fly or crawl up through the opening and are trapped.

Electrified grids are not permitted for outdoor use on Navy facilities. In specific instances, these grids may be used indoors. Overall, electrocuting grids are ineffective.

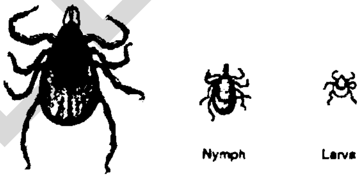
15.2.3.2 Chemical. Chemical control of flies is usually limited to the control of adults. Usually this is performed by applying residual pesticides to resting sites in and around buildings, and through the use of space sprays both in and outside buildings. Treating areas where larvae exist will reduce fly populations.

Because space sprays will only control adults, repeated treatments may be necessary. Baits that are usually provided in a granular form with a suitable attractant such as sugar can also reduce fly breeding. Traps or resting grids may be utilized by the QAE to determine the effectiveness of the contractor's control efforts.

15.3 TICKS. Ticks are parasites which feed on the blood of both warm and cold blooded vertebrates. Lyme Disease, Rocky Mountain Spotted Fever and dog heartworm are transmitted by ticks. Tick paralysis may result from tick bites. For this reason, control must be considered a priority item. Technical Information Memorandum No. 26 titled LYME DISEASE VECTOR SURVEILLANCE AND CONTROL, issued by the Armed Forces Pest Management Board is an excellent reference. Figure 15-3 is a pictorial key to genera of adult ticks.

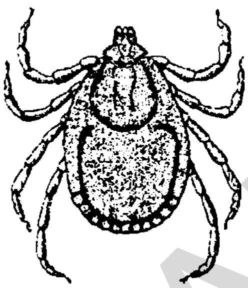
15.3.1 Identification.

15.3.1.1 Hard Ticks. While adult hard ticks are clearly visable, nymph and larval tick life stages can be very small. This can present a particular problem with some **Ixodes ticks** which are proven vectors of **Lyme Disease**. The larval life stage (sometime called seed ticks) can be as small as the size of a pin head.



DEER TICK

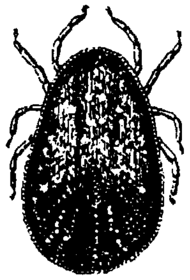
Adults and nymphs have eight legs while the larvae have six legs. Ticks are flattened from top to bottom. The body is hard and usually shiney. Hard ticks have mouth parts which can be clearly seen from a top view. When they are engorged after a blood meal, the abdomen will be expanded making the head area appear extremely small in comparison.



BROWN DOG TICK

- **Ticks Indoors**. Ticks will enter a household on a person or pet that has visited the ticks habitat. Rarely will a tick wander in or "invade" a residence on it's own. However, after a tick has fed, it will drop off and seek some protected situation in the immediate surroundings. For this reason, ticks may be located behind baseboards, in furniture, under door moldings etc. in houses. A family home can become heavily infested with ticks if the family dog continues to bring them in from outdoors.

15.3.1.2 Soft Ticks. Soft ticks have a body which is rather sac-like and soft. The head and mouthparts cannot be seen from a top view. In the U.S., these ticks are generally associated with birds.



SOFT TICK

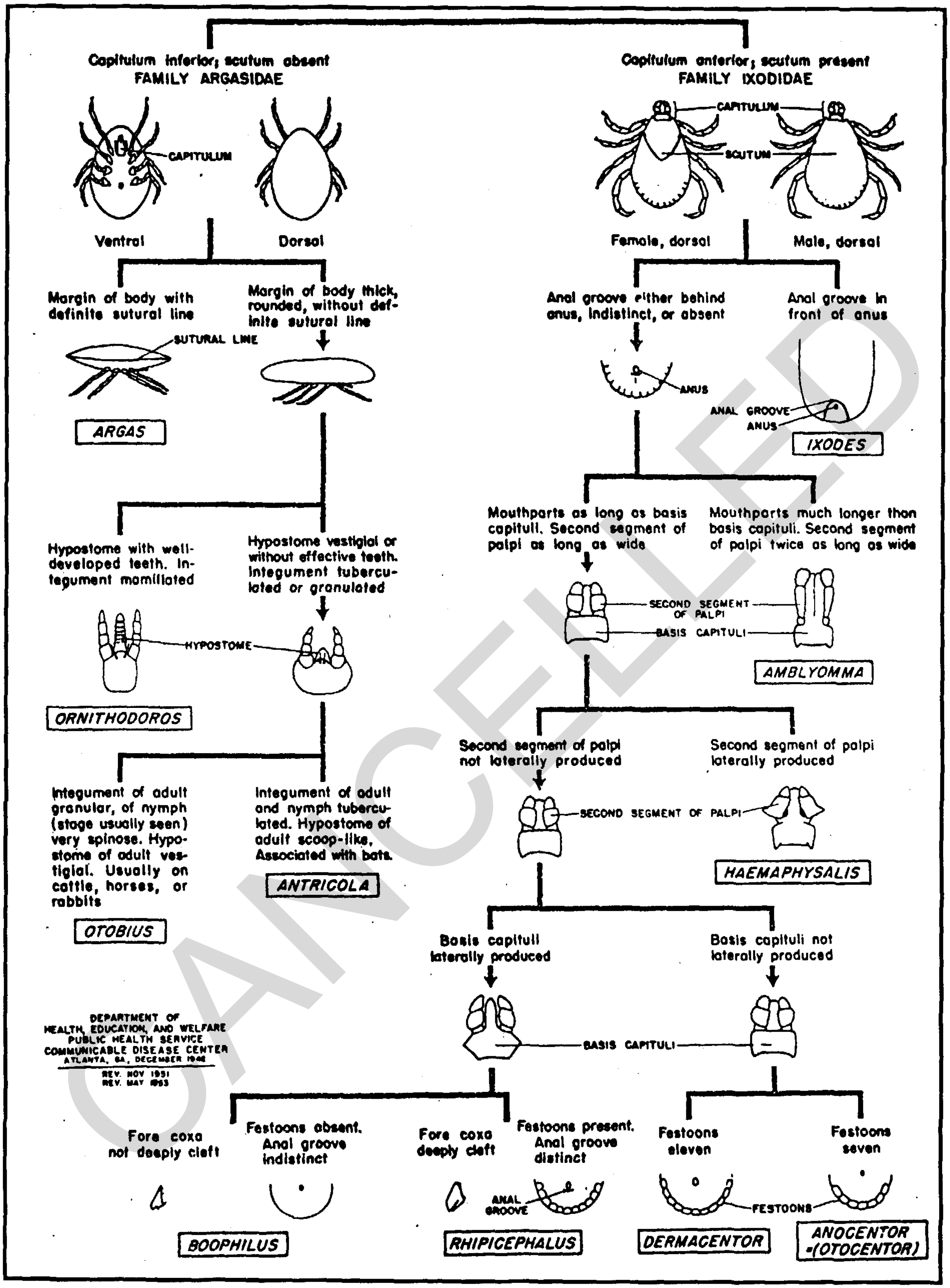


Figure 15-3
Pictorial Key to Genera of Adult Ticks in United States

15.3.2 Inspection and Survey. Survey for ticks is generally performed by preventative medicine personnel, or DVECC or EPMV medical entomologists. However, there may be occasion when this function is contracted out.

15.3.2.1 Tick Traps. Most ticks are attracted to carbon dioxide (a biproduct of breathing). Tick traps use dry ice as bait which gives off carbon dioxide as it warms. There are many trap designs. The most common design uses a styrofoam box with small holes to allow the carbon dioxide to escape slowly. Sticky tape placed strategically around the trap catches the ticks.

15.3.2.2 Tick Drags. Dragging for ticks through a plot is similar to trolling for fish. A person pulls a white flannel cloth across the area which is to be sampled. Searching ticks will "grab" the drag as it passes. The white cloth allows for easy spotting of the tick. Some other variations of this procedure is for a human to simply walk through the sample area, and then collect the ticks from themselves. Generally, the human will be dressed in white clothes with boots taped tightly to the pants legs.

TICK DRAG

15.3.3 Control.

15.3.3.1 Non-Chemical Control.

- **Indoor.** Exclusion is the primary control method. Limit the indoor harborage areas by caulking and sealing as many openings as possible. Removing debris such as leaf litter, old mulch, etc. from around foundations reduces their hosts desirable habitat close to the structure.
- **Outdoor.** Personal protection is the only choice. Avoid areas where ticks abound. If not possible, wear light colored clothing to aid in finding the ticks. Long pants and long sleeved shirt, with high-top or closed boots should be worn. Tightly tape the pants legs to the boots or your ankles. When you return, a thorough strip and self examination is essential.

15.3.3.2 Chemical Control. Several methods of pesticide application may be used to control ticks. They may be used separately or in combination. The PCQAE should require a copy of the label and MSDS for all pesticides a contractor intends to use. The PCQAE should then ensure that pesticides are used for intended pests in accordance with label instructions.

- **Repellents** are very effective. The new extended formulation DEET (NSN# 6840-01-284-3982) which can be applied to the skin, gives longer protection, lower odor and less irritation than the old military formulation of DEET. Cloth impregnating tick repellents such as permethrin (NSN #6840-01-278-1336) are applied to the clothing before being worn and allowed to dry. Family pets should have a good quality, water safe, tick repellent collars.

- **Indoor Treatments.** Brown dog tick control requires treatment of the pet(s) by the owner or a Veterinarian plus a residual treatment of areas of the structure. Residual treatment of structures is covered in Chapter 12, Household Pest Control.
- **Outdoor Treatments.** Either granular formulations or emulsions can be used. The control achieved will be temporary, as the ticks will repopulate the area. Repeat applications over time are generally performed. The area to be treated is dependent upon the type of tick to be controlled. Examples are: lawns surrounding dwellings, a 10'wide swath on either side of a forest path or low brush on the perimeter of a field.

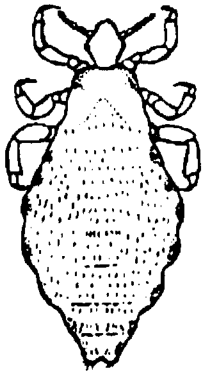
15.4 LICE. Lice are ectoparasites that live and feed on the external body surfaces of the host. Identification, survey and control of lice is the responsibility of the medical department, however, it is appropriate for the QAE to have knowledge of them. Attachment 15-A7 is a summary of lice and other important ectoparasites that attack humans. Fleas, ticks and mites are covered in Chapter 12, Household Pest control.

15.4.1 Identification. Lice are insects commonly associated with poor sanitation and wars. However, they can be found on people of any social standing. Lice can be passed from individual to individual by social contact.

There are three types of lice that infest humans. They are:

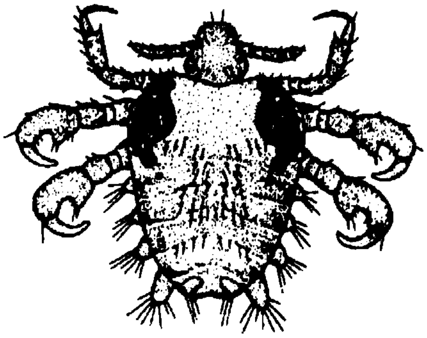
- body lice
- head lice
- crab (pubic) lice

15.4.1.1 Head Lice and Body Lice. Head lice and body lice are similar in appearance. Both are small wingless insects with an elongated oval body approximately 1/8 inch in length. The color varies from a grey-white to a brown. Body lice confine themselves to feeding on the body and remain in the clothing next to the skin. The head louse lives in the hair of the head and is also found on the hair of the legs, chest, armpits and occasionally in the beard and eyebrows. Head and body lice have been known to transmit several diseases such as epidemic typhus and relapsing fever.



HEAD AND BODY LICE ARE SIMILAR IN APPEARANCE

15.4.1.2 Crab Lice. The crab louse is one-half the size of the body louse. It has a nearly round hairy body. The crab louse lives among the hairs of the pubic region. They are not known to transmit disease, however the presence of these pests causes considerable distress in its host. Widespread infestations can have a pronounced effect on personnel morale.


CRAB LOUSE

15.4.2 Inspection and Survey. Lice surveys involve an inspection of the body hairs to locate the presence of head lice eggs ("nits"), inspection of clothing to locate body lice, or the inspection of the pubic region to locate adult crab lice.

15.4.3 Control

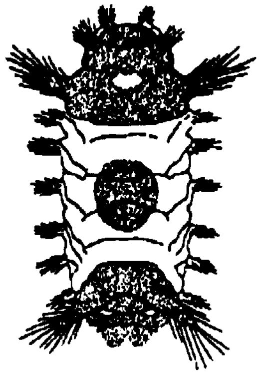
15.4.3.1 Non Chemical. Combs for removal of lice eggs from hair are available for personal use, and may be purchased from drug stores. No other method of non-chemical control is available at this time other than to limit and use care in physical contact between humans.

15.4.3.2 Chemical.

- **Epidemic.** When lice are found in epidemic proportions on military personnel, chemical control consists of mass delousing operations under the supervision of medical entomologists. Other than for specific military operations, treating of humans and animals should never be allowed.
- **Individual.** Normal louse control is a personal matter as the lice remain closely associated with a body and unless there is body contact, they will not be spread from individual to individual. Pesticide applications to places such as toilets, beds, furniture, etc. will have no effect in a control program and should not be done. A number of personal delousing products are available at drug stores. The Command PMC can recommend materials for personal delousing.

15.5 URTICARIOUS (STINGING) CATERPILLARS.

15.5.1 Identification. Certain caterpillars and moth larvae secrete or inject a venom through the hairs or spines on their bodies. Some of the caterpillars may be attractive and strikingly colored, giving the impression of being harmless. However, brushing against them can result in painful skin problems. The medical importance of such caterpillars is the potential allergic reaction in


SADDLEBACK CATERPILLAR

those who are stung. The venom of these caterpillars is produced in glands located at the base of the hairs. The more important venomous caterpillars are the pus caterpillar, the flannel moth, the brown tail moth, the white tussock moth, the Io moth, and the saddleback caterpillar. Figure 15-4 is a pictorial guide to some of the important stinging caterpillars found in the United States.

15.5.2 **Inspection and Survey.** No special techniques have been developed for these pests other than direct observation, or to query people who were stung, or otherwise involved in complaints.

15.5.3 Control.

15.5.3.1 **Non Chemical.** Problems with caterpillars with stinging hairs may be decreased by either removing or locating the host plants away from populated areas. Nests of stinging and biting arthropods should be destroyed, or avoided.

15.5.3.2 **Chemical.** Caterpillars with stinging hairs may be controlled with residual pesticide applications to individual host plants that are in close proximity to humans. Normally these pests are not a serious problem and unless found in large numbers, chemical control is not recommended for area use.

15.6 CONTROL EQUIPMENT. A wide variety of equipment will be used in operations to control pests of medical importance. Equipment will vary in size and complexity from simple hand held sprayers or dusters to aircraft mounted ULV sprayers. Therefore, it is essential that the calibration of equipment be verified and in proper working order. Examples of equipment used for control of medically important arthropods are:

- hand sprayers (compressed air)
- hand dusters
- aerosol cans
- power sprayers (battery and fuel driven)
- power dusters
- traps
- exclusion devices such as screens
- bait stations
- aerial pesticide dispersal units

15.7 CONTROL HAZARDS. Considerable care must be taken when applying pesticides for medically importance arthropods. The areas of application may be close to water, food processing, or areas of animal and human habitation. Frequently, pesticide applications are made with power equipment which can be difficult to control. Area

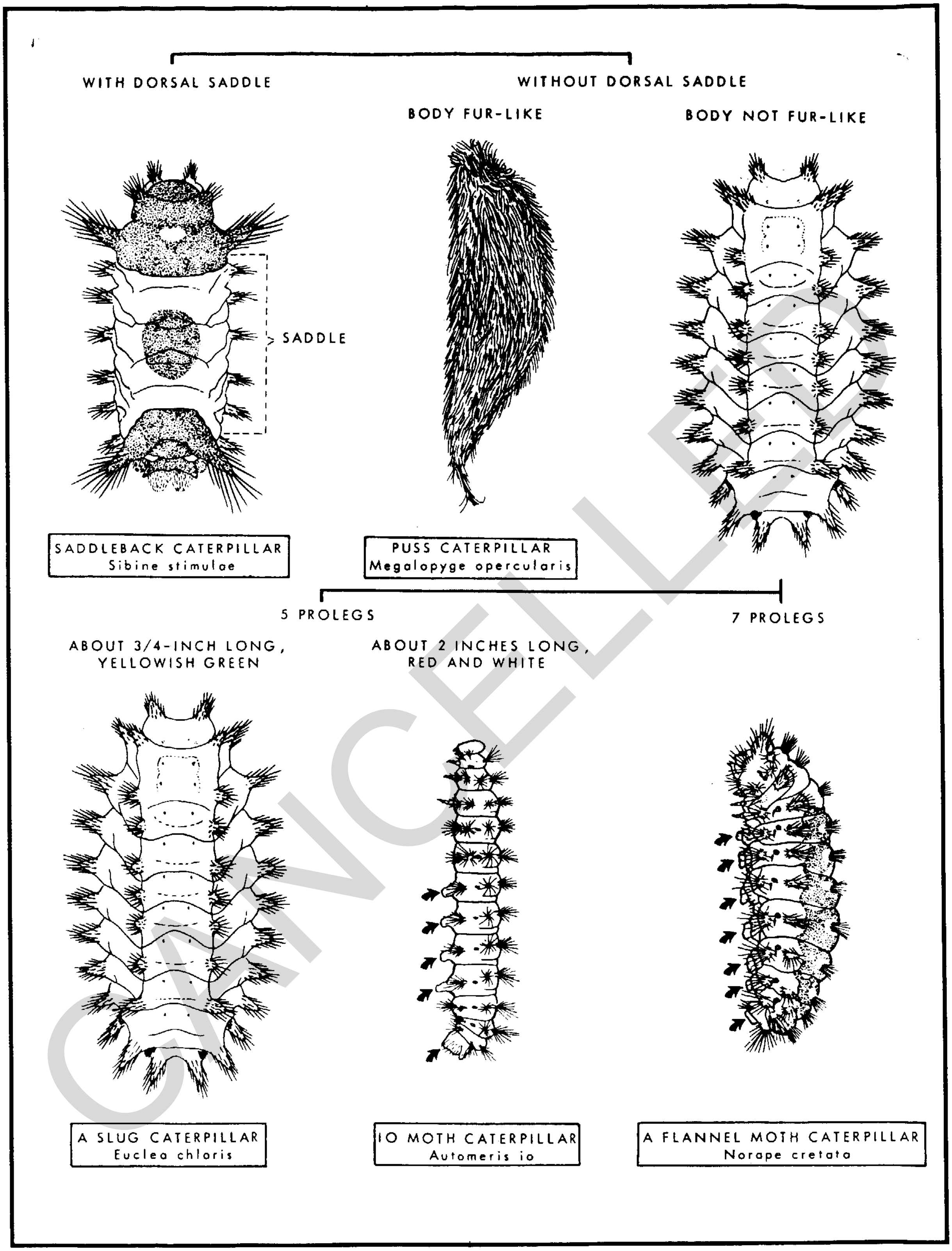


Figure 15-4
Stinging Caterpillars
Pictorial Key to Some Important United States Species

and volume calculations must be verified, as well as equipment calibration.

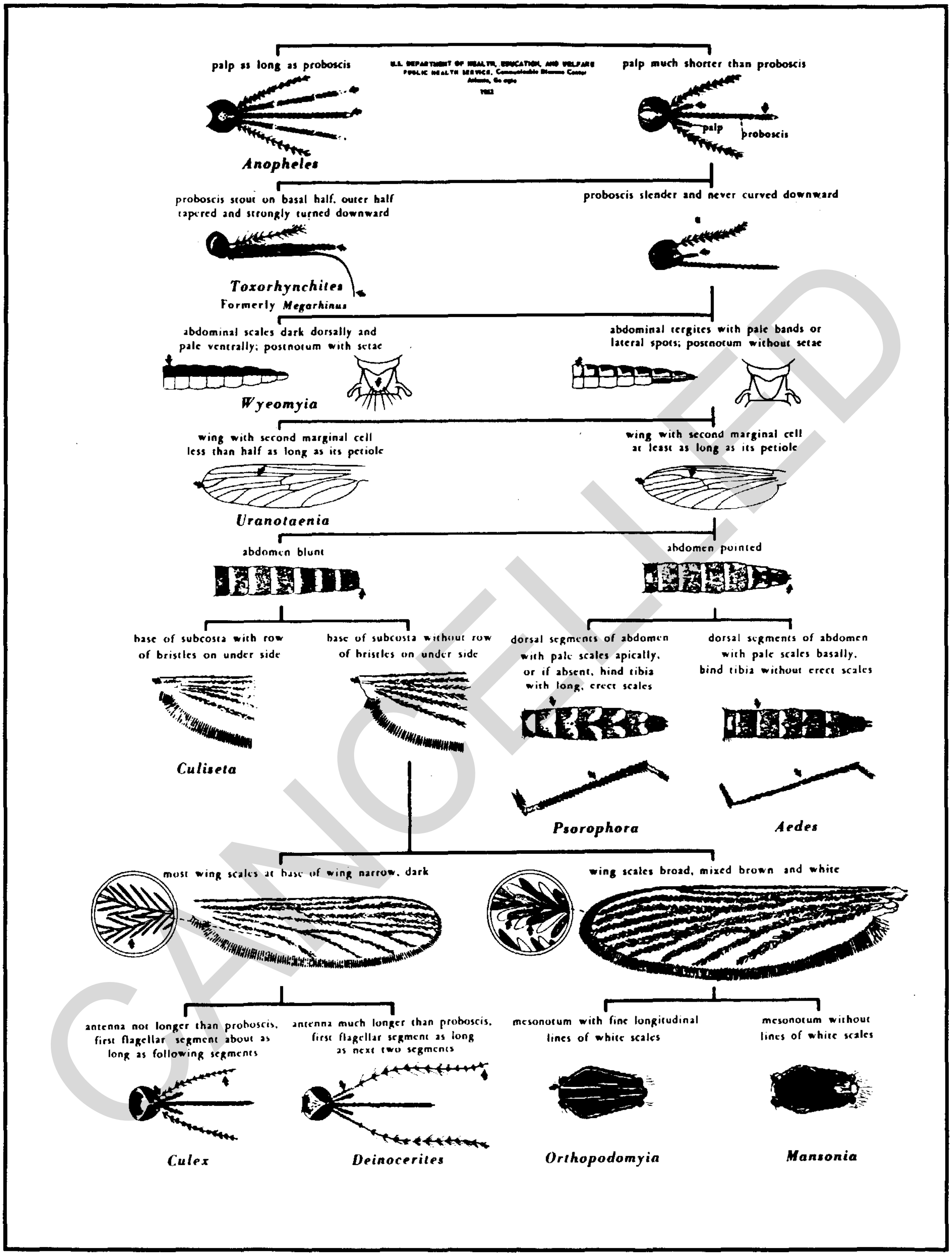
Timing of power and aerial applications of pesticides is extremely critical. The applicator and PCQAE should ensure that applications are not made at times of maximum human or animal exposure or when wind speeds exceed 5 miles per hour, to prevent drift. The PCQAE should be present whenever planning sessions are held for aerial applications. Extreme care should be taken to have food materials removed or covered when pesticides are applied nearby. Pesticides should never be applied to humans or pets.

15.8 RECORDS AND REPORTING. One form 6250/2 (indoor) or 6250/3 (outdoor) should be filled out for each pest management operation performed at each unit, building, structure or site. If more than one pest, operation, or control agent are involved in a specific pest management operation, then a separate form must also be completed for each.

After a record is completed, the bottom (yellow) copy should be retained at the installation as a daily legal record of pesticide usage, and as a maintenance record. The back of the yellow copy may be used to record additional details about the operation. Copies of inspections, survey reports, site maps and charts, etc. should be permanently attached to the yellow copy.

At the end of each month, all of the top (blue and green) copies are assembled and submitted to the Command PMC. The PCQAE should review records on a regular basis to ensure that records are completed and submitted in accordance with contract specifications.

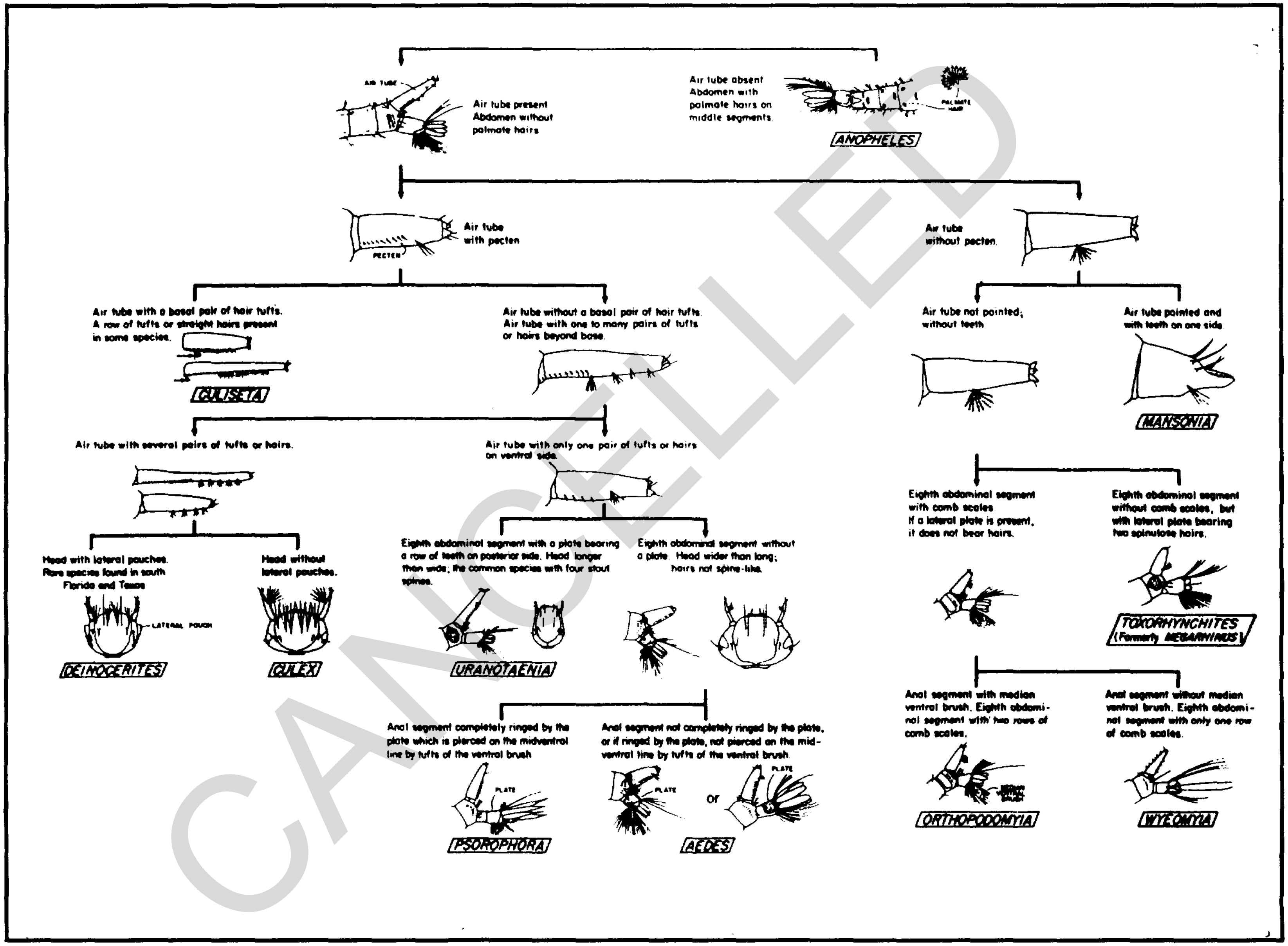
The PCQAE shall complete a separate report for each PCQAE inspection performed, including the time required for the inspection. At the end of the month the PCQAE should assemble and submit all blue and green copies to the Command PMC.



Attachment 15-A1
MOSQUITOES:
Pictorial Key to United States Genera of Adults (Female)

Attachment 15-A2

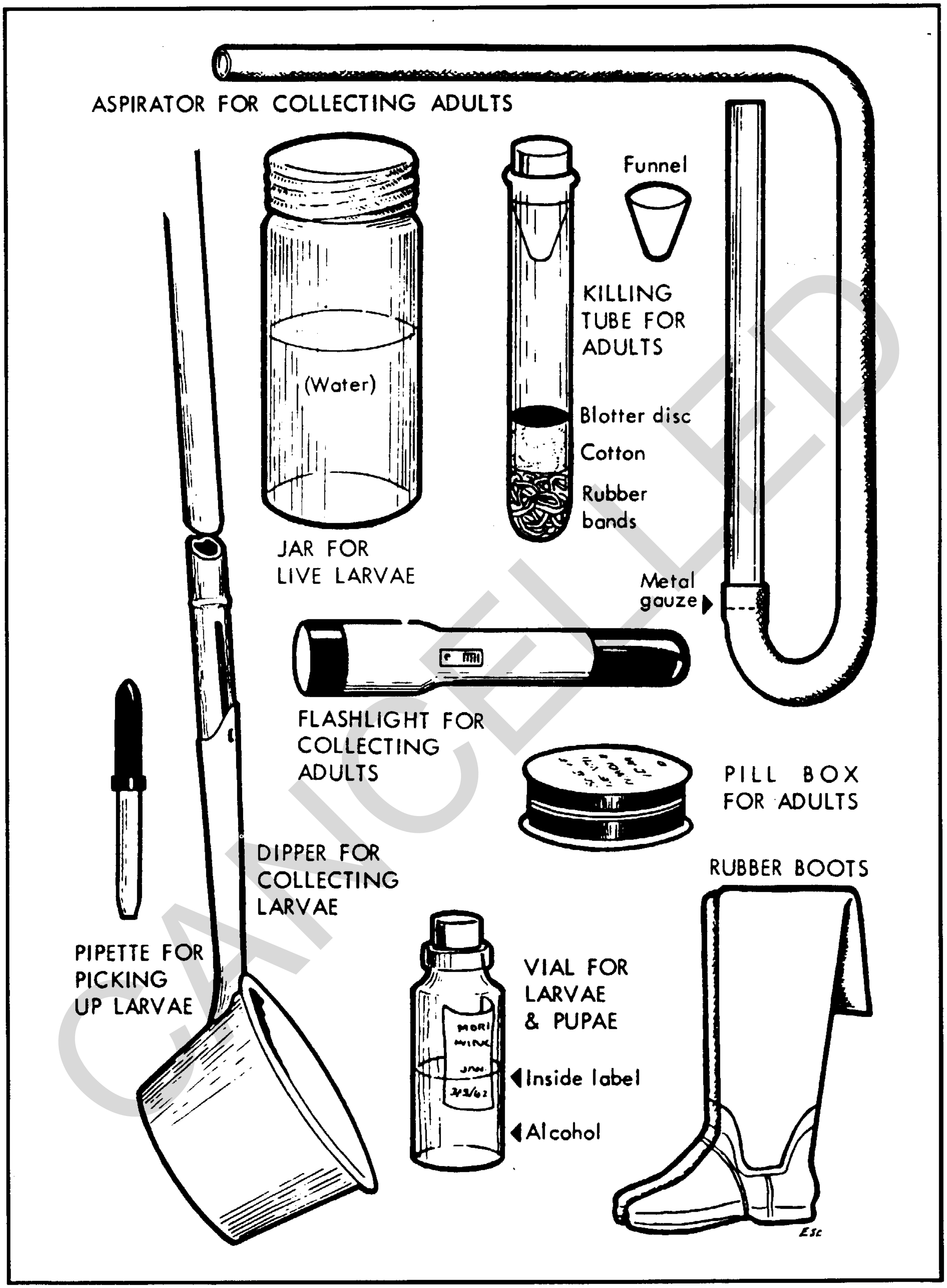
Pictorial Key to U S Genera of Mosquito Larvae



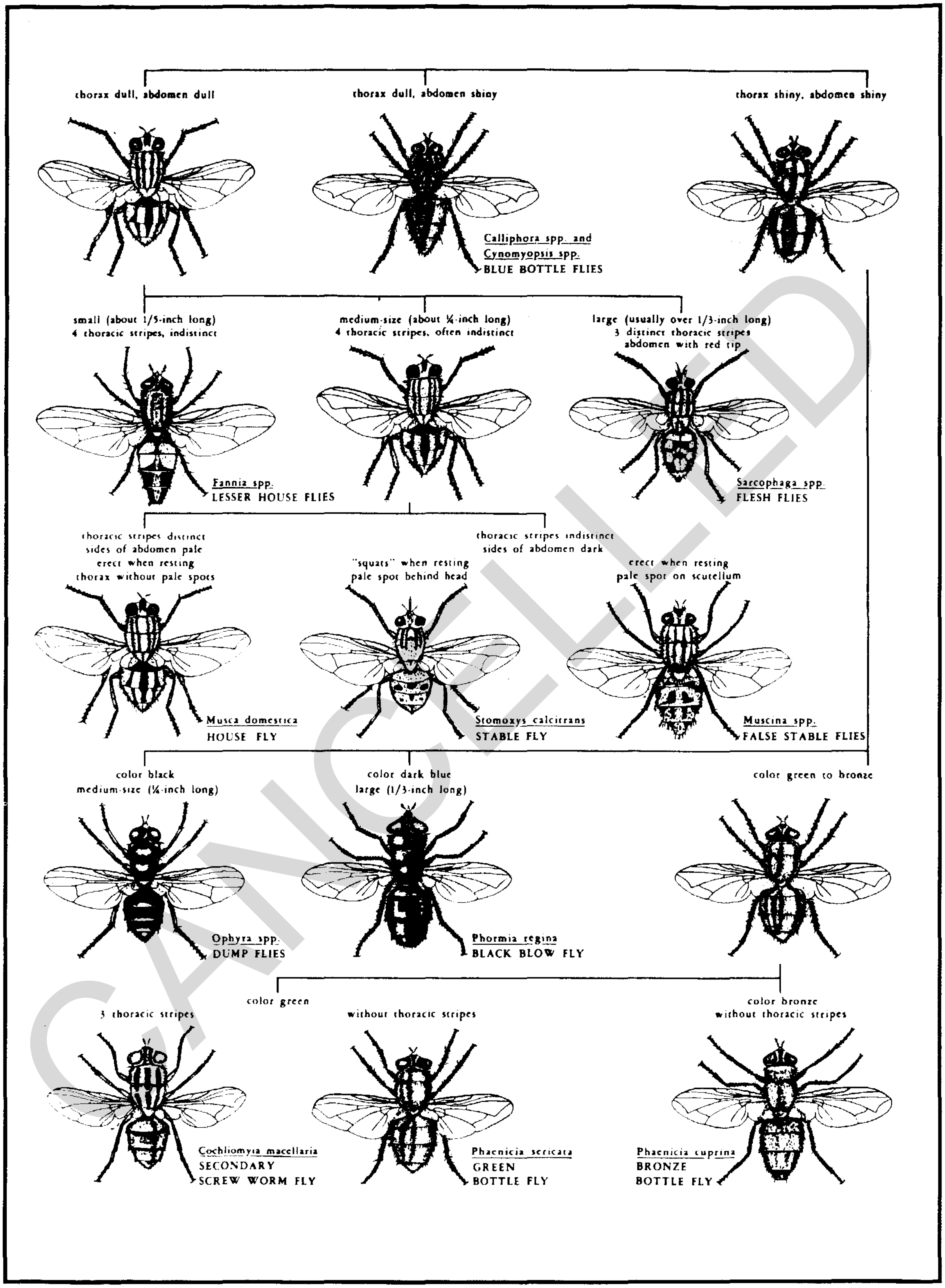
Species	Egg Deposition	Broods /Year	Overwintering Stage	Preferred Larval Habitat	Range of Effective Flight
Anopheles quadrimaculatus	Singly on water.	Many	Adult female	Clean water, partially shaded, some vegetation.	1 mile
Anopheles freeborni	Singly on water.	Many	Adult female	Clean water, partially shaded, some vegetation.	1-2 miles +
Culex pipiens complex	Rafts on water.	Many	Adult female	Permanent water with organic matter.	1 mile +
Culex tarsalis	Rafts on water.	Many	Adult female	Almost any collection of water.	2-10 miles
Mansonia perturbans	Rafts on water.	One	Larva	Permanent water with some aquatic vegetation.	1-5 miles
Aedes aegypti	Singly on sides of containers.	Many	Egg	Artificial containers.	Less than 1/2 mile.
Aedes triseriatus	Singly on sides of containers.	Many	Egg	Tree holes, artificial containers.	1/2- 1 mile.
Aedes sollicitans	Singly on ground.	Many	Egg	Temporary pools, usually brackish water.	5-20 miles.
Aedes taeniorhynchus	Singly on ground.	Many	Egg	Temporary pools, usually brackish water.	5-20 miles.
Aedes dorsalis	Singly on ground.	Many	Egg	Temporary pools, pastures etc.	10-20 miles.
Aedes nigromaculis	Singly on ground.	Many	Egg	Temporary pools, pastures etc.	2-5 miles
Aedes vexans	Singly on ground.	Many	Egg	Temporary pools.	5-20 miles.
Psorophora ciliata	Singly on ground.	Many	Egg	Temporary pools, rice fields.	5 miles +
Psorophora confinnis	Singly on ground.	Many	Egg	Temporary pools.	5 miles +
Culiseta melanura	Rafts on water.	Many	Adult female and larva	Permanently shaded pools in swamps.	100-1000 yards.

(Acknowledgement is made for information in the above table taken in part from Pratt, Barnes, and Littig 1963)

Attachment 15-A3
Biological Data on Some Important Mosquitoes Found in North America



Attachment 15-A4
Equipment for Mosquito Surveys



Attachment 15-A5
Pictorial Key to Common Domestic Flies

SUMMARY OF IMPORTANT BITING FLIES

Biting Midges	Adult midge	Warm-blooded vertebrates	Irritating bites.	Residual and contact sprays; repellents.	Habitat destruction.
Horse Flies	Adult fly	Domestic animals	Irritating bites.	Residual and contact sprays; repellents.	Habitat destruction.
Deer Flies	Adult fly	Domestic animals	Irritating bites.	Residual and contact sprays; repellents.	Habitat destruction.
Black Flies	Adult fly	Domestic animals	Irritating bites.	Residual and contact sprays; repellents.	Habitat destruction.
Stable Fly	Adult fly	Domestic animals	Irritating bites.	Residual and contact sprays; repellents.	Habitat distruction.

SUMMARY OF IMPORTANT FILTH FLIES

Insect	Identifying Characteristics	Preferred Host Material	Adult Occurance	Life Cycle	Control	
					Chemical	Other
House Fly	1/4 inch long; dull gray with 4 stripes on thorax. 4th wing vein sharply angled.	Animal waste, garbage and other decaying organic matter.	Most abundant late summer and early fall.	7 to 45 days.	Residual and contact sprays; baits, traps; larvicides.	Sanitation and habitat destruction.
Flesh Flies	2 to 3 times larger than house fly; gray and black checker-board pattern on the abdomen.	Garbage, manure and animal carcasses.	Common in warm months.	2 to 4 weeks.	Residual and contact sprays; larvicides.	Sanitation and habitat destruction.
Blow Flies	About twice as large as house fly; metallic blue or green color.	Animal carcasses, garbage and manure.	Spring and summer.	2 to 4 weeks.	Residual and contact sprays; larvicides.	Sanitation and habitat destruction.
Fruit Flies	1/8 inch long; yellowish brown; hover around ripe or decaying fruits.	Decaying fruits and vegetables; garbage.	Most abundant in late summer and early fall.	1 to 2 weeks.	Residual and contact sprays.	Sanitation and habitat destruction.
Phorid Flies	Superficially resemble fruit flies, but are more hump-backed.	Decaying vegetation.	Most abundant in warmer months.	1 to 2 weeks.	Residual and contact sprays.	Sanitation, habitat destruction and moisture control.
Moth Flies	1/8 inch long; body and wings densely covered with long hairs.	Decaying organic matter, especially around drains and sewers.	More common in warm months.	2 to 3 weeks.	Residual and contact sprays.	Sanitation habitat destruction and moisture control.
Cluster Fly	Superficially resemble house flies, but is slightly larger and more sluggish in its movement.	Parasitic on earthworms.	Abundant in spring and fall.	4 to 6 weeks.	Residual and contact sprays.	Screening and calking around eaves, windows, etc.

Attachment 15-A6
Summary of Important Domestic Flies

Arthropod Pest	Damaging Stages	Preferred Host(s)	Public Health Importance	Control Methods	
				Chemical	Other
Bed Bugs	Adult, nymph	Man	Irritating bites.	Residual and contact sprays.	Habitat destruction; sanitation.
Cat Flea and Dog Flea	Adult	Cats, dogs	Bites; intermediate host of dog tapeworm.	Residual sprays and dusts; contact sprays; flea collars.	Habitat destruction.
Human Flea	Adult	Man	Bites; intermediate host of dog tapeworm.	Residual and contact sprays.	Habitat destruction.
Oriental Rat Flea	Adult	Rats	Bites; vector of plague and murine typhus.	Residual and contact sprays.	Habitat destruction: rat control.
Pubic Louse	Adult, nymph	Man	Irritating bites.	Insecticidal soaps and shampoos.	Personal hygiene.
Body Louse	Adult, nymph	Man	Bites; vector of epidemic typhus, trench fever, epidemic relapsing fever	Insecticidal soaps and shampoos.	Personal hygiene; launder infested clothing.
Head Louse	Adult, nymph	Man	Pediculosis.	Insecticidal soaps and shampoos.	Personal hygiene.
Chiggers	Nymph	Rodents and man.	Irritating bites.	Residual sprays and repellents.	Habitat destruction; rodent control.
Tropical Rat Mite	Adult, nymph	Rats and man	Irritating bites.	Residual and contact sprays.	Habitat destruction; rat control.
Human Itch Mite	Adult, larva, nymph	Man	Scabies	Insecticidal soaps and shampoos.	Personal hygiene.
Brown Dog Tick	Adult, larva, nymph	Dogs	Nuisance pest.	Residual sprays; collars, dips and powders for dogs.	Animal (dog) sanitation.
American Dog Tick	Adult, larva, nymph	Dogs	Bites; vector of Rocky Mt. spotted fever; causal organism of tick paralysis.	Residual sprays; repellents.	Animal (dog) and personal hygiene.
Rocky Mountain Wood Tick	Adult, larva, nymph	Large mammals including man	Bites; vector of Rocky Mt. spotted fever, causal organism of tick paralysis	Residual sprays; repellents.	Habitat destruction in limited situations.

Attachment 15-A7
Summary of Important Ectoparasites That Attack Man

CHAPTER 16. RODENT CONTROL

Rodent control may be included as a part of household, stored product, or miscellaneous pest control contracts. Rodent control may be included as a Firm Fixed Price Item or as an Indefinite Quantity Item. Contractor certification for rodent control is in Category 7: Industrial, Institutional, Structural and Health Related Pest Control. This category may be subdivided into many separate sub-categories, of which rodent control may be included. Assistance in interpreting state categories and ensuring proper contractor certification is available from the Command PMC.

16.1 ECONOMIC AND HEALTH IMPACTS. Commensal rodents live close to humans. Commensal rodents include the Norway Rat (Rattus norvegicus), the roof rat (Rattus rattus), and the house mouse (Mus musculus). The deer mouse, Peromyscus sp., (sometimes called the white footed mouse) resembles the house mouse in appearance. Deer mice often cause the largest rodent problems in an area. They frequently move from wooded or shrubby areas entering houses, garages, storage sheds, and stored campers during the colder months.

WHITE FOOTED
DEER MOUSE

Rodents cause enormous economic loss by eating and contaminating food commodities. They are responsible for many fires attributed to unknown origin due to gnawing through insulation on electrical wires. They are also responsible for costly disruption of electrical equipment and computer operations. Rodents also damage upholstery, books, paper, and similar materials.

Perhaps the greatest social and economic impact of rodents is disease dissemination. Plague, murine typhus, leptospirosis, and food poisoning are a few of the diseases in which rodents have been implicated.

16.2 GENERAL CHARACTERISTICS. Rodents have a poor sense of vision. Instead they rely on their sense of touch, using highly sensitive whiskers to run along walls and between objects. Rodents also have a keen sense of smell and are attracted to most odors associated with humans. Their sense of taste and hearing is also well developed.

Rodents have a great reproductive potential. However, factors such as living conditions, disease, and predation slow down rodent reproduction and population growth considerably.

16.2.1 Identification. Figure 16-1 shows how to distinguish between the three commensal rodents; the Norway rat, the roof rat, and the house mouse. Figure 16-2 is a

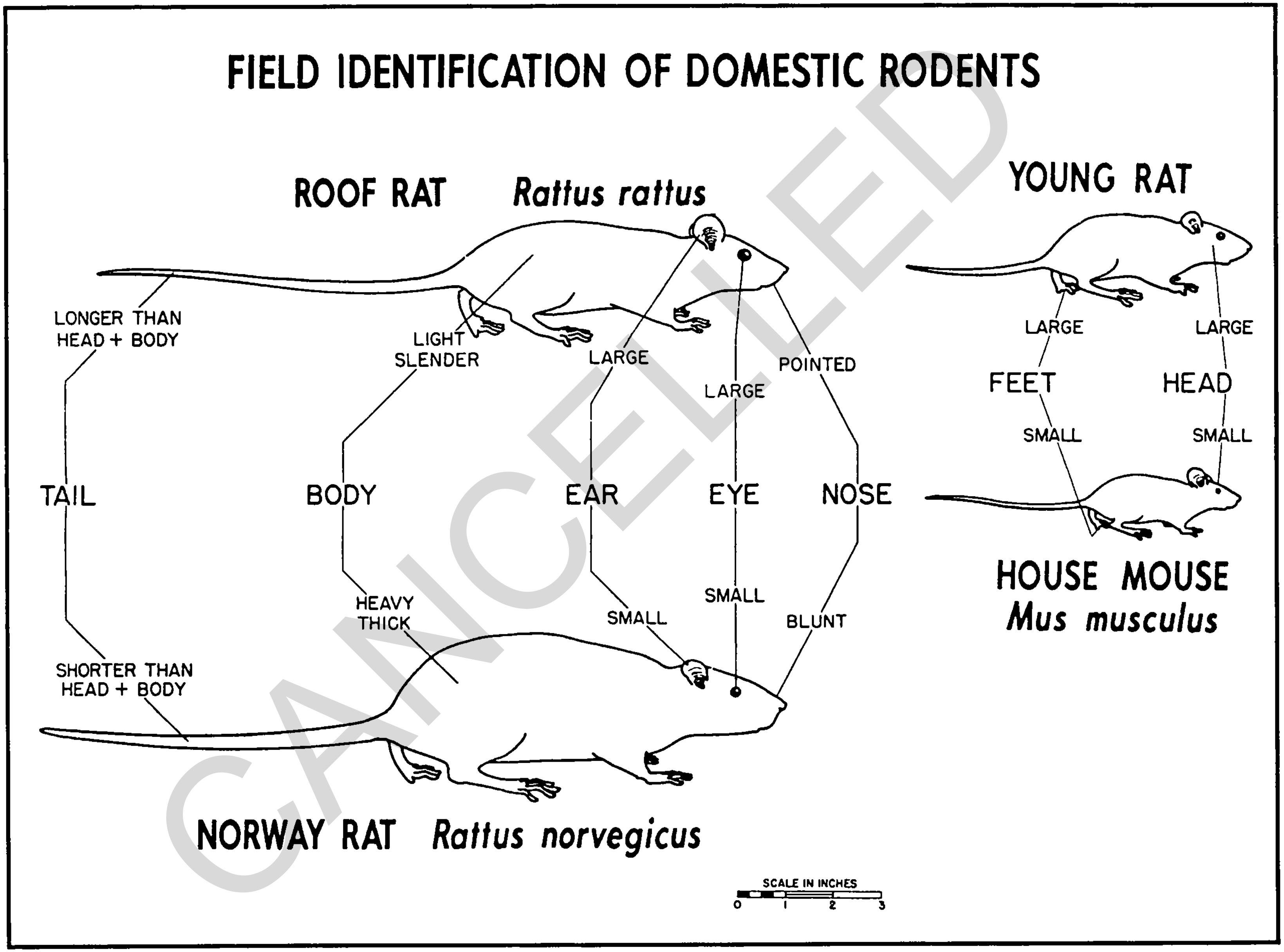


Figure 16-1
Field Identification of Domestic Rodents

Figure 16-2
Summary of Biological And Physical Characteristics of Commensal Rodents

Characteristic	Norway Rat	Roof Rat	House Mouse
General appearance	large robust	sleek graceful	small slender
Adult size			
weight (gm)	7 18oz/200 500g	5 9oz/150 250g	0 4 1oz/12 30g
length (nose to tip of tail)			
head & body (mm)	7 9 5in/18 25cm	6 8in/16 20cm	2 3 5in/6 9cm
tail (mm)	6 8in/15 21cm	7 10in/19 25cm	3 4in/7 10cm
Snout	blunt	pointed	pointed
Ears	small covered with short hairs do not reach eyes	large nearly naked can be pulled over eyes	large some hair
Eyes	small	large prominent	small
Tail	dark above pale beneath	uniformly dark	uniformly dark
Fur	brown with scattered black (agouti) venter gray to yellow/white shaggy	agouti to gray to black venter white gray or black smooth	light brown light gray smooth
Droppings	capsule shaped 2cm/3/4 1in	spindle shaped 1cm/0 5in	rod shaped 3 6mm/0 5in
Senses			
sight	poor color blind	poor color blind	poor color blind
smell tast touch hearing	excellent	excellent	excellent
Food	omnivorous often preference for meats (22 30 g/d) 0 8 1 oz	omnivorous especially fruits nuts grains vegetables (15 30 g/d) 0 5 1 oz	omnivorous prefers cereal grains (3 g/day) 0 1 oz
Water	15 30 ml/day	15 30 ml/day	3 9 ml/day can subsist without free water
Feeding habits	shy (new object reaction) steady eater	shy (new object reaction) steady eater	inquisitive nibbler
Climbing	readily climbs limited agility	very agile active climber	good climber
Nests	usually burrows	walls attics vines trees sometimes burrows	within structures stored food burrows
Swimming	excellent swimmer	can swim	can swim
Home range radius (m)	30 50m/98 164ft	30 50m/98 164ft	3 10m/10 33ft
Age at mating (months)	2 3	2 3	1 5 2
Breeding season	spring and fall peaks	spring and fall peaks	year long
Gestation period (days)	22	22	19
Young per litter	8 12	4 8	4 7
Litters per year	4 7	4 6	8
Young weaned/female/year	20	20	30 35
Length of life	1 year	1 year	1 year

summary of biological and physical characteristics of commensal rodents.

16.2.2 Norway Rat. The Norway Rat is the most common and largest of the domestic rats found throughout the world. Color ranges from brown to dark grey. It is a heavy, stocky rodent that can measure from 7 to 10 inches in body length with a 6 to 8 inch tail.

NORWAY RAT

The nose of the Norway rat is blunt, the ears are small and closely set, and the eyes are small. The Norway rat usually nests outdoors in burrows in the ground or under foundations of buildings. It also nests beneath rubbish, beneath garbage dumps, in sewers, indoors between floor and ceiling partitions, and in enclosed spaces of cabinets and appliances.

The home range is usually between 100 to 150 feet from the nest. It has been known to travel up sewers and into dwellings through toilets. The Norway rat feeds on just about everything; it needs water on a daily basis.

16.2.3 Roof Rat. The roof rat is smaller than the Norway rat and is a more agile climber. The geographic range is normally confined to the southern states, the Pacific coast, Hawaii, and other tropical and sub-tropical regions. Sometimes outbreaks occur in port cities.

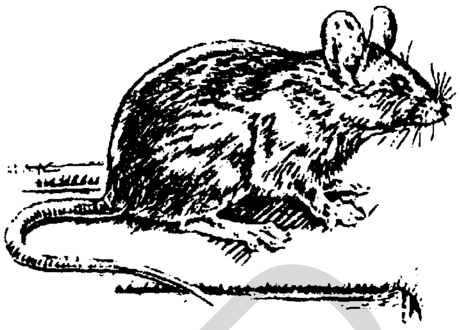
ROOF RAT

The body of the roof rat is slender and graceful and weighs considerably less than the Norway rat. The body length is approximately 6 to 8 inches. The tail is considerably longer than the tail of the Norway rat, ranging from 7 to 10 inches. The fur is finer than that of the Norway rat and is usually black in color. The roof rat has a pointed nose with large ears and eyes.

The roof rat prefers to nest above ground. Indoors it will nest in attics, between floors and ceilings, in walls, and in other enclosed spaces such as cabinets. Outdoors it will usually be found in trees and in dense vine growths.

The roof rat usually has a home range of approximately 100 to 150 feet from its nest. It is omnivorous, preferring vegetables, fruits, and cereal grains.

16.2.4 House Mouse. The house mouse is found throughout the world. It is a slender, graceful, small animal weighing approximately one-half to three-quarters of an ounce. It measures 5 to 7 inches in length from the head to the tip of the tail. The body is slightly smaller than the tail.



HOUSE MOUSE

The fur is fine with the color ranging from brown to black, with a lighter belly coat. It has a pointed nose with large eyes and ears.

House mice can be distinguished from deer mice by the coloring. The deer mouse is distinctly bicolored, the underside being light and the upper side dark. Deer mice also have larger eyes and ears than the house mouse.

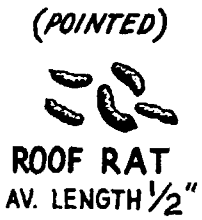
The house mouse prefers nesting sites indoors. They may nest in spaces between walls, in cabinets and furniture, and in stored products. Outdoors they may nest in weeds, rubbish, or in grasslands.

The normal home range is 10 to 30 feet from the nest. The house mouse is omnivorous, preferring cereal grains. A major water source is not always required for the house mouse. It can live in a dry habitat and metabolize water from its food source.

16.3 INSPECTION AND SURVEY. Rodents are usually nocturnal and secretive, and are rarely seen during the day except when infestations are very heavy. It is necessary to recognize signs which indicate the presence of rodents and to plan control strategies accordingly.

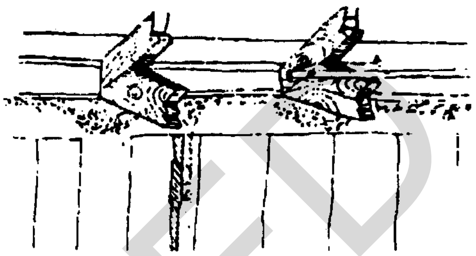
Signs are found along walls, under piles of rubbish, behind or under storage areas, and in thick vegetation. The following signs are indicative of rodent infestations and can sometimes be used to identify the specific rodent involved.

16.3.1 Fecal Droppings. Fresh droppings are dark, moist, soft, and shiny. In a few days the droppings become dry and hard.



Norway rat droppings are large, capsule shaped, with blunt ends. Roof rat droppings are more slender, about 1/2 inch in length, and are pointed at the ends. House mouse droppings are 1/4 inch or less in length and are also pointed at the end.

16.3.2 Runways. Rodents are creatures of habit and use the same runways between food and water sources and harborage areas. They prefer body contact with a vertical surface, such as a wall or fence, due to their keen sense of touch. They often develop pathways that can be recognized outdoors and indoors. Outdoors, fresh runways are smooth, well packed, and free of vegetation. Indoors, runways are free of dust and dirt.



OVERHEAD RUB MARKS ALONG RAFTERS

16.3.3 Rub Marks. Rodents have a very oily fur and leave rub marks along runways. Norway rat rub marks are normally closer to the ground whereas roof rat rub marks are commonly seen overhead. However, Norway rats are excellent climbers and their rub marks are found above ground also. Mice do not leave detectable rub marks unless there is an extremely heavy infestation.

16.3.4 Rodent Burrows. Commensal rodents have preferred nesting sites. The Norway rat prefers burrows for nesting and harborage. Burrows are commonly found in earth banks, along walls, under concrete slabs, and around garbage areas. Active burrows are usually clear of vegetation and the entrance is smooth and compacted. A PCQAE can determine if a burrow is active by stuffing the entrance with dirt or wads of paper and returning to see if the entrance has been reopened.

Roof rats tend to construct globular nests within bushes, vines and trees. The house mouse prefers to nest in buildings within walls, closets, ceiling and cabinet voids, large appliances, storage boxes, desks, or upholstery. The nest is made from paper, insulation, furniture stuffing, or any soft material chewed into small bits. The house mouse nests outdoors among debris or in ground burrows.

16.3.5 Gnaw Marks. Rodents have large incisors which grow continuously. Gnawing damage to various items or parts of buildings is often seen. Gnawing damage from rats can be very significant, 2" or more in diameter with rough, torn edges. Mice frequently gnaw small clean-cut holes about 1/2 - 1" in diameter. Gnawing damage of mice is often seen in kitchen cabinets and in bathrooms.

RODENT TRACKS CAN BE SEEN IN TALC OR OTHER POWDERS

16.3.6 Tracks. Rodent tracks are seen where there is dust or soft soil. Talc or other powders can be placed in suspected rodent areas to verify their presence and identify traveling patterns. Commensal rodents have 5 toes on their hind feet and 4 toes on their front feet. The hind foot leaves the most visible track. Rat's hind feet are about 3/4 to 1" whereas house mouse hind feet are 3/8" or less. Rats may also leave "tail drag" marks which appear between the foot tracks.

16.3.7 Urine Stains. Rodents eliminate urine as they feed. Urine stains are not readily visible to the naked eye. A black light can be used to make urine stains fluoresce a blue-white color.

16.3.8 Other Signs. Sightings of live or dead rodents, sounds produced by rodents, and odors (especially for the house mouse) are additional signs which indicate an infestation.

16.4 CONTROL METHODS.

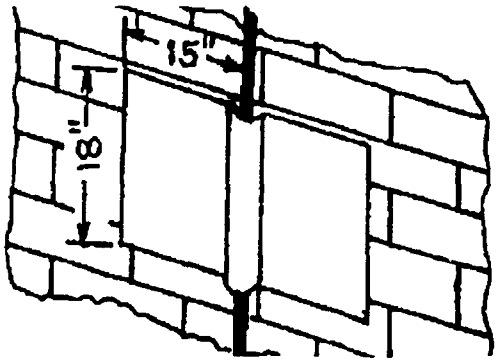
16.4.1 Non-Chemical Control. Non-chemical control methods concentrate on eliminating the causes of an infestation.

16.4.1.1 Sanitation. Rodent infestations are often attributed to poor sanitary conditions. A good control program should include removal or reduction of the food source by improving refuse storage and removal, and food storage practices.

Materials, such as lumber, scrap metal, etc., should be properly stored to minimize nesting sites. Vegetation along canals and ditch banks and near buildings should be maintained. Tree limbs should be trimmed at least 4 feet from buildings.

RODENT PROOF
TRASH CAN

16.4.1.2 Rodent Proofing. Rats enter through openings as small as 3/4 inch; mice openings as small as 1/4 inch. Openings around pipes and electrical conduits should be sealed. Rodents gnaw through wood and concrete, therefore they are capable of enlarging openings in those materials to gain entry. Openings should be sealed with metal plates or concrete. Doors should be self-closing and tight fitting at the bottom. Spaces at the bottoms should be sealed by attaching kick plates.



RODENT GUARD FOR
SMALL DIAMETER PIPE

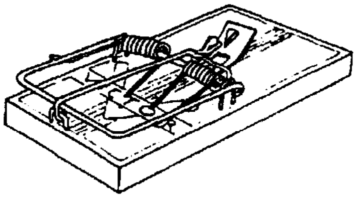
When considering other rodent proofing measures, remember that rats:

- can jump vertically 2 feet

- can dig 4 feet or more to get under foundations
- can climb rough walls
- can climb smooth pipes up to 3" diameter
- can travel on telephone and electrical wires
- can swim well

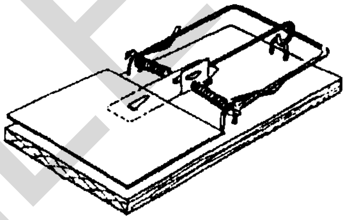
16.4.1.3 Trapping. Trapping is an effective method of controlling rodents. Trapping is particularly effective where poison baits pose a hazard, dead rodents present odor problems, or where rodents exhibit bait shyness.

Trapping is also an effective tool for the PCQAE to determine levels of control. There are three general types of rodent traps:



SNAP TRAP

1) snap traps
2) automatic, multiple-catch traps, and
3) glue board traps.

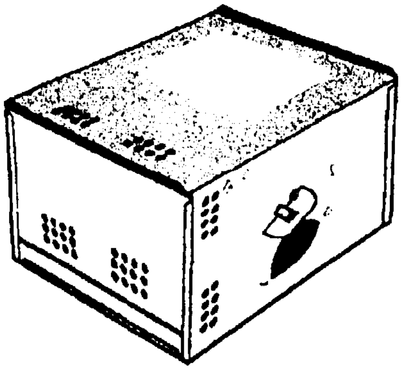


SNAP TRAP WITH EXPANDED TRIGGER

Snap traps have been used for many years. Snap traps with expanded triggers ("professional model") are now available and work better than common snap traps.

Automatic, multiple-catch traps are specific for mice. There are two models available: one is a wind up trap which flips mice into the holding chamber; the other works via the trap door principle.

Glue boards can be effective tools for controlling rodents, especially mice. Glue boards should not be used in areas where there is excessive dirt, dust, or water, or areas of extreme hot or cold temperatures. Glue boards should never be used in areas where children or pets may come in contact with them or in highly visible areas.



WIND UP MULTIPLE CATCH MOUSE TRAP

Traps should be placed in runways, along walls, behind appliances, and in other frequented areas. Snap traps should be placed against the wall with the trigger portion near the wall. Traps must be inspected daily to remove dead rodents and insure that the trap is set and in the right location. Traps should be anchored if necessary to prevent movement.

Rodents can become trap shy whenever large numbers of rodents are trapped, therefore the location of the traps should be moved periodically. A large number of traps should be used. For mice, traps should be spaced about 10 feet apart; for rats, 15 to 20 feet apart.

16.4.2 Chemical Control. Chemical rodent control can involve rodenticide baits, tracking powders, and burrow fumigation.

16.4.2.1 Rodenticide Baits. Rodenticide baits consist of food baits or liquid (water) baits mixed with a toxicant. Rodenticides can be divided into two broad categories; anticoagulants and non-anticoagulants.

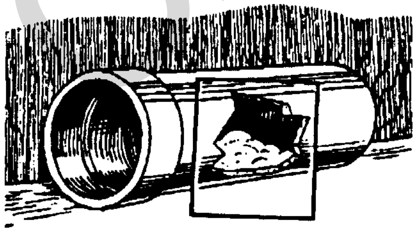
- **Anticoagulants.** Anticoagulants cause death by disrupting blood clotting, causing rodents to die of internal bleeding. There are first generation anticoagulants and second generation anticoagulants. First generation anticoagulants require multiple feedings whereas second generation anticoagulants require only a single feeding.
- **Non-Anticoagulants.** Non-anticoagulant rodenticides have various modes of action. Some are single dose poisons while others require multiple feedings.

Rodenticides are available as pellets, loose meal, packet baits, paraffin (wax) blocks, or liquid baits. Figure 16-3 contains information on commonly used rodenticides.

Rodenticides are hazardous to humans, pets, and wildlife. Rodenticides should be placed in tamper-proof bait stations both in occupied buildings, and outdoors. All bait stations should be plainly marked with the word poison, and the identity of the rodenticide. The bait station should be anchored so that it cannot be removed. Open tray bait containers can be used to hold rodenticides in situations where there is no threat of contact by children, pets, wildlife, and other non-target organisms.

TAMPER RESISTANT
BAIT STATION

16.4.2.2 Tracking Powders. Rodenticides formulated as tracking powders can be effective because rodents groom themselves by licking their feet and fur. Tracking powders are usually highly concentrated and are not generally recommended for use in and around homes and food areas. The applicator must be extremely careful to prevent the tracking powder from being blown or moved off site. Tracking powders can provide good control in areas where rodenticide bait acceptance is low.



TRACKING POWDER
IN PIPE ALONG
RODENT RUN

SOME CHARACTERISTICS OF COMMON RODENTICIDES

RODENTICIDE	DESCRIPTION	LD_{50} mg/kg	PERCENTAGE IN BAIT	BAIT	BAIT ACCEPTED	CAUSE OF DEATH	HAZARD
Hydroxycoumarin (warfarin, fumarin, pival)	anti-coagulant, multiple dose	1.0	0.025	grain, water	very good	internal hemorrhage	low
Indandiones (Diphacinone, Chlorophacine)	anti-coagulant, multiple dose	0.5	0.005	grain	very good	internal hemorrhage	low
Brodifacoum	anti-coagulant, single dose	0.2 to 1.0	0.005	grain	very good	internal hemorrhage	low
Bromadiolone	anti-coagulant, single dose	1.0 to 2.0	0.005	grain	very good	internal hemorrhage	low
Zinc Phosphide	single dose poison	40	1.0 - 2.0	grain or fresh foods	good: bait shyness	heart paralysis	medium
Cholcalciferal (Quintox)	single dose poison	43.0	0.075	grain, seed	very good	metabolizes calcium (hyper-calcemia)	medium
Bromethalin	single dose poison	2.0 to 5.0	0.005	grain	good	metabolic inhibition	low

Figure 16-3
Some Characteristics of Common Rodenticides

16.4.2.3 Burrow Fumigation. Poisonous gases (fumigants), or sufficant cartridges can be used to control rodents. Fumigants or sufficants are used to obtain a quick kill of rodents, and in some cases their ectoparasites (ie. fleas), in outdoor burrows. When fumigating burrows, openings should be sealed to prevent rodents from escaping.

Burrows inside buildings should not be fumigated. Outdoor burrows closer than 25 feet from occupied buildings also should not be fumigated. The PCQAE should use precautions by wearing proper respiratory equipment when observing burrow fumigation.

> PCQAE NOTE: Burrow fumigation should only be done by a certified operator. Uncertified operators, even if under direct supervision of a certified applicator, should not be allowed to apply burrow fumigants on military installations. Guards are not required for burrow fumigation as the gas is not confined for a prolonged period.

16.5 CONTROL HAZARDS. The greatest control hazard is accidental feeding on a rodenticide by pets or humans. Unsuspecting children or animals can consume unprotected baits. Bait stations must be tamper proof in occupied areas. Bait material must be inaccessible to children and pets at all times.

Secondary poisoning is another problem that can occur when using rodenticides. Some rodenticides, after killing a rodent, remain active in the carcass. An animal that feeds on that carcass may be poisoned as a result. Dead rodents should be collected and removed frequently. Protective gloves should be used when handling carcasses. When fumigating burrows, people and pets should not be allowed to remain in the area.

Sometimes rodents die in walls and other inaccessible places. As decomposition of the carcass starts, the odor can be unbearable. Every attempt should be made to locate and dispose of the carcass. If the carcass is not located, then odor masking agents may be used, or evacuation may be required. Normally the odor should dissipate in 7-10 days.

Rodents frequently carry ectoparasite such as fleas and ticks. If the rodents are killed, ectoparasites will search for other food sources such as humans or pets. Control of these additional pests, as discussed in other sections, may be required.

SECONDARY POISONING
MAY AFFECT
NON-TARGET SPECIES

16.6 RECORDS AND REPORTING. One blue form (6240/2) should be used for each indoor rodent control operation performed at each unit, building, or structure. For rodent control operations performed outdoors, one green form (6250/3) should be completed for each operation at each site. If more than one pest, operation, or control agent are involved in a specific pest management operation, then a separate form must be completed for each.

After a record is completed, the bottom (yellow) copy should be retained at the installation as a daily legal record of pesticide use and as a maintenance record. The back of the yellow copy may be used to record additional details about the operation. Copies of inspections, survey reports, site maps and charts, etc. should be permanently attached to the yellow copy.

At the end of the month all of the top (blue and green) copies are assembled and submitted to the Command PMC. The PCQAE should review records on a regular basis to ensure that they are complete and submitted in accordance with contract specifications.

The PCQAE shall complete a separate report for each PCQAE inspection performed, including the time required for the inspection. At the end of the month the PCQAE should assemble and submit all blue and green copies to the Command PMC.

CHAPTER 17. TURF AND ORNAMENTAL PEST CONTROL

Section C.9 of FAR - PWS. Turf and ornamental pest control operations may be included as firm fixed price items or indefinite quantity items. Contractor certification for this function is in a category typically called "Turf and Ornamental Pest Control". Certification in additional state categories and federal and/or state permits for the control of vertebrate pests of turf may be necessary . Certification in an appropriate category and environmental documentation will be required for aerial applications. Assistance in interpreting state categories and ensuring proper contractor certification is available from the Command PMC.

Insects, weeds, disease causing organisms, and nematodes are the major pests of turf and ornamental plantings. Management of turf and ornamental pests requires proper identification of the pest, knowledge of surveillance techniques for the pest, and knowledge of the life cycle of the pest. It is beyond the scope of this manual to address identification, surveillance techniques, and life cycles of every turf and ornamental pest organism. Additional reference materials or the assistance of the Command PMC may be necessary to identify, survey, and control turf and ornamental pests.

General identification and control procedures for weed control are covered in Chapter 18, Vegetation Control. Chapter 16 discusses Rodent control; Chapter 19 discusses Miscellaneous Vertebrate control.

17.1 TURFGRASS AND ORNAMENTAL PLANT DISEASE MANAGEMENT.

Proper plant management is the most important practice in reducing the effects of turfgrass and ornamental pests. A plant is considered to be "diseased" if it is injured or subjected to stress over a long period of time by some factor in the environment. These factors interfere with its normal appearance, structure, growth, or functional activities. Diseases may be abiotic (non-living) or biotic (living).

17.1.1 Abiotic (non-living) Disease. Abiotic disease can be caused by:

- improper watering
- improper fertilization practices
- insufficient or excessive sunlight
- chemical injury
- excessive thatch in turfgrass
- soil compaction
- improper selection of species or variety
- improper mowing height of turfgrass
- improper soil pH

- accumulation of salts in the soil

Whenever a diagnosis of a turfgrass or ornamental problem is made, these factors should be considered. Information on proper management practices, including species and variety selection, site selection, fertilization, thatching, aeration, and irrigation is available from the appropriate EFD Natural Resources Section.

17.1.2 Biotic (living) Disease. Biotic disease is caused by living organisms such as:

- fungi
- bacteria
- nematodes
- viruses
- parasitic plants

The living organism that causes the disease is called a pathogen.

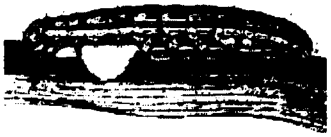
17.1.3 Plant Injury. Plant injury results from momentary or discontinuous damage such as:

- mechanical damage
- lightning
- chemical spill

Insect and mite feeding is generally considered to be plant injury, however there is no sharp distinction between disease and injury when insect or mite feeding is harming the plant.

17.2 TURFGRASS PESTS. There are several species and varieties of turfgrass. Generally turfgrass species are restricted to certain growing areas. Many turfgrass pests are specific to certain turfgrass species and varieties or more prevalent in certain regions. Common turfgrass pests are discussed in the following text.

17.2.1 Turfgrass Insects (Figure 17-1). Some insects feed on above ground portions of turfgrass. Others feed on the roots. Some may feed on both parts at different stages in their development. In addition, there are secondary pests of turfgrass which do not feed on turfgrass but use it for nesting.



ARMYWORM

17.2.1.1 Above Ground Feeders. Insect pests which feed on the aboveground portions of grass (blades, stems,

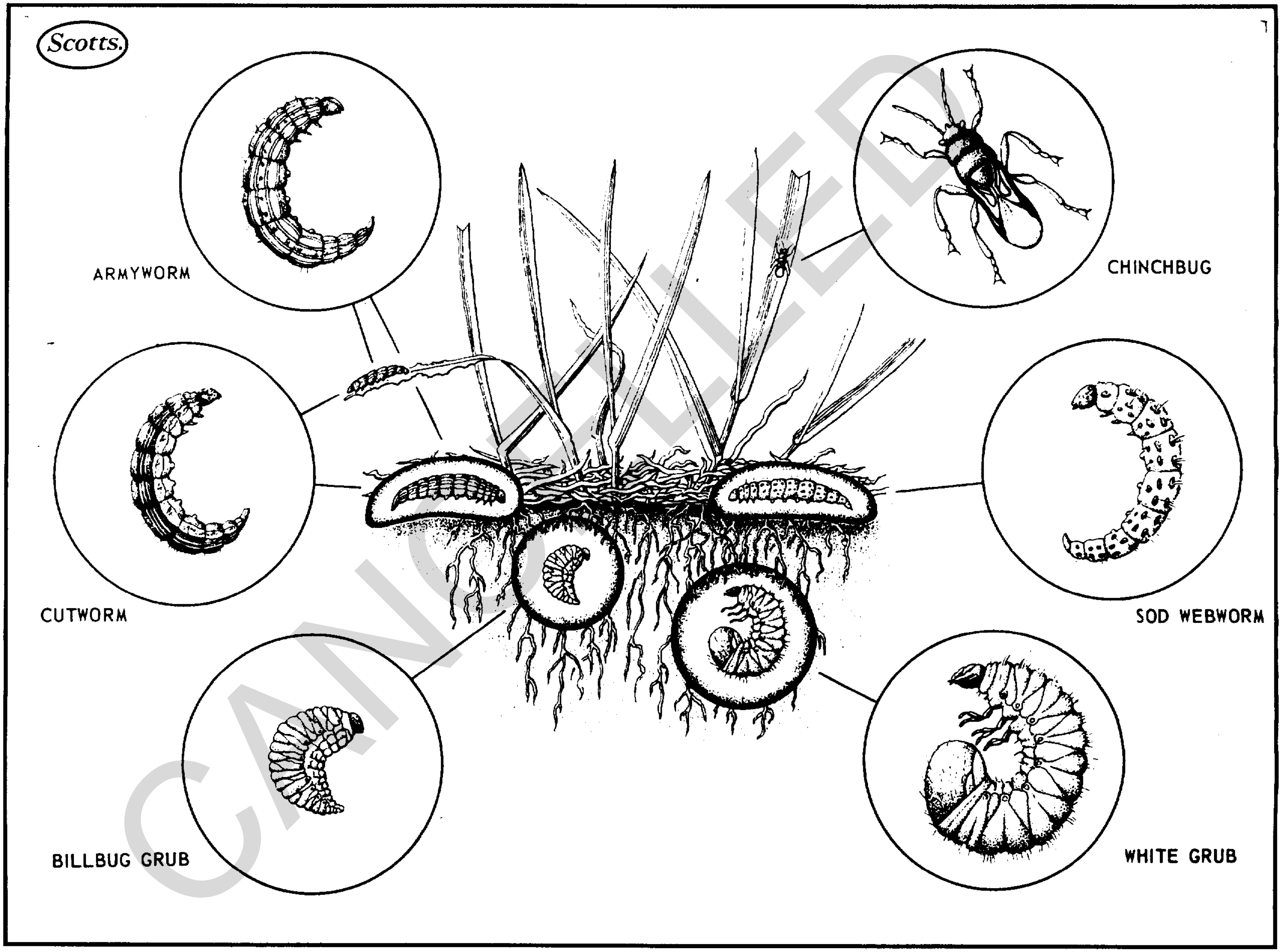
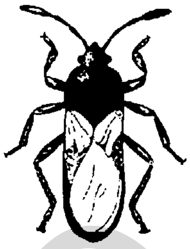


Figure 17-1
Turfgrass Insects

and crowns) include chinch bugs, sod webworms, billbugs, cutworms, armyworms, leafhoppers, grasshoppers, aphids, and mites (not technically insects). Chinch bugs, sod webworms, and billbugs are discussed below.

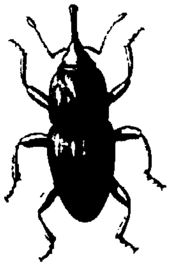
Chinch Bugs. Adult chinchbugs are 1/5 in. long and black with white wings overlapped over the back. The nymphs have a white band across the back and are wingless. Chinch bugs damage grass by injecting salivary fluids into the plants as they suck the sap. This feeding produces scattered patches of turf which changes from green to pale yellow and eventually brown.


CHINCH BUG

Sod Webworms. Sod webworms are the larvae of several species of moths. The larvae are about 1 in. long when fully grown, and are gray to dusky green with a brown head and brown spots over the body. The larvae often hide during the day in silk-lined burrows in the thatch layer or on the surface. Sod webworms feed by clipping of the blades of grass just above the crown. Irregular brown spots appear in the turf when populations are high.


SOD WEBWORM LARVA

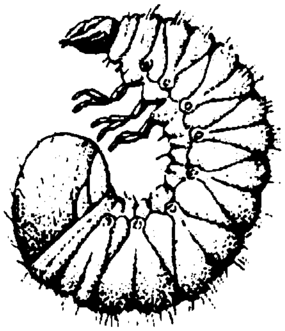
Billbugs. Billbugs are weevils or snout beetles. Adult billbugs range from 1/4 to 3/4 in. long and the color varies between species from black or brown to dull yellow. The stem is chewed on by adults, leaving sawdust-like material present in the chewed area. Eggs are laid in stems above the crown. White, legless larvae with brown heads feed and tunnel into the stems, eventually migrating into the root zone. Billbug damaged plants pull loose from the crown. Late in the season dead areas appear in the grass.


BILLBUG

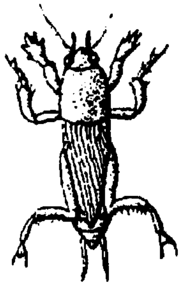

BILLBUG LARVA

17.2.1.2 Below Ground Feeders. Insects which feed on roots and other below ground portions include white grubs, mole crickets, ground pearls, leather jackets, wireworms, and billbug larvae. White grubs and mole crickets are discussed below.

White Grubs. White grubs are the larvae of several species of scarab beetles. They are C-shaped and range in length from 1/4 to 3/4 in. in length with three pairs of legs and a brown head. White grubs feed on the roots. In severely damaged areas, the turf can be rolled back with little resistance. Large areas of turf may be killed.


WHITE GRUB

Mole Crickets. Mole crickets are light brown insects (2-3 in.) with a front pair of spade-like feet developed for digging through soil. They feed on roots and physically lift up the soil when burrowing near the surface. The burrowing and root pruning dry out the turf, causing wilting and death.



MOLE CRICKET

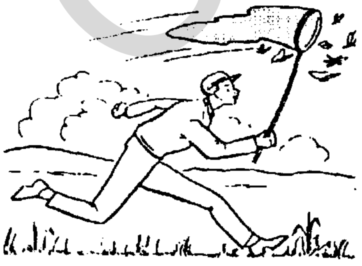
17.2.1.3 Secondary Turfgrass Pests. Some insects and arthropods damage turf because of activities other than direct feeding. Ants, bees, and wasps damage turf by nesting in the soil. Millipedes damage turf as they feed on decaying organic matter. Ticks, fire ants, chiggers, scorpions, centipedes, and spiders may bite or sting humans. Assistance in managing pests which present a health risk can be obtained from the Command PMC or Navy Environmental and Preventative Medicine Unit.

MILLIPEDE

17.2.1.4 Inspection And Survey Of Turfgrass Insects . When examining turfgrass to determine if insects or other arthropods are the cause of a turfgrass problem, look for:

- the suspected pest
- thinned grass stands
- discolored or withered blades
- dying or dead patches
- chewed or frayed blades or roots
- frass or webbing
- small holes, mounds, or burrows
- presence of large numbers of bird and animal droppings

FEEDING DAMAGE



SWEEP NET

Surveillance techniques to monitor insect populations in turfgrass include:

- drenches with water or irritant solutions to bring pests to the surface
- pitfall traps
- sweep nets
- inspecting for insects feeding on the roots

Open end cans forced into the ground filled with water or irritant solutions is an effective surveillance tool for chinch bugs. Larger scale (up to 2 square feet) drenches are effective for surveying caterpillars and other surface pests. Pitfall traps are effective for pests walking on or tunneling near the surface. Sweep nets are effective for pests feeding above ground on the blades and external area of the crowns. A spade or sod cutter can be used to survey the turfgrass roots for white grubs, billbug larvae, or nematode damage.

Assistance in identifying turfgrass pests is available from local extension offices or the Command PMC. Upon proper identification it is important to study the life cycle of a pest in order to be able to perform effective survey and control operations. The PCQAE should be aware of time periods when a pest is in a life stage which causes damage and when and where to survey. Attachment 17-A1 of this chapter describes the life cycle of several turfgrass pests.

17.2.2 Biotic Turfgrass Disease. The major biotic diseases of turf are caused by fungi. Most fungi are multicellular and are composed of thread-like tubular structures called hyphae. A multi-branched system of hyphae is called a mycelium (pleural mycelia). Mycelia are capable of reproducing the fungi asexually. Fungi reproduce sexually via spores, which are contained in structures called fruiting bodies. Mycelia and fungal fruiting bodies are important diagnostic signs in identifying turfgrass diseases. Bacteria (ex. bacterial wilt of bentgrass) and viruses (ex. St. Augustine decline) play a minor role in turfgrass diseases.

17.2.2.1 Identification And Survey. Identification of turfgrass diseases is the first step in planning corrective control measures. Identifying turfgrass diseases is not very easy in many instances. Assistance is available from local extension offices or the Command PMC.

A turfgrass manager should be aware of the disease problems associated with a particular stand of turfgrass from a historical, geographical, and environmental perspective. It is important for a turfgrass manager to know what grass species are subject to fungal infection and to monitor weather conditions which promote disease development. It is also important to recognize early symptoms of turfgrass disease and to recognize signs that indicate the disease organism is present. Stands of diseased grass may look thin and unhealthy or contain streaks, circular patches of dead grass, or leaf lesions.

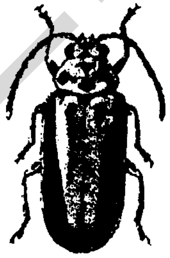
Attachment 17-A2 provides a key to common turfgrass diseases caused by fungi. Timetables for turfgrass disease development are also provided in Attachment 17-A2.

17.3 ORNAMENTAL PESTS. There are several types of ornamental plantings. It is beyond the scope of this manual to address every ornamental pest and disease. Additional information is available from other reference materials, local extension offices, or the Command PMC. Common pests and diseases are discussed below.

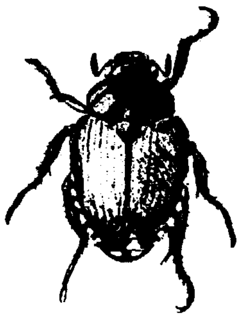
17.3.1 Ornamental Arthropod Pests. Figure 17-2 illustrates typical insect damage on ornamentals. The following groups of insects and other arthropods are common or serious pests of ornamentals: defoliators, skeletonizers, borers, leaf miners, scales, mealybugs, and aphids. There are several species of each of these types and most are named after the host on which they feed. A general guide is provided in Attachment 17-A3.

GYPSY MOTH LARVA

17.3.1.1 Defoliators. Defoliators have chewing mouthparts and eat the leaves, needles, or flowers of a plant. The major defoliators are caterpillars, sawflies, snails and slugs, and some beetles. Some of the more common defoliators include the gypsy moth, tent caterpillar, bagworm, pine sawfly, fall webworm, black vine weevil, and spruce budworm.



ELM LEAF BEETLE

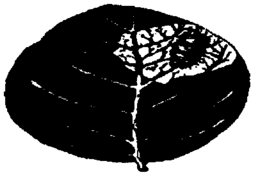


JAPANESE BEETLE

17.3.1.2 Skeletonizers. Skeletonizers also have chewing mouthparts but the feeding damage is different from defoliators. Skeletonizers feed on layers between the veins making it possible to see through the leaf while the structure remains intact. Common skeletonizers include the Japanese beetle and many types of leaf beetles (ex. elm leaf beetle).

TWIG BORER

17.3.1.3 Borers. Borers enter the shoots, twigs, stems, bark, and trunk to feed and complete their life cycle. Beetles, caterpillars, and sawflies are the major types of borers. Some common borers include bark beetles (ex. southern pine beetle), pine tip moths, twig borers (ex. dogwood twig borer), and stem and trunk borers (ex. bronze birch borer, locust borer, fogwood borer).



LEAF MINER

17.3.1.4 Leaf Miners. Leaf miners enter the leaf and tunnel within the leaf while feeding. Leaf miners may be flies (ex. holly leafminer), sawflies (ex. birch leafminer), caterpillars (ex.

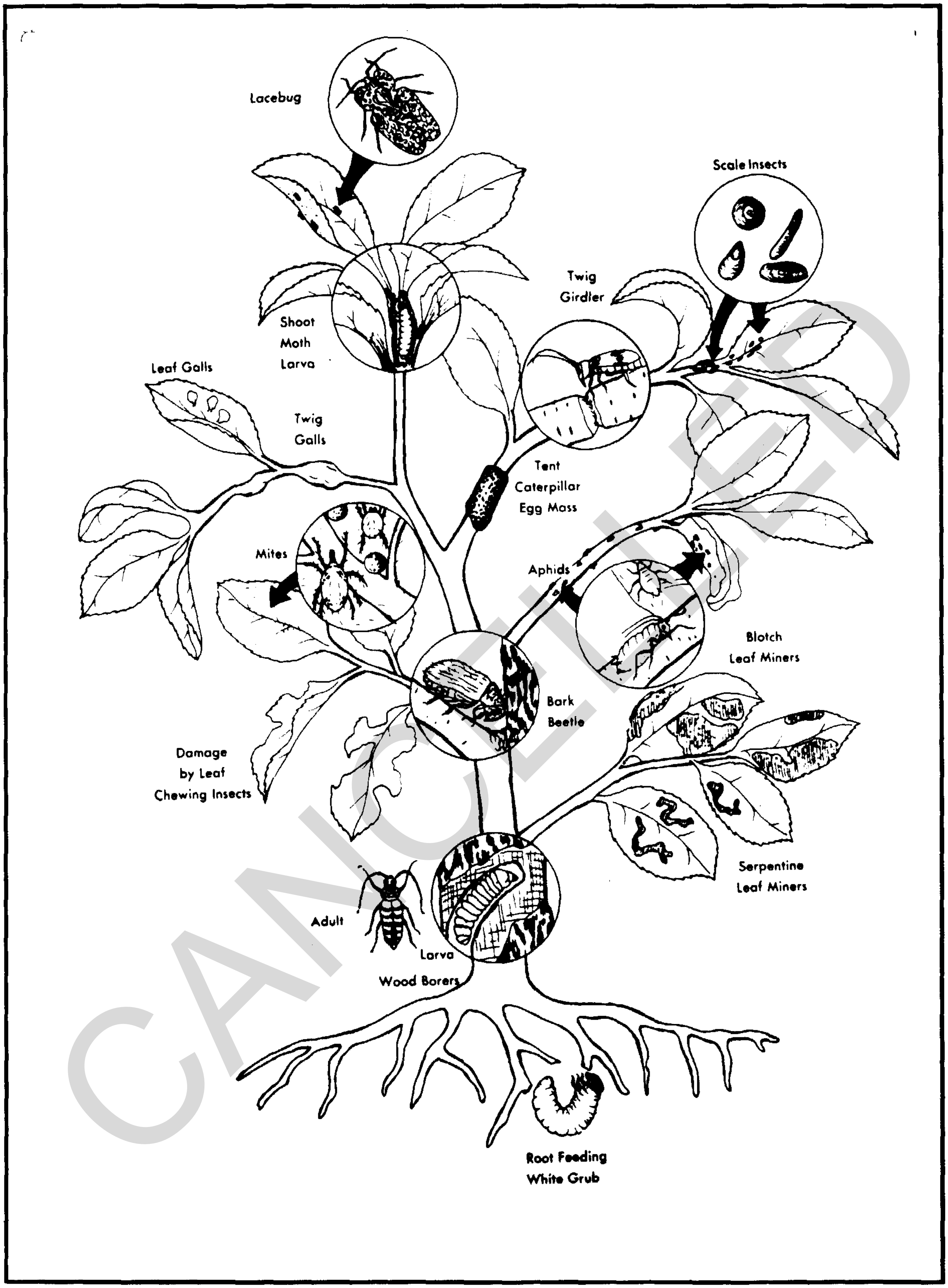


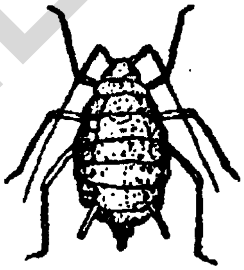
Figure 17-2
Insect Damage

azalea leafminer), or beetles (ex. black locust leafminer). The feeding causes irregular blotches or serpentine markings in the leaves. The damage is mainly aesthetic.

MEALYBUG

SCALE

17.3.1.5 Scales And Mealybugs. Scales and mealybugs have piercing and sucking mouthparts. Scales attach to the plant to feed. There are many types of scales and they are usually relatively specific to and named after a certain plant. Mealybugs move both as nymphs and adults. Feeding may cause leaves and needles to become discolored, drop prematurely, and cause entire branches or the plant to die.

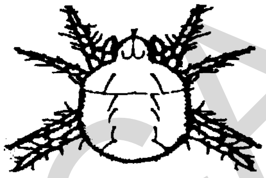


APHID

17.3.1.6 Aphids. Aphids are tiny insects which have sucking mouth parts. They suck plant fluids causing leaves to discolor, become distorted, and wilt. In addition, aphids secrete honeydew (droplets of a sugary, liquid fecal material) that may spot vehicles or furniture beneath the host plant. Frequently a black sooty mold will develop on the honeydew.

17.3.1.7 Other Ornamental Pests. Other major ornamental pests include leafhoppers, thrips, whiteflies, snails, slugs, and mites. These pests can be serious pests of certain ornamentals.

17.3.1.8 Identification And Survey. Identification is the first stage in controlling arthropod pests. Assistance in identifying ornamental pests is available from local extension offices and the Command PMC. The life cycle of the pest should be studied to plan survey and control operations.



SPRUCE
SPIDER MITE

Ornamental inspections should be concentrated during the growing season. The time interval between inspections depends on the value of the particular planting. Highly valued ornamental plantings should be inspected at least weekly. Plantings should also be inspected during the dormant period to determine the presence of over-wintering pests. Most insect pests of ornamentals will not feed on exposed surfaces, therefore inspection should include the underside of leaves, and the stems and trunks for borers.

Shaking the limbs and branches over a white piece of paper of cloth is an effective method for surveying many ornamental insects and mites. Pheromone traps and sticky traps can be very efficient in monitoring insect pests. The Command PMC can be contacted for assistance in specific surveillance techniques.

17.3.2 Ornamental Diseases. Symptoms of many ornamental diseases are shown in Figure 17-3. Biotic diseases of ornamental trees and shrubs are caused by:

- Bacteria - Bacteria may cause blights, wilts, cankers, rots, or leaf spots.
- Fungi - Fungi cause mildews, rusts, smuts, and rots.
- Viruses - Viruses cause a change in the color of the foliage, producing patterns varying from a yellow to white mosaic (mottled pattern), or may cause the leaves to curl.

17.3.2.1 Inspection And Survey. Identification of ornamental diseases is the first step in planning corrective control measures. The PCQAE should be familiar with the disease problems associated with particular ornamental from a historical, geographical, and environmental perspective. It is important for a turfgrass manager to know what species are subject to infection and to monitor weather conditions which promote development of the disease. It is also important to recognize early symptoms and signs that indicate the disease organism is present, as shown in Attachment 17-A4.

17.4 VERTEBRATE PESTS OF TURF AND ORNAMENTALS. Vertebrate animals may damage turf and ornamentals in several ways. Some animals such as moles, skunks, squirrels and birds may damage large areas of turf while they search for grubs or other soil infesting insects. Some voles feed on roots and crowns of shrubs and trees.

TREE SQUIRREL

Rabbits, deer, and woodpeckers may damage stems, trunks, twigs, and the foliage of trees. Indirect damage to ornamental plants and shrubs is frequently caused by dogs and cats either mechanically, by digging or constant tramping, or chemically, as a result of their feces and urine. Chapter 16, Rodent Control and Chapter 19, Vertebrate Pest Control provide more information on vertebrate pests.

YELLOW BELLIED SAPSUCKER

17.5 WEEDS. Weeds are frequently a problem in turfgrass and around ornamental plantings especially in areas that are maintained for aesthetic purposes such as golf courses and administrative grounds. Chapter 18, Vegetation Control discusses weeds in greater detail.

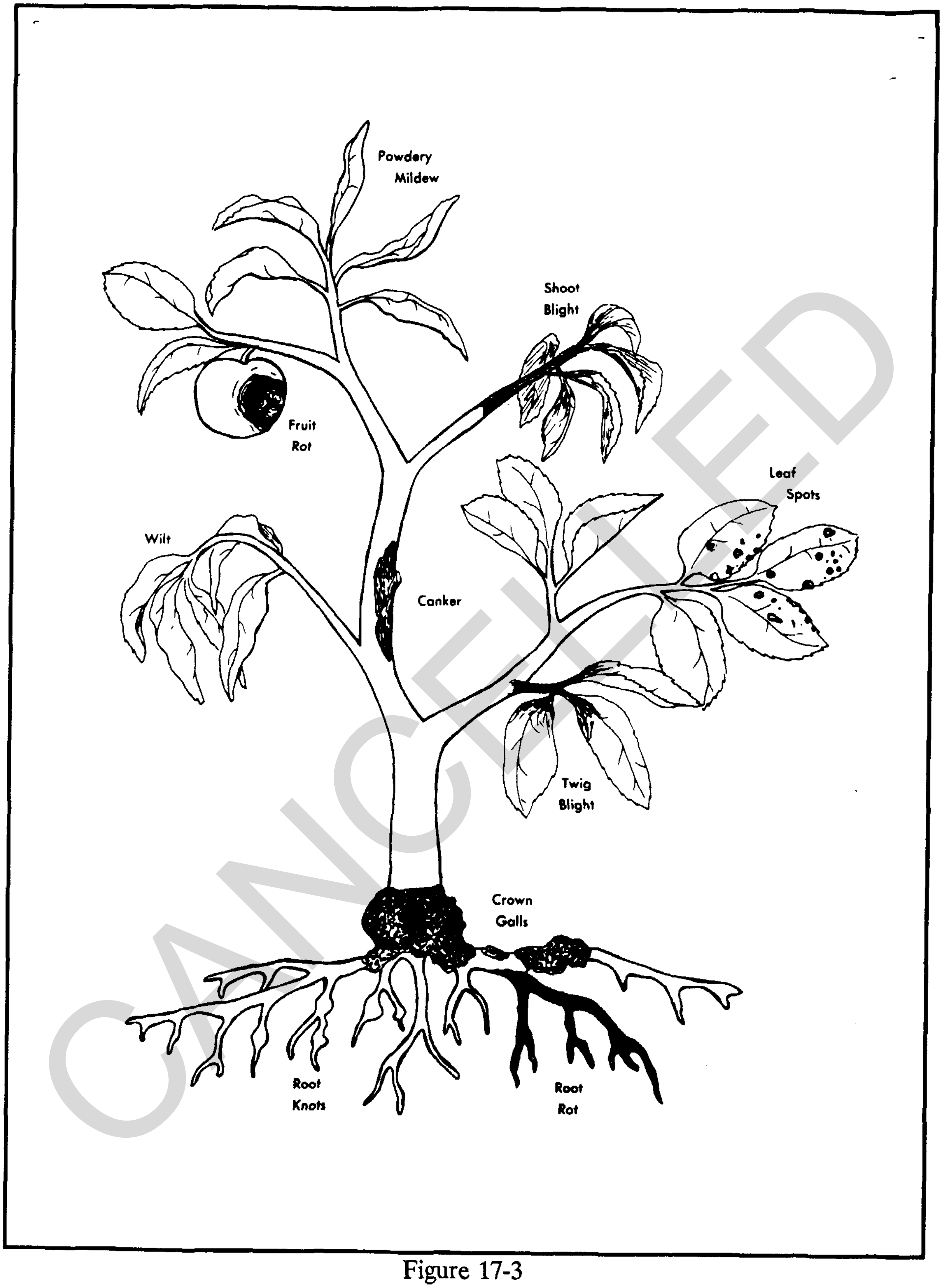


Figure 17-3
Symptoms of Ornamental Diseases

17.6 CONTROL METHODS.

17.6.1 Non-chemical Control. Plants that are maintained in a healthy growing condition are less likely to be damaged by pests. Most non-chemical control methods for turf and ornamental pests involve cultural practices to maintain plant vigor, namely:

- proper irrigation
- fertilization
- maintaining proper soil conditions
- mowing and/or pruning

Ground litter should be removed to deter harborage sites. Removing leaf litter may reduce some diseases by removing spores which reinfect the plants the following year. The use of pest resistant varieties should always be considered when planning new plantings. Predators and parasites of turf and ornamental pests should not be harmed. Trapping and the use of repellents may provide some relief from vertebrate pests.

17.6.2 Chemical Control.

Turf. Disease pathogens in turfgrass can be minimized and, in some cases, controlled through the use of good management practices. When a disease occurs, fungicides should be applied to surrounding areas if warranted. Spot treatments are not effective. Systemic fungicides are used to control existing plant infections while contact fungicides only prevent further plant infection.

Systemic and contact fungicides are available in liquid or granular formulations. Timing of fungicide applications is critical and should be discussed with the command PMC. A knowledge of the life cycle of the fungus and the weather conditions must be considered in selecting the most effective fungicide and application rates.

The routine use of fungicides, while they can prevent disease, can be expensive and potentially harmful to either the lawn or the environment. Therefore, it is recommended that the Command PMC be consulted before initiating any preventive control measures.

In the control of turfgrass insects and arthropods, a knowledge of the pests and their life cycle is required because timing and placement of the pesticide is essential. Certain pesticides will be applied to the surface and others may require considerable watering-in so that the pesticide reaches the root area where the insects are feeding.

Ornamentals. Effective and economic control of insect pests requires correct identification of pests and their host plants, proper selection of pesticides, proper selection of equipment, and timely and proper application of pesticides. Timing is very critical in that certain pest species are only vulnerable for short periods

BAGWORMS IN
PROTECTIVE CASES

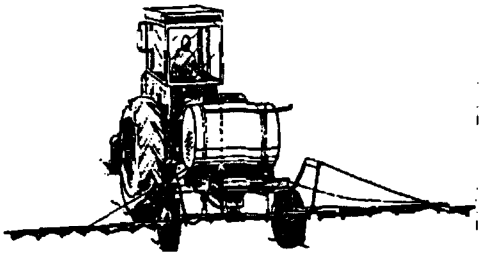
during their development. Examples are bagworms, which construct a covering case during the larval stage, or scale insects which form hard outer coverings. Pesticides are effective for just a few weeks during the spring while these insects are exposed. The Command PMC is a valuable resource for pest identification, control planning, and assistance in developing an effective PCQAE surveillance program.

Fungicides are generally not applied on a preventive basis for shrub and ornamental diseases unless the planting is of extreme value. It is important to properly identify the disease, learn the life cycle, and monitor weather conditions before any fungicide application is made.

17.7 CONTROL EQUIPMENT.

17.7.1 **Dusters And Granular Applicators.** Granular applicators (spreaders) are used in application of granules to turf. Sprinkling equipment may be required to water the active ingredient down to the root zones. Because of problems with drift, dusts are limited to small areas of turf or small plants. Hand dusters of the plunger variety are most suitable.

17.7.2 **Sprayers.** Sprayers for application of turf and ornamental pesticides can range from small hand types to knapsack to large hydraulic types. Generally the smaller types are used for small turf areas and smaller shrubs and trees. Mist blowers, hydraulic sprayers, and aircraft mounted sprayers are frequently used for larger turf areas, and large trees. Spraying is preferred to dusting because the problems with drift are less, and adherence of sprays to plants is greater. Hose type hydraulic sprayers are preferred for trees in inaccessible areas, and mist blowers are preferred along streets, and where space for maneuvering is available. The mist blower can present problems with drift because it produces smaller particle sizes. Operation of power equipment requires the use of experienced personnel to prevent damage and environmental injury.

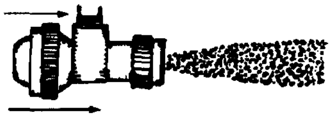


BOOM SPRAYER

17.8 CONTROL HAZARDS. Drift is possibly the greatest hazard that can occur during the application of pesticides to turf and ornamental plants. The pesticide applicator should:

- not apply the pesticide when winds are higher than 5 miles per hour
- use the lowest practical operating pump pressure

- use the largest nozzle opening possible
- keep the nozzle as close to the target plant as possible to avoid misting and drift
- use extreme caution when applying pesticides on or near slopes, water or wetlands, or areas of non-target organisms
- set the nozzle pattern and height in accordance with the type of pesticide used



NOZZLE

Wettable powder formulations are generally preferred over emulsifiable concentrate formulations when applying pesticides to foliage due to the reduced risk of phytotoxicity (injury to the plant). Equipment that is used for herbicide applications *should not* be used to apply fungicides and insecticides. Contractors who apply herbicides and insecticides and/or fungicides should clearly mark their equipment to prevent using a herbicide sprayer with the insecticides or fungicides, unless specifically allowed by their labels.

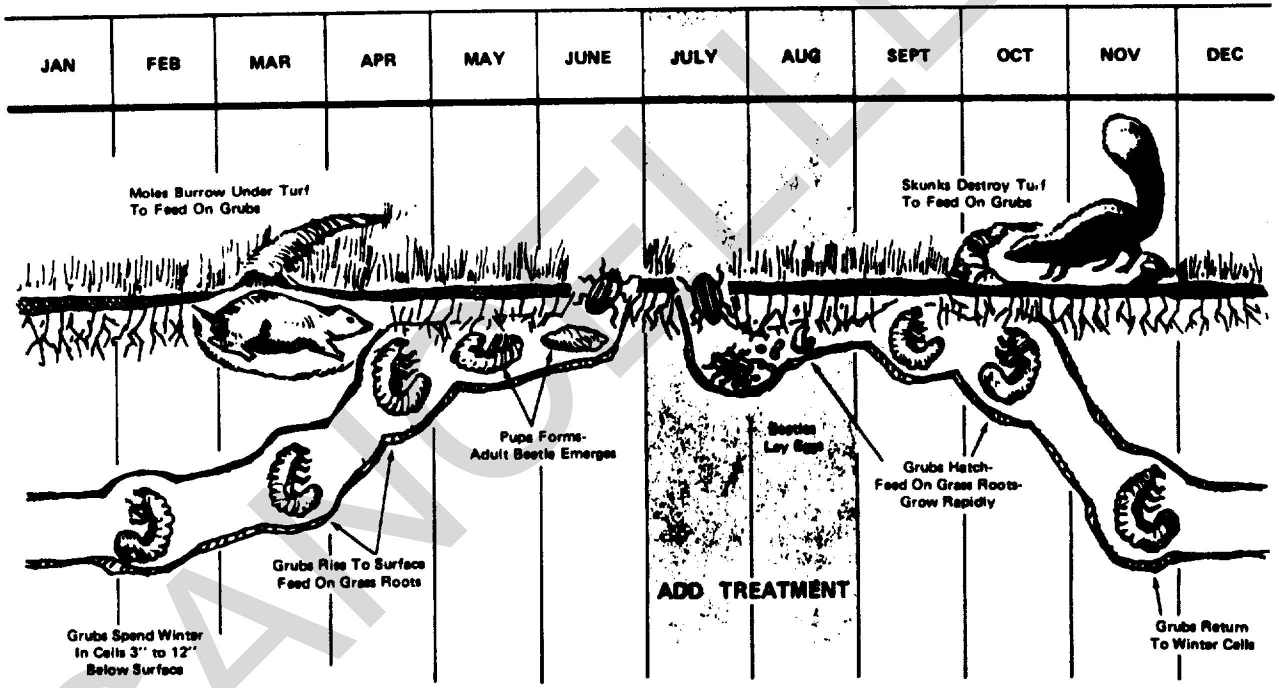
Some pesticides may be harmful to paint finishes such as on automobiles. When spraying is required in areas where cars are parked an announcement should be made through the appropriate installation media, at least one day prior to the operation. This will allow vehicle owners to make alternate parking arrangements.

17.9 RECORDS AND REPORTING. One DD 6250/3 should be used for each outdoor pest management operation performed. If more than one pest, operation, or control agent are involved in a specific pest management operation, then a separate form must be completed for each. After a record is completed the bottom (yellow) copy should be retained at the installation as a daily legal record of pesticide use, and as a maintenance record. The back of the yellow copy may be used to record additional details about the operation such as building numbers, wind speed, etc. When large or valuable trees or shrubs are included in an operation, their location and numbers should be included. Copies of inspections, survey reports, site maps and charts, etc. should be permanently attached to the yellow copy.

At the end of the month all of the top (green) copies are assembled and submitted to the Command PMC. The PCQAE should review records on a regular basis to ensure that records are completed and submitted in accordance with contract specifications.

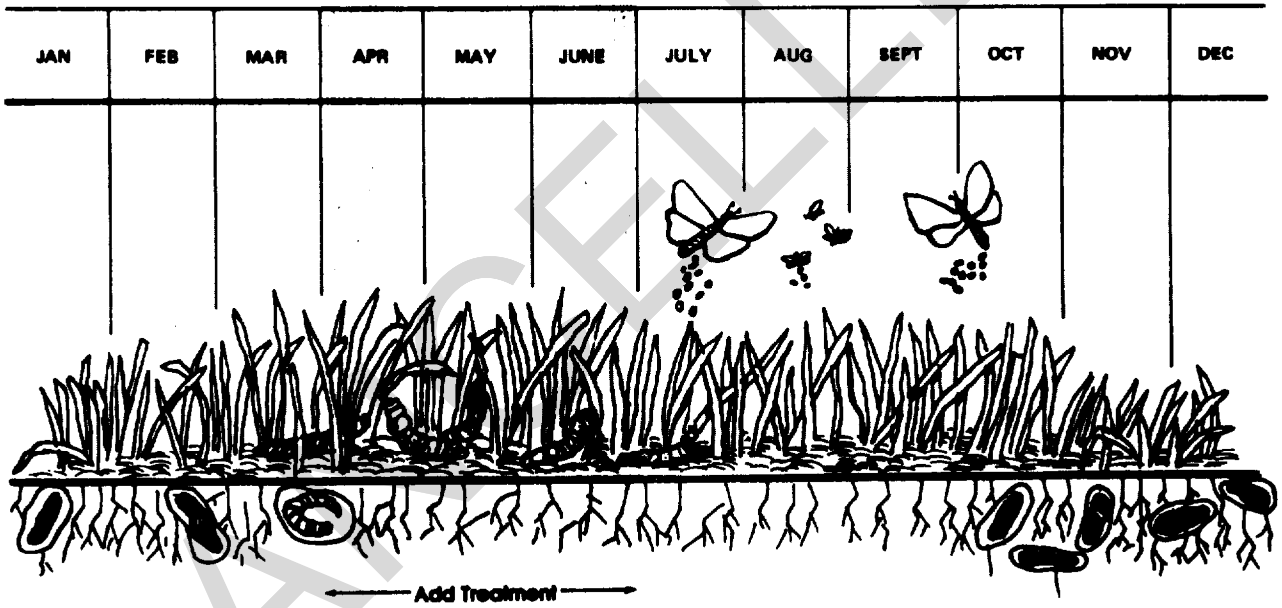
Attachment 17-A1
Life Cycle Chart

BEETLE GRUB LIFE CYCLE CHART

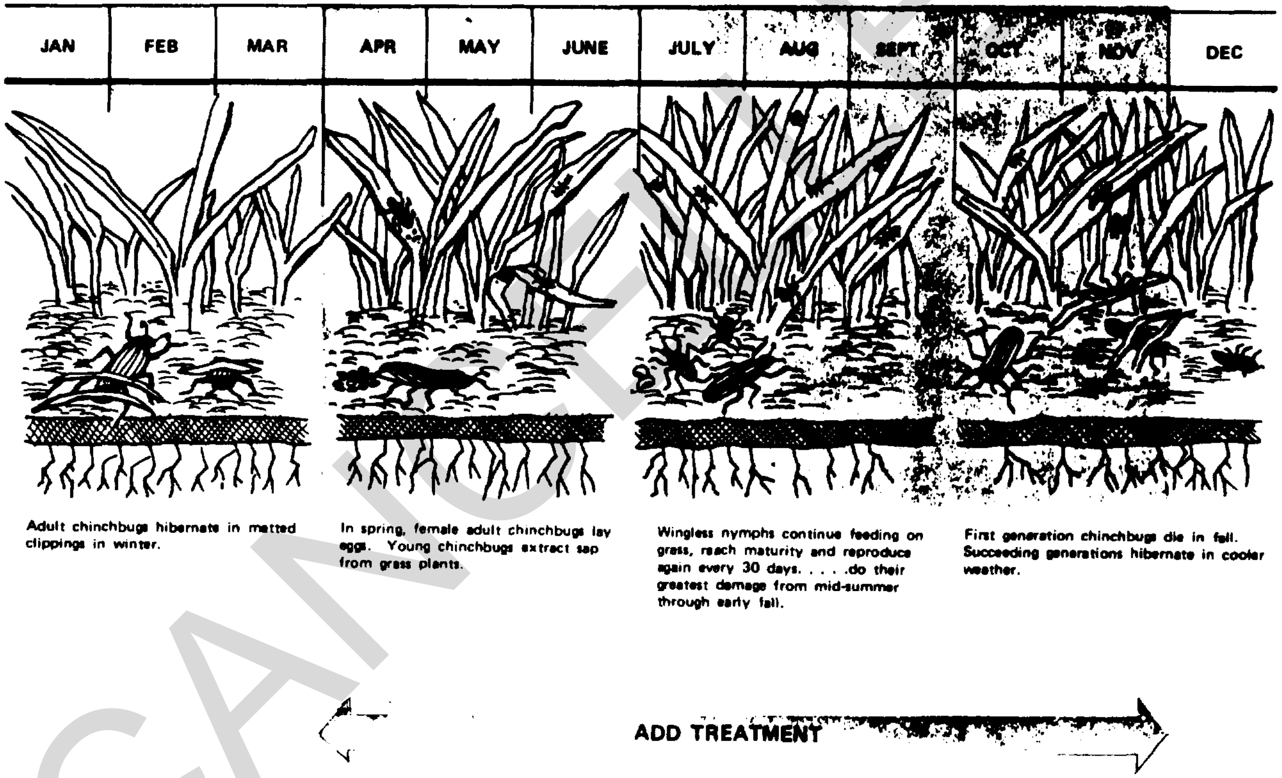


SOD WEBWORM LIFE CYCLE CHART

SOUTHERN AREAS



CHINCHBUG LIFE CYCLE CHART



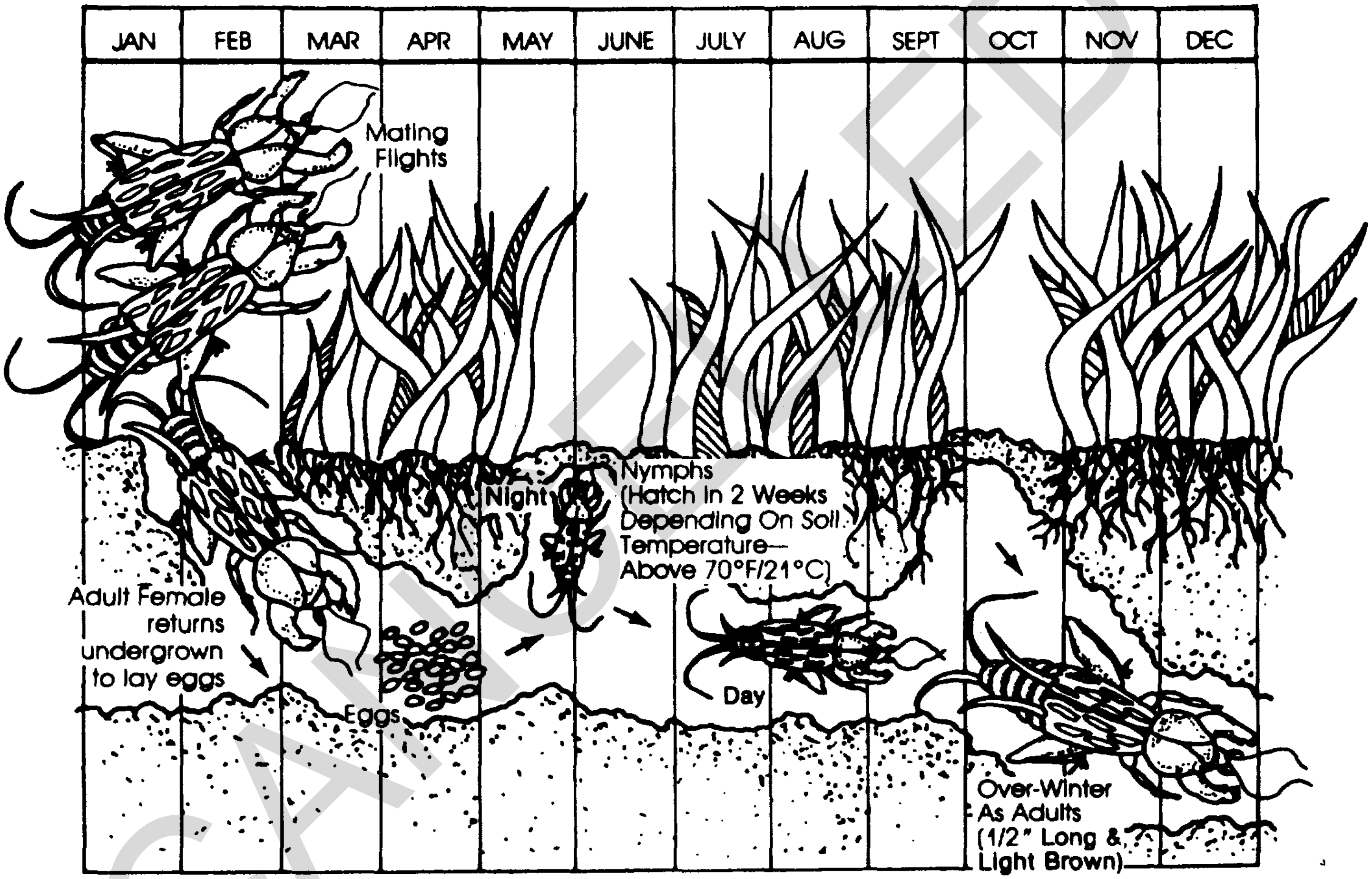
Adult chinchbugs hibernate in matted clippings in winter.

In spring, female adult chinchbugs lay eggs. Young chinchbugs extract sap from grass plants.

Wingless nymphs continue feeding on grass, reach maturity and reproduce again every 30 days. . . . .do their greatest damage from mid-summer through early fall.

First generation chinchbugs die in fall. Succeeding generations hibernate in cooler weather.

LIFE CYCLE OF A MOLE CRICKET



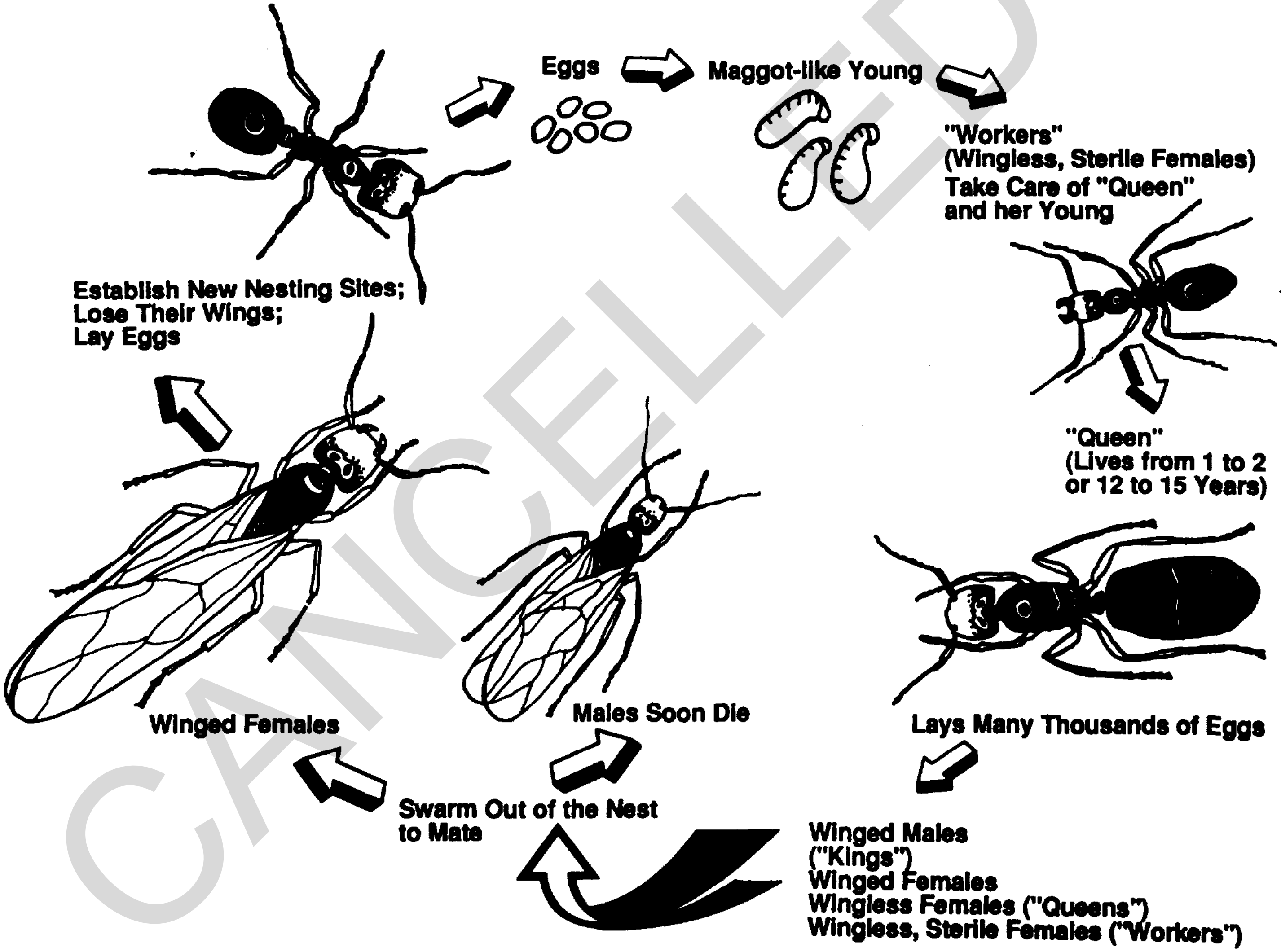
Add Treatment

(Most Active At Night Especially After Rain Or Irrigation
And When The Temperature Is Above 70°F/21°C)

(Only One Generation Per Year)

Attachment 17-A1 (Cont'd)
Life Cycle Chart

Life Cycle of Fire Ants



FUNGUS GROWTH CAN BE SEEN

Black elongate pustules.........................STRIPE SMUT

White pustules..................................POWDERY MILDEW

Red or orange pustules..........................RUSTS

Gray pustules (easily rubbed off)...............SLIME MOLD

LEAF SPOTS PRESENT

Blue-black, elongate............................LEAF SPOT

Straw colored with brown border.................DOLLAR SPOT

INFECTED AREAS CIRCULAR

Occurring in Mid-Winter.............................SNOW MOLD

Occurring in Spring, Summer or Fall:

Size 1 inch to 4 feet or more in diameter:

mushrooms occur within a circle.....................FAIRY RING

no mushrooms..BROWN PATCH

Size 1 - 4 inches in diameter:

symptoms throughout the turf....................... DOLLAR SPOT
symptoms only in full sun......................NECROTIC RING SPOT

symptoms occur in streaks, low areas........... PYTHIUM BLIGHT

INFECTED AREAS IRREGULAR IN SHAPE

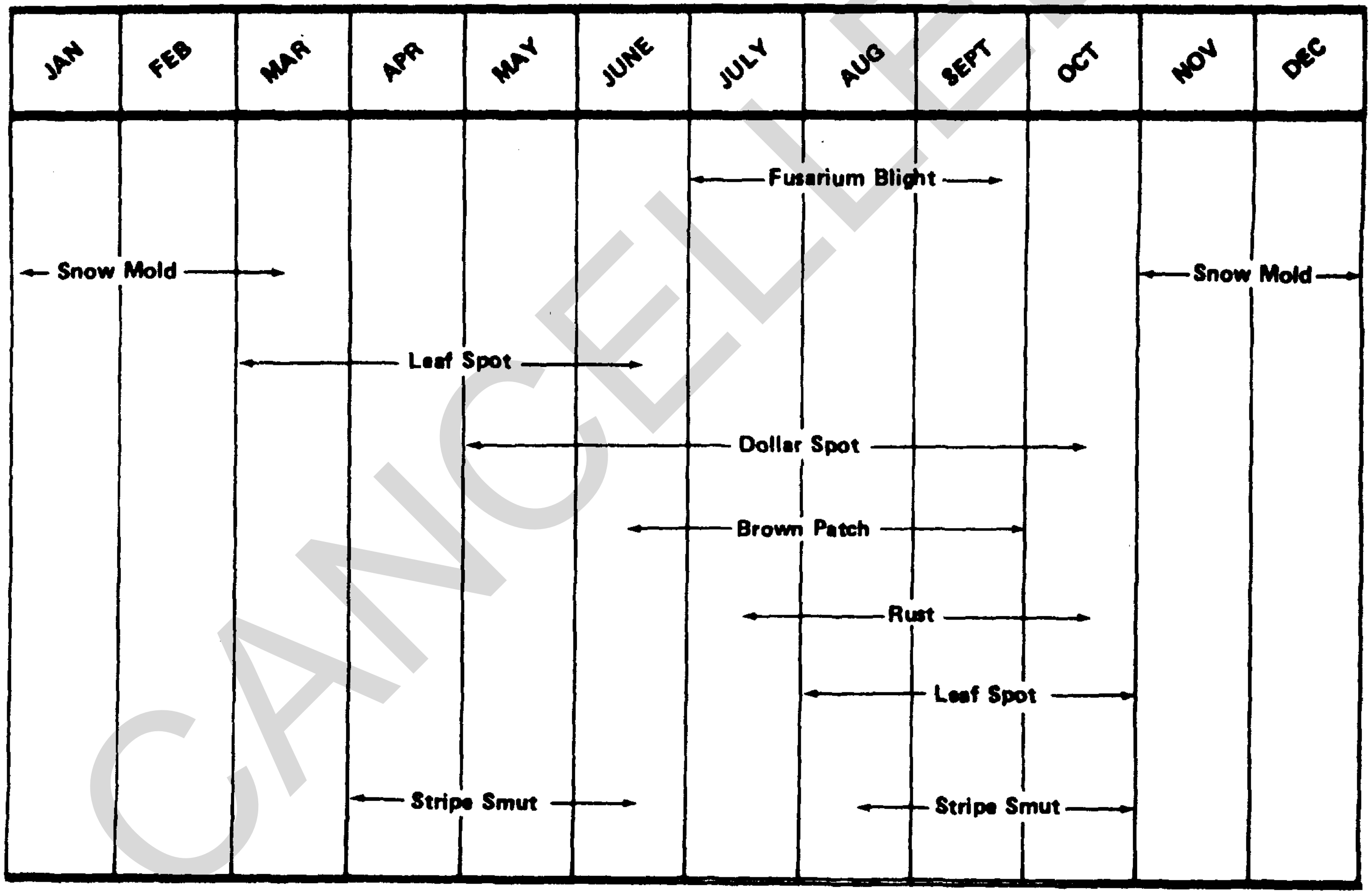
Seedlings affected, wilt and die....................DAMPING OFF

Mature plants affected..............................MELTING-OUT

Attachment 17-A2
A Key to Common Turf Diseases Caused by Fungi

DISEASE TIMETABLE

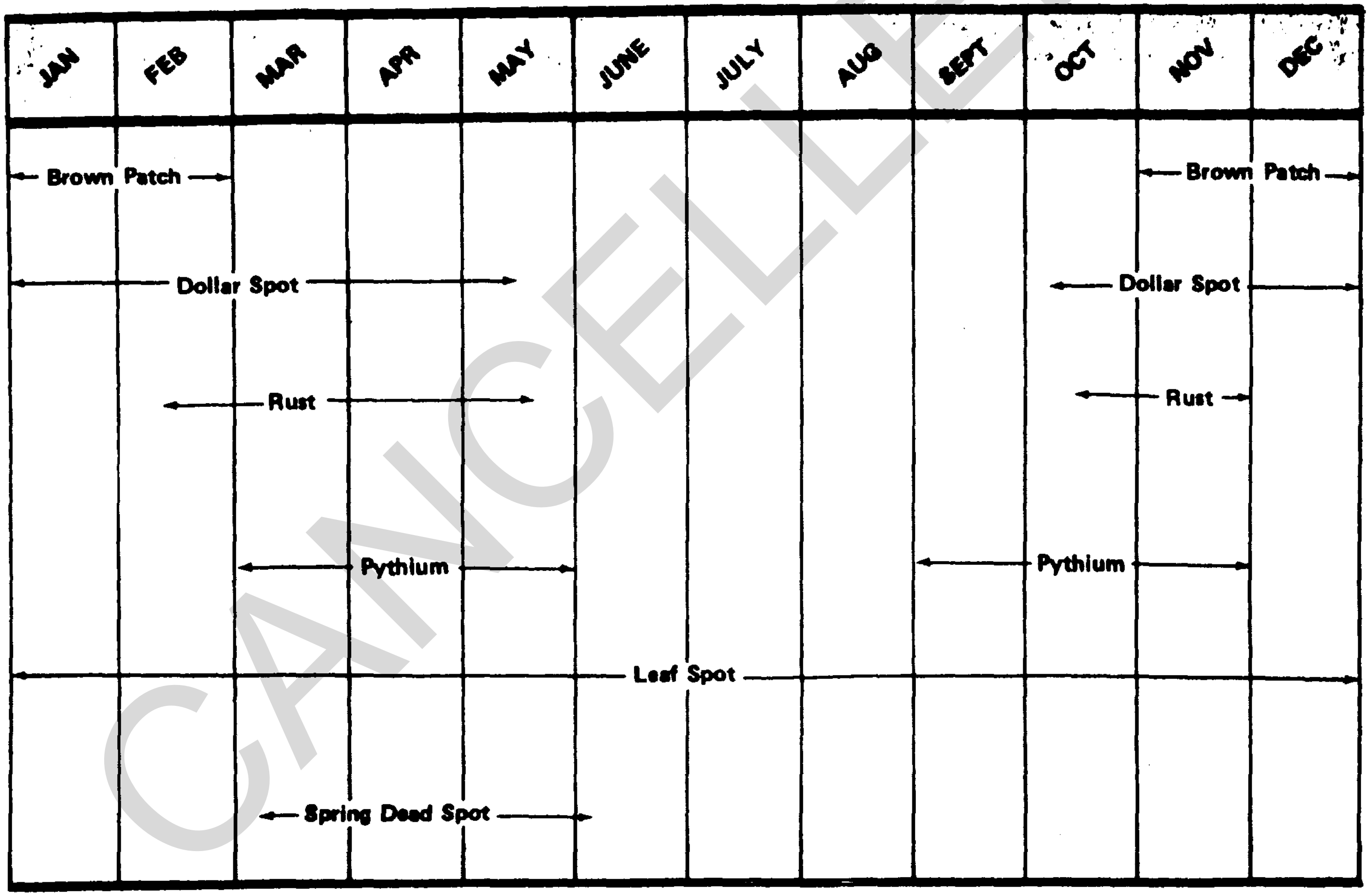
NORTHERN AREAS



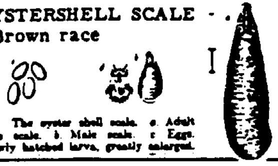
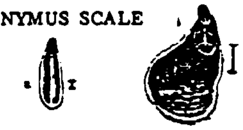
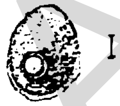
Attachment 17-A2 (Cont'd)
A Key to Common Turf Diseases Caused by Fungi

DISEASE TIMETABLE

SOUTHERN AREAS

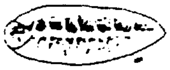
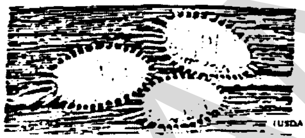
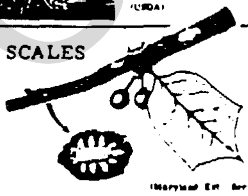


INSECT SCALE PESTS OF TREES AND SHRUBS

Insect or Other Arthropod Pest	Overwintering Stage and Location	Generations /Year	Host Plants	Part(s) of Plant Attacked and Symptoms	Control Measures
OYSTERSHELL SCALE - Gray or banded race  (Maryland Ext. Serv.)	Eggs under female on branches.	1	Lilac, ash, maple, willow, poplar.	Dead branches covered with scales.	
OYSTERSHELL SCALE - Brown race  The oyster shell scale. a. Adult female scale. b. Male scale. c. Eggs. d. Newly hatched larva, greatly enlarged.	Eggs under female on branches. 	2	Apple, birch, redbud, dogwoods, beech, walnut.	Dead branches covered with mussel-like scales.	
EUONYMUS SCALE  a. scale of male, enlarged; b. scale of female, enlarged. (From Department of Agriculture)	Partially grown nymph on stems.	3	Euonymus, camellia, bittersweet, pachysandra, holly etc.	Yellowish leaves with white male scales on underside of leaf; dead branches covered with scales.	
OBSCURE SCALE 	Partially grown nymph on branches.	1	Chestnut, pin oaks, pecan, beech, willow, walnut, hickory, grape etc.	Lower branches dying; scales with black.	
SAN JOSE SCALE yellow center 	Young scales on bark.	2-North 6-South	Extremely long host list on ornamentals and fruit.	Kills branches and entire trees which become encrusted with scales.	
FORBES SCALE red center 	Young nymphs on bark.	1-North 3-South	Cherry and other fruit trees and dogwood.	Dead branches.	
PUTNAM SCALE brick red center 	Partially grown on the bark.	1	Basswood, maple, fruit and ornamental trees.	Dieback of branches and twigs.	

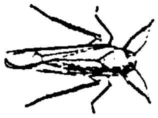
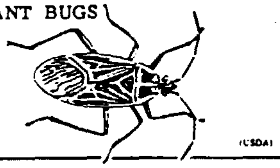
Attachment 17-A3
Various Ornamental Insects

INSECT SCALE PESTS OF TREES AND SHRUBS

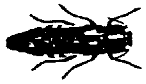
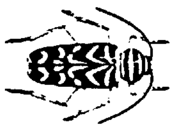
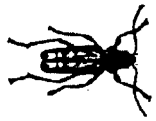
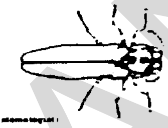
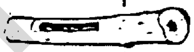
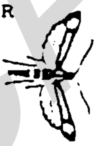
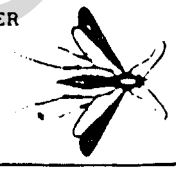
Insect or Other Arthropod Pest	Overwintering Stage and Location	Generations /Year	Host Plants	Part(s) of Plant Attacked and Symptoms	Control Measures
COTTONY MAPLE SCALE  (a) An adult female with the cottony egg mass attached to a twig. (b) Part of interior of egg sac, showing the contained eggs. (Ind. Dept. Conservation)	Partially grown female on branches.	1	Maples, dogwood, beech, mulberry, willow, apple, euonymus, sycamore etc.	Twig dieback, honeydew and sooty mold; bees, wasps and flies swarm trees.	
TULIP TREE SCALE 	Partially grown nymphs.	1	Yellow poplar, linden, magnolia, walnut etc.	Twigs and branches die, leaves yellow with honeydew and sooty mold; bees, wasps, flies swarm trees.	
FLETCHER'S SCALE 	Partially grown nymphs.	1	Yews, juniper, arborvitae and pachysandra.	Foliage yellows; honeydew and sooty mold.	
COTTONY CUSHION SCALE  (USDA)	Young nymphs on twigs.	3+	General feeder with long list of hosts such as rose and citrus etc.	Honeydew and sooty mold; large white fluted ovisac.	
TEA SCALE 	Partially grown nymphs on lower side of leaves.	Multiple broods.	Camellia, tea plant, holly, euonymus, orchids, fern, gardenia, citrus etc.	Yellow spots on leaves; lower surface with white males and gray females, and cottony waxy filaments.	
MEALYBUGS - several species  (USDA)	Eggs in crevices in the bark.	1-North 2-Central 3-South	Catalpa, apple, holly, maple, magnolia, poplar, weigela.	On underside of leaves and in crevices of bark; honeydew and sooty mold.	
AZALEA BARK SCALE  (USDA)	Nymphs on bark.	1-North 2-South	Azalea, blueberry, poplar, rhododendron, hawthorn and poplar.	Infest branch crotches and cracks in bark.	
WAX SCALES  (Maryland Ext. Serv.)	Adults on stems.	1-North	Over 50 hosts including euonymus, boxwood, barberry, holly, quince, magnolia etc.	Leaves and stems with white terrapin shell-shaped scales; honeydew and sooty mold.	

Attachment 17-A3 (Cont'd)
Various Ornamental Insects

SUCKING INSECT PESTS OF TREES AND SHRUBS

Insect or Other Arthropod Pest	Overwintering Stage and Location	Generations /Year	Host Plants	Part(s) of Plant Attacked and Symptoms	Control Measures
LEAFHOPPERS - many species 	Eggs in leaf tissue, some species overwinter only in the south.	Several	Aster, elm, honeylocust, willow, oak, poplar, hawthorn.	Leaves spotted, sometimes curled.	
PLANT BUGS 	Adult in protected area.	2-north 5-south	Ash, elm, forsythia, boxelder.	Brown spotting of foliage, withering and distortion of leaves.	
TWO-SPOTTED TREEHOPPER 	Eggs in twigs	1	Bittersweet, red bud, hoptree, walnut and viburnum.	Elliptical shaped scars on twigs covered by white froth resembling scale infestations	
PLANT HOPPERS 	Eggs in twigs	1	Boxwood, rose, elm, hickory, oak, azalea, holly and magnolia etc.	Small dead twigs, white flocculent wax along stems.	

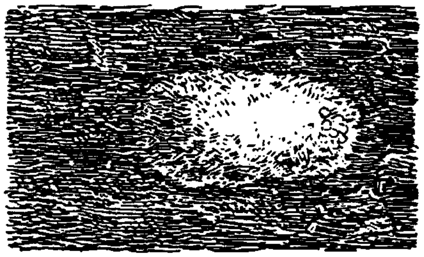
BORERS THAT INFEST TREES AND SHRUBS

Insect or Other Arthropod Pest	Overwintering Stage and Location	Generations /Year	Host Plants	Part(s) of Plant Attacked and Symptoms	Control Measures
HONEYLOCUST BORER 	Larva	1	Honeylocust	Trunk, wet areas at site of attack.	
LOCUST BORER 	Larva under bark flakes.	1	Black locust	Excessive tunnels with frass extruded from hole. Adults found on goldenrod in fall.	
PAINTED HICKORY BORER 	Pupa in wood. Adults emerge in early spring.	1	Hickory, Hackberry, Ash.	Frass exudes from tunnel.	
SUGAR MAPLE BORER 	Larva	2 year cycle.	Sugar maple	Moist tunnel entrance with frass, ridges or gall-like swellings.	
TWIG GIRDLER 	Larva in fallen twig.	1 Sometimes 2 year development.	Persimmon, Mimosa, Oak, Elm, Poplar, Honeylocust, Dogwood, Basswood, Gum.	V-shaped girdle of twigs; dead twigs hang on tree, eventually fall to ground.	Sanitation
OAK TWIG PRUNER 	Larva in fallen twig. 	1	Oak, Maple, Fruit trees, Locust, Sassafrass, sumac and Hickory.	Twigs, cut from inside, break off and fall to the ground.	Sanitation
DOGWOOD BORER 	Larva in wood.	1	Dogwood, Pecan, Oak, Hickory, Mountain Ash, Willow, Bayberry.	Trunk and branches; wet areas on trunk, fine dust-like frass.	Prevent wounds.
LILAC BORER 	Larva in wood.	1	Lilac, Ash, Mountain Ash	Holes in trunk, much frass, ugly swollen scars.	

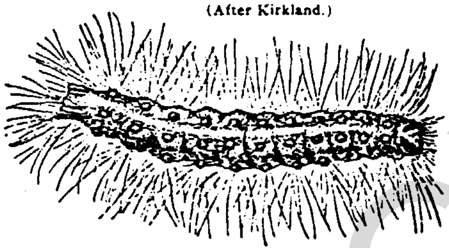
Attachment 17-A3 (Cont'd)
Various Ornamental Insects

GYPSY MOTH

FEMALE GYPSY MOTH.



—Egg-mass of gypsy moth.
(After Kirkland.)



—Gypsy moth caterpillar.

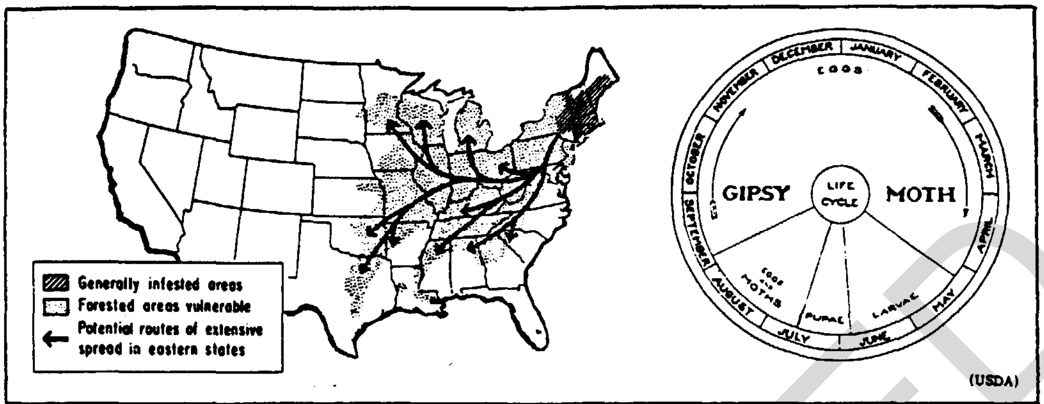
—Cocoon of gypsy moth. (USDA)

The gypsy moth was accidently introduced into the United States in 1868 by Professor Leopold Trouvelot at Medford, Massachusetts. He imported the moth to hopefully improve silkworm culture, but a storm blew over the cages and the pest escaped. The insect has become one of the most destructive pests of forest and shade trees. Periodic outbreaks develop and extensive defoliation and death of host trees occurs. In 1971 two million acres were defoliated in the heavily infested northeastern U.S. involving nine states. One million oaks were killed, along with 9,000 hemlocks and 8,000 white pines.

Suppression and eradication of the gypsy moth were attempted from 1890 to 1943 using cresote on egg masses, banding trees with burlap and sticky materials and spraying with lead arsenate (Burgess 1930). Parasites and predators were imported from Europe and Japan (Brown and Sheals 1944). DDT was used from 1944 through 1957 for eradication and control. Carbaryl was used as a substitute for DDT beginning in 1958 because of public concern over DDT residues.

Since DDT was removed from the control program the gypsy moth has spread rapidly to the south and west. Isolated populations have been found southward along the Atlantic and Gulf coasts to Texas, westward to Missouri and more recently in Washington and California. Much of the long distance spread resulted from large outbreaks in several eastern states and consequent movement from these infested areas on recreational vehicles. The ultimate spread of the gypsy moth will depend upon the availability of suitable hosts.

Climate does not appear to be much of a limiting factor in the spread of the gypsy moth in the United States.



(USDA)

1. Description and Seasonal Development

The gypsy moth overwinters in the egg stage. The globular white eggs are deposited in a mass containing several hundred eggs. These masses are fuzzy and tan-colored, are about 3/4 by 1 and 1/2 inches in size. Under epidemic conditions egg masses can be found on tree trunks, siding of houses, stones etc. as well as on the under side of vehicles.

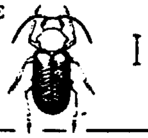
The caterpillars are hairy and have a dusky ground color. There are two rows of wart-like tubercles down the center of the back. The first five pairs are blue and the remaining six pairs are brick-red. Full grown larvae are two or more inches in length. The first three molts of the caterpillar feed in the tops of trees both day and night. The fourth to sixth instars hide on the tree trunk during the daylight hours. They reach maturity in mid-July.

The pupae often occur in clusters in protected sites. They are almost naked, being covered by only a few strands of silk. The pupal stage lasts about 10-14 days.

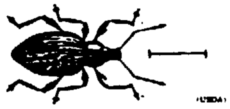
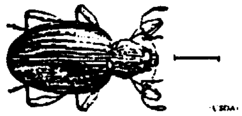
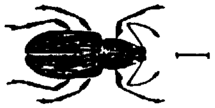
The creamy-white, heavy bodied female moth does not fly, but rests on tree trunks, siding of houses, fence posts and other convenient sites. The smaller, darker colored males fly both day and night seeking out the females for mating.

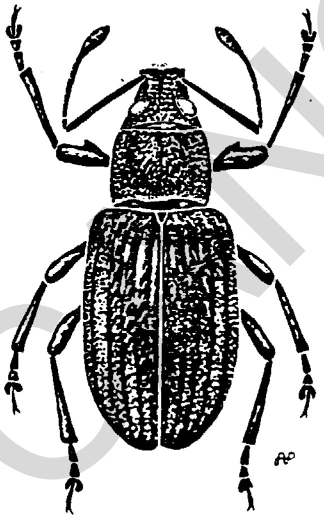
(USDA) —Male gypsy moth.

LEAF-BEETLE PESTS OF TREES AND SHRUBS

Insect or Other Arthropod Pest	Overwintering Stage and Location	Generations /Year	Host Plants	Part(s) of Plant Attacked and Symptoms	Control Measures
COTTONWOOD LEAF BEETLE  variation in color markings. (USDA)	Adult in protected sites.	3-4, 5 in California.	Willows and poplars.	Skeletonize the leaves.	
IMPORTED WILLOW LEAF-BEETLE 	Adults under bark.	2 - 4	Willows and Lombardy poplar.	Skeletonize the leaves.	
COTTONWOOD LEAF-MINING BEETLE 	Pupa in the soil.	1	Poplars	Leaves mined and skeletonized	
ALDER FLEA BEETLE 	Adult in protected sites.	1-north 2-south	Alder, willow, poplars.	Eat all of leaf but veins.	

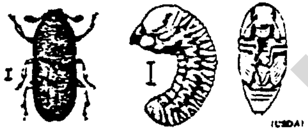
WEEVILS THAT INFEST TREES AND SHRUBS

Insect or Other Arthropod Pest	Overwintering Stage and Location	Generations /Year	Host Plants	Part(s) of Plant Attacked and Symptoms	Control Measures
BLACK VINE WEEVIL 	Grubs on roots in the soil.	1	80 known host plants including Rhododendron, Yew, Azalia, Hemlock etc.	Numerous feeding symptoms: leaves notched, roots eaten off, bark may be eaten and plant may be girdled.	
STRAWBERRY ROOT WEEVIL 	Larvae in roots and adults in trash.	1	Strawberries, conifers. and deciduous trees and shrubs.	Larvae on roots, girdled twigs.	
ASIATIC OAK WEEVIL 	Larvae on roots.	1	Chestnut, Hickory, Beech, Hazelnut, Dogwood, Oak etc.	Eat all but the mid-vein of the leaves.	
YELLOW POPLAR WEEVIL 	Adults in sheltered sites.	1	Sassafrass, Magnolia, Tulip tree.	In spring crescent feeding scars on sassafrass and magnolia leaves; later blotch mines on magnolia, tulip.	

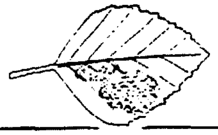
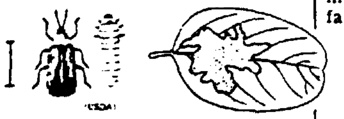
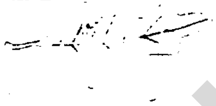


Asiatic Oak Weevil

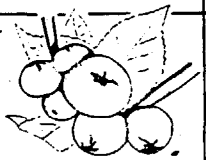
BARK BEETLES THAT INFEST TREES AND SHRUBS

Insect or Other Arthropod Pest	Overwintering Stage and Location	Generations /Year	Host Plants	Part(s) of Plant Attacked and Symptoms	Control Measures
HICKORY BARK BEETLE  (USDA)	Larvae under bark.	1 North, 2 South	Hickories	Trunk and branches with shot-holes, premature defoliation, dead branches.	
HACKBERRY ENGRAVER 	Larvae under bark.	1-2	Hackberry	Dead branches with shot-holes.	
SHOT-HOLE BORER  (USDA)	Larva under bark.	1 North, 3 South	Fruit trees, Mountain Ash, Hawthorn, Elm.	Foliage yellows and wilts, shot-holes in trunk and branches leading to winding galleries filled with sawdust.	

LEAF-MINER PESTS OF TREES AND SHRUBS

Insect or Other Arthropod Pest	Overwintering Stage and Location	Generations /Year	Host Plants	Part(s) of Plant Attacked and Symptoms	Control Measures
BIRCH LEAF-MINER 	Larvae hibernate in soil beneath tree.	2-4	Birch: gray, European, river, and white.	Brown blotch mines toward tip of leaf.	
LOCUST LEAF-MINER 	Pupae in mines in fallen leaves.	2	Black locust	Digitate mines in center of leaf blade.	
GREGARIOUS OAK LEAF-MINER 	Pupae in fallen leaves.	2-North 5-South	Oak: white oaks most common.	Large blotch mines in blade of leaf.	
ARBORVITAE LEAF-MINER (Several Sp. form a complex) 	Larvae in leaves.	1	Arborvita	Brown terminal growth, leaves tunneled out.	

ARTHROPOD INDUCED GALLS

Insect or Other Arthropod Pest	Overwintering Stage and Location	Generations /Year	Host Plants	Part(s) of Plant Attacked and Symptoms	Control Measures
MAPLE SPINDLE GALL 	Adults in cracks and crevices of bark and bud scales.	Several	Sugar maple	Purplish, elongated, spindle-like galls on leaf blade.	
GOUTY MAPLE GALL *See illustration below.*	Larvae in ground under tree.	1	Sugar maple	Yellowish pockets resembling open clam shells along the vein.	
HICKORY POUCH GALL 	Eggs in cracks and crevices of bark and in old galls.	1	Hickories	New twigs and leaf petioles with hollow marble sized galls. Later they split open and turn brown.	
VEIN POCKET AND MARGINAL FOLD GALLS See illustration below.	Pupae in soil under tree.	1	Pin oak	Irregular rolls or tubes form- at margin of leaf and along veins.	

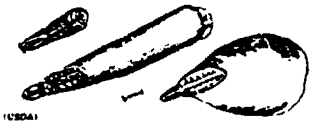
Vein Pocket and Marginal Fold Galls

Gouty Maple Gall

INSECT TRANSMITTED DISEASES OF ORNAMENTAL PLANTS

Disease	Pathogen(s)	Host(s)	Insect Vector(s)
Aster Yellows	Virus- Chlorogenus callistephi	Asters and various other plants.	Macrosteles divisa (leafhopper).
Beech Bark Disease	Fungus- Nectria coccinea faginata	American and European beeches.	Cryptococcus fagisuga (beech scale).
Blue Stains	Fungus- Certaocystis minor and C. ips.	Pines	Ips calligraphus (southern pine beetle and Ips grandicollis and Ips pini (engraver beetles).
Bud Rot	Fungus- Sporotrichum poae	Carnations	Pediculopsis graminium (mite).
Chestnut Blight	Fungus- Endothia parasitica	Chestnut	Various borers and bark beetles.
Dutch Elm Disease	Fungus- Ceratocystis ulmi	Various species of elm.	Scolytus multistriatus (European elm bark beetle), Hylurgopinus rufipes (Native elm bark beetle).
Elm Phloem Necrosis	Virus- Morsus ulmi	Elm	Scaphoideus luteolus (white banded elm leafhopper).
Fire Blight	Bacteria- Erwinia amylovora	Crabapple, quince, pyracantha etc.	Flies, wasps, bees, aphids, leafhoppers, plant bugs and bark beetles.
Persimmon Wilt	Fungus- Cephalosporium diospyri	Persimmon	Xylobiops basilaris (bostrichid)

SCALE INSECTS INFESTING PINE TREES

Insect or Other Arthropod Pest	Overwintering Stage and Location	Generations /Year	Host Plants	Part(s) of Plant Attacked and Symptoms	Control Measures
PINE NEEDLE SCALE  (USDA)	Egg under female scale.	2	Hemlock, Pine, Fir, Spruce, Incense cedar.	Needles white due to encrusted scales.	
CHIONASPIS HETEROPHYLLAE Appearance is the same as the pine needle scale above.	Egg under female scale	1?	Scotch pine	Off-color needles encrusted with white scales.	
BLACK PINE NEEDLE SCALE 	Partially grown scale on needles.	1 in North, 3 in South	Pine, Douglas fir	Dead branches, Off-color foliage.	
PINE TORTOISE SCALE 	Partially grown female scale on branches.	1	Scotch, Red, Austrian and Jack pines.	Reddish-brown scales, honeydew and black sooty mold, yellow stunted foliage.	

SEASONAL APPEARANCE OF ORNAMENTAL PESTS AND THE SUGGESTED TIME TO APPLY CONTROL MEASURES

The following information should serve as a guide to help you to know the approximate time that certain pests are more effectively controlled. However, you will need to consult the text for more detailed instructions and information.

Dormant-- Before Growth Starts

Host	Pest
Arborvitae	tip dwarf mite, Fletcher scale, spider mites
Ash	ash flower gall mite, scurfy scale, oystershell scale
Bittersweet	euonymus scale
Cotoneaster	San Jose scale
Douglas fir	Cooley spruce gall adelgid
Elm	bark beetles, European elm scale, Putnam scale, scurfy scale. San Jose scale
Euonymus	euonymus scale, winged euonymus scale
Fir	pine needle scale
Flowering fruit trees	mites, San Jose scale, scurfy scale, terrapin scale, aphids
Hackberry	Putnam scale
Hawthorne	terrapin scale, European red mite
Hemlock	Hemlock scale, pine needle scale, Fiorinia scale
Juniper	juniper scale, tip dwarf mite, spider mites
Lilac	oystershell scale
Linden	cottony maple scale
Maple	terrapin scale, cottony maple scale, Putnam scale, oystershell scale, scurfy scale, lecanium scale
Oak	golden oak scale, kermes scale, obscure oak scale, lecanium scale
Pine	pine bark aphid, pine tortoise scale, pine needle scale
Poplar	oystershell scale
Spruce	spruce spider mite
Sweet gum	sweet gum pit-making scale
Tulip tree	tulip tree scale
Willow	oystershell scale
Yew (Taxus)	Fletcher scale, mealybugs

Attachment 17-A4
Important Diseases on Common Landscape Plants and Timing
Appropriate Control Measure Implementation

April

April (early)

Host	Pest
Ash	ash flower gall mite
*Douglas fir	Cooley spruce gall adelgid
Pine	Pales weevil, Zimmerman pine moth
Spruce (Norway, red, black, white, Colorado)	eastern spruce gall adelgid spruce spider mite, Cooley spruce gall adelgid spruce needle miner

*Cooley spruce gall adelgid on Douglas fir can be controlled from spring through fall when temperature is above 60°F.

April (mid)

Host	Pest
Flowering fruit trees	eastern tent catepillar
Honey locust	honey locust pod gall
Juniper	juniper webworm
Pine	white pine weevil, European pine shoot moth, Nantucket pine tip moth,
Spruce	northern pine weevil, Pales weevil white pine weevil, spruce spider mite, spruce nedle miner

April (late)

Host	Pest
Boxwood	boxwood psyllid
Fir	balsam twig aphid
Douglas fir	Cooley spruce gall adelgid
Flowering fruit trees	eastern tent catepillar
Inkberry	inkberry leafminer
Maple	maple bladder gall mite
Pine	northern pine weevil, Pales weevil
Spruce (Blue)	eriophyid mite, spruce spider mite

Attachment 17-A4 (Cont'd)
Important Diseases on Common Landscape Plants and Timing
Appropriate Control Measure Implementation

May

May (early)

Host	**Pest**
Arborvitae	arborvitae leafminer
Ash	forest tent caterpillar
Birch	forest tent caterpillar
Boxwood	boxwood leafminer, boxwood psyllid
Elm	woolly apple aphid
Fir	balsam twig aphid
Flowering fruit trees	eastern tent caterpillar lesser peachtree borer
Hackberry	hackberry nipple gall psyllid
Hawthorn	woolly apple aphid, hawthorn leafminer
Juniper	juniper webworm
Maple	eriophyid mite, maple shoot moths, forest tent caterpillar
Mountain ash	woolly aphid
Oak	forest tent caterpillar
Pine	sawflies, spotted pine aphid, Zimmerman pine moth, pine tube moth, northern pine weevil, Pales weevil
Poplar	forest tent caterpillar
Spruce	balsam twig aphid, spruce spider mite, woolly larch aphid
Sweetgum	forest tent caterpillar
Wild Cherry	eastern tent caterpillar

May (mid)

Host	**Pest**
Arborvitae	spruce spider mite, arborvitae leafminer
Ash	ash borer, forest tent caterpillar
Azalea	azalea mite, rhododendron borer
Birch	birch leafminer, forest tent caterpillar
Dogwood	dogwood borer
Douglas fir	Coolley spruce gall adelgid
Elm	cankerworm
Flowering fruit trees	eastern tent caterpillar
Hackberry	lace bugs
Hawthorn	hawthorn leafminer cankerworm
Hemlock	spruce spider mite, pine needle scale
Holly	holly leafminer
Juniper	juniper midge, juniper tip midge, juniper scale
Laurel	rhododendron borer
Maple	forest tent caterpillar fall cankerworm
Mountain ash	lack bugs
Oak	lace bugs, oak kermes scale, golden oak scale, forest tent caterpillar
Pieris	andromeda lace bug
Pine	pine bark adelgid, spittlebug, Nantucket pine tip moth, Pales weevil, pine root collar weevil, eriophyid mite
Poplar	forest tent caterpillar
Rhododendron	rhododendron borer, lace bugs
Serviceberry	hawthorn lace bug
Shade trees	cankerworms
Spruce	spruce spsider mite
Sweetgum	forest tent caterpillar
Sycamore	sycamore lace bug
Yew (Taxus)	mealybugs

Attachment 17-A4 (Cont'd)
Important Diseases on Common Landscape Plants and Timing
Appropriate Control Measure Implementation

May (late)

Host	Pest
Arborvitae	arborvitae leafminer, spruce spider mite
Ash	Putnam scale, oystershell scale
Birch	bronze birch borer, birch leafminer, oystershell scale
Bittersweet	euonymus scale
Elm	flatheaded apple tree borer, white-marked tussock moth
Euonymus	euonymus scale
Fir	Pales weevil
Flowering fruit trees	flatheaded apple tree borer, Putnam scale
Hackberry	Putnam scale
Hawthorn	hawthorn leafminer, scurfy scale, oystershell scale
Hemlock	pine needle scale, Fiorinia scale
Hickory	hickory petiole gall adelgid
Juniper	juniper scale
Lilac	oystershell scale, lilac borer
Linden	scurfy scale
Maple	oystershell scale, flatheaded apple tree borer, green-striped maple worm
Mountain ash	lace bugs
Oak	flatheaded apple tree borer, golden oak scale, oak kermes scale, May beetles, orange-striped oak worm
Pachysandra	euonymus scale, two spotted spider mite
Pieris	andromeda lace bug
Pine	pine needle scale, spruce spider mite, northern pine weevil, Pales weevil, eriophyid mite
Rhododendron	azalea leafminer
Serviceberry	hawthorn lace bug
Shade trees	white-marked tussock moth, scurfy scale
Spruce	pine needle scale
Sycamore	sycamore lace bug
Willow	scale
Yew (Taxus)	mealybugs

Attachment 17-A4 (Cont'd)
Important Diseases on Common Landscape Plants and Timing
Appropriate Control Measure Implementation

June

June (early)

Host	Pest
Arborvitae	spruce spider mite, black vine weevil
Ash	oystershell scale, ash borer, fall webworm, elm spanworm
Azalea	lace bugs, rhododendron borer, azalea whitefly, black vine weevil
Birch	bronze birch borer, oystershell scale
Bittersweet	euonymus scale
Boxwood	boxwood leafminer, lecanium scale
Dogwood	dogwood borer
Douglas fir	bagworms
Euonymus	euonymus scale, winged suonymus scale
Fir	Pales weevil
Flowering fruit trees	terrapin scale, black vine weevil (peach, plum, apricot)
Hawthorn	oystershell scale
Hemlock	spruce spider mite, black vine weevil
Hickory	elm spanworm
Holly	holly leafminer
Honeysuckle	honeysuckle leafminer
Juniper	juniper tip dwarf mite, juniper scale, spruce spider mite
Lilac	oystershell scale, lilac borer
Maple	oystershell scale, greenstriped maple worm
Mountain ash	European red mite, lace bugs
Mountain laurel	azalea leafminer, lace bug
Oak	golden oak scale, oak kermes scale, orange-striped oak worm, elm spanworm
Pachysandra	oystershell scale, euonymus scale
Pieris	andromeda lace bug
Pin oak	May beetles
Pine	Pales weevil, northern pine weevil, pine needle scale
Poplar	oystershell scale, euonymus scale
Rhododendron	azalea whitefly, azalea leafminer, rhododendron borer, black vine weevil
Shade trees	terrapin scale leafhoppers
Spruce	spruce spider mite
Tulip tree	yellow poplar weevil
Yew (Taxus)	mealybugs, black vine weevil
Willow	oystershell scale

June (mid)

Host	**Pest**
Arborvitae	bagworms, black vine weevil
Ash	elm spanworm
Azalea	azalea bark scale, black vine weevil
Birch	bronze birch borer
Dogwood	dogwood borer
Fir	Pales weevil
Flowering fruit trees	flatheaded apple tree borer, wooly apple aphid
Hemlock	strawberry root weevil
Hickory	elm spanworm
Ivy	Japanese beetle
Juniper	juniper tip midge, juniper scale
Linden	Japanese beetle, webworms
Maple	flatheaded apple tree borer, lecanium scale
Oak	oak skeletonizers, May beetles, flatheaded apple tree borer, lecanium scale, elm spanworm
Pine	pine tortoise scale, Pales weevil, European pine shoot moth, Nantucket pine tip moth
Rhododendron	azalea bark scale, black vine weevil
Shade trees	Japanese beetle
Shrubs	Japanese beetle
Spruce	spruce needle miner, spruce spider mite
Sweet gum	sweet gum pit-making scale
Sycamore	sycamore lace bug
Walnut	fall webworm
Yew (Taxus)	black vine weevil

Attachment 17-A4 (Cont'd)
Important Diseases on Common Landscape Plants and Timing
Appropriate Control Measure Implementation

June (late)

Host	**Pest**
Arborvitae	arborvitae leafminer, bagworms, black vine weevil, Fletcher scale
Azalea	oystershell scale
Bald-cypress	bagworms
Birch	birch leafminer, bronze birch borer
Buckhorn	bagworms
Cedars	bagworms
Cotoneaster	San Jose scale, black vine weevil
Dogwood	dogwood borer
Fir	Pales weevil, bagworms, black vine weevil
Flowering fruit trees	San Jose scale, bagworms
Hemlock	spruce spider mite, bagworms, black vine weevil
Hornbean	bagworms
Ivy	Japanese beetle
Juniper	bagworms, juniper scale
Larch	bagworms
Linden	linden leaf beetles, Japanese beetle, bagworms
Magnolia	yellow poplar weevil
Maple	bagworms, lecanium scale
Oak	bagworms
Pine	European pine shoot moth, pine tortoise scale, Pales weevil, northern pine weevil, bagworms
Rhododendron	rhododendron borer, black vine weevil
Shade trees	bagworms, leafhoppers
Shrubs	Japanese beetle
Spruce	spruce spdier mite, spruce needle miner
Tulip trees	yellow poplar weevil
Walnut	walnut caterpillar
Willow	bagworm
Yew (Taxus)	Fletcher scale, black vine weevil

Attachment 17-A4 (Cont'd)
Important Diseases on Common Landscape Plants and Timing
Appropriate Control Measure Implementation

July

July (early)

Host	Pest
Arborvitae	bagworms
Euronymus	bagworms
Fir	bagworms, Pales weevil
Flowering fruit trees	flatheaded borer, San Jose scale, peach tree borer, lesser peach tree borer bagworms
Hemlock	bagworms
Honey locust	mimosa webworm
Juniper	bagworms
Linden	bagworms
Locust	locust leafminer
Magnolia	yellow poplar weevil
Maple	flatheaded borer, cottony maple scale, bagworms
Mimosa	mimosa webworm
Oak	flatheaded apple tree borer, bagworms
Pine	northern pine weevil, Pales weevil, bagworms, pine tortoise scale
Silver maple	cottony maple scale, bagworms
Spruce	spruce bud scale
Tulip tree	yellow poplar weevil

July (mid)

Host	**Pest**
Arborvitae	Fletcher scale, bagworms
Euonymus	euonymus scale, bagworms
Flowering fruit trees	San Jose scale, bagworms
Hemlock	hemlock scale, pine needle scale, bagworms
Honey locust	mimosa webworm
Linden	cottony maple scale, bagworms
Oak	flatheaded apple tree borer, bagworms
Pine	pine tube moth, Nantucket pine tip moth, pine webworm, bagworms
Silver maple	cottony maple scale, bagworms
Spruce	pine needle scale
Walnut	walnut caterpillar
Yew (taxus)	Fletcher scale

Attachment 17-A4 (Cont'd)
Important Diseases on Common Landscape Plants and Timing
Appropriate Control Measure Implementation

July (late)

Host	**Pest**
Barberry	barberry webworm
Bittersweet	euonymus scale
Colorado blue spruce	Cooley spruce gall adelgid
Englemann spruce	Cooley spruce gall adelgid
Euonymus	euonymus scale, winged euonymus scale
Fir	pine needle scale
Flowering fruit trees	San Jose scale, peach tree borer
Honey locust	mimosa webworm
Maple	cottony maple scale
Oak	kermes scale
Pine	pine needle scale, pine tortoise scale
Spruce	pine needle scale, Cooley spruce gall adelgid
Yew (Taxus)	mealybugs, Fletcher scale

Attachment 17-A4 (Cont'd)
Important Diseases on Common Landscape Plants and Timing
Appropriate Control Measure Implementation

August

August (early)

Host	**Pest**
Fir	Pales weevil
Hemlock	hemlock looper
Honey locust	mimosa webworm
Juniper	juniper tip midge
Oak	oak skeletonizers
Pine	Pales weevil, northern pine weevil, pine needle scale, pine root collar weevil
Spruce	Cooley spruce gall adelgid
Tulip tree	tulip tree scale

August (mid)

Honey locust	mimosa webworm
Mimosa	mimosa webworm
Oak	flatheaded apple tree borer
Pine	aphid, pine webworm, pine root collar weevil
Flowering fruit trees	peachtree borers

August (late)

Ash	ash borer
Flowering fruit trees	lesser peach tree borer (peach, plum, apricot)
Magnolia	magnolia scale

September/October

September (early)

Host	Pest
Arborvitae	Fletcher scale
Honey locust	locust borer
Locust	locust borer
Magnolia	magnolia scale
Maple	cottony maple scale
Pine	pine root collar weevil
Spruce (Norway, white, red, black)	eastern spruce gall adcigid
Sweet gum	sweet gum pit-making scale

September (mid)

Host	Pest
Juniper	juniper tip midge
Spruce	Cooley spruce gall adelgid (through October)

September (late)

Host	Pest
Juniper	juniper webworm
Pine	Pales weevil, white pine weevil

October (early)

Host	Pest
Spruce (Norway, white, red, black)	eastern spruce gall adelgid

ABBREVIATIONS:

*	Only if had been severe
BSp	Begin spray schedule-discontinue when weather dries
CSp	Continue spraying if wet-discontinue when weather dries
D	Apply soil drench fungicides
F	Fumigate before planting
I	Irrigate to prevent drought stress
NT	No treatment required
P	Prune
R	Rake and destroy fallen leaves
X	Remove infected plant

	Dormant	Budbreak	Summer	Autumn
Arborvitae (Thuja)				
Kabatina twig blight	P	BSp		BSp
Phomopsis twig blight	P	BSp		BSp
Root rot			D	
Ash (Fraxinus)				
Anthracnose	R			
Azalea (Rhododendron)				
Botrytis blight		BSp		
Leaf gall	P-BSp*			
Leaf spots	BSp			R
Nematodes				F
Ovulinia flower blight		BSp		
Phytophthora dieback	P	BSp	CSp	CSp-P
Powdery mildew			BSp	CSp
Root rots		D	D	F
Boxwood (Buxus)				
Macrophoma leaf spot	P		I	
Nematodes				F
Root rot			F	
Butternut (Juglans)				
Anthracnose				R
Dieback	P			
Catalpa (Catalpa)				
Leaf spots				R
Powdery mildew				NT
Verticillium wilt				NT

Attachment 17-A4 (Cont'd)
Important Diseases on Common Landscape Plants and Timing
Appropriate Control Measure Implementation

	Dormant	Budbreak	Summer	Autumn
Cherry (Prunus)				
Bacterial leaf spot		BSp	CSp	
Black knot	P-X*	BSp		
Chestnut (Castanea)				
Blight	P-X*			
Leaf spot				R
Cotoneaster (Cotoneaster)				
Fire blight	P-BSp*	CSp	CSp	
Crabapple (Malus)				
Cedar-apple rust		NT		
Fire blight	P-BSp*	CSp*	CSp*	
Powdery mildew			NT	
Scab		BSp	CSp	R
Dogwood (Cornus)				
Anthracnose		BSp	CSp	
Decline	P-X*	BSp	CSp-I	I
Septoria leaf spot		BSp	CSp	
Douglas-fir (Pseudotsuga)				
Rhabdocline needlecast		BSp		
Swiss needlecast		BSp		
Elm (Ulmus)				
Dutch elm disease			X	X
Leaf spot		NT		R
Wet wood		NT		
English Ivy (Hedera)				
Colletotrichum leaf spot	P	BSp	CSp	
Bacterial leaf spot	P	BSp	CSp	
Root rot	X			
Euonymus (Euonymus)				
Anthracnose		BSp	CSp	R
Crown gall	P-X*			
Root rot			D	
Forsythia (Forsythia)				
Crown gall	P-X*			
Hackberry (Celtis)				
Witches' broom	P			

Attachment 17-A4 (Cont'd)
Important Diseases on Common Landscape Plants and Timing
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	Dormant	Budbreak	Summer	Autumn
Hawthorn (Crataegus)				
Fire blight	P	BSp	CSp	
Leaf spot		BSp*	CSp*	
Rust		BSp*		
Holly (Ilex)				
Nematodes				F
Root rot			D	
Honeysuckle (Lonicera)				
Powdery mildew				BSp
Juniper (Juniperus)				
Cedar-apple rust	P-X*			
Kabatina twig blight	P	BSp		BSp
Phomopsis twig blight	P	BSp		BSp
Root rot			D	
Leucothoe (Leucothoe)				
Leaf spot		BSp	CSp	
Root rot			D	
Lilac (Syringa)				
Leaf blight	P	BSp*		
Powdery mildew			BSp	CSp
Maple (Acer)				
Anthracnose				P
Bleeding canker				X*
Leaf spots				NT
Verticillium wilt				X*
Mountain Ash (Sorbus)				
Cytospora canker	P		I	
Fire blight	P			
Leaf spot		BSp*		R
Mountain Laurel (Kalmia)				
Leaf spot		BSp*	CSp*	R

Attachment 17-A4 (Cont'd)
Important Diseases on Common Landscape Plants and Timing
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	Dormant	Budbreak	Summer	Autumn
Oak (Quercus)				
Anthracnose				R
Decline			I	
Leaf blister		BSp*		
Pachysandra (Pachysandra)				
Volutella blight	X	BSp	CSp	X
Pear (Pyrus)				
Fire blight	P-BSp*	CSp	CSp	
Scab		BSp	CSp	
Pieris (Pieris)				
Phytophthora dieback	P	BSp	CSp	CSp-R
Root rot			D	F
Pine (Pinus)				
Diplodia tip blight		BSp	CSp	I
Needle blights		BSp		
Needlecasts			BSp	R
Root rots			D	
Gall and cankering rusts	P-X*	BSp		
Pyracantha (Pyracantha)				
Fire blight	P	BSp	CSp	
Scab				
Rhododendron (Rhododendron)				
Botryosphaeria dieback	P		I	I
Cercospora leaf spot		BSp*	CSp*	R
Ovulinia flower blight		BSp		R
Phytophthora dieback	P	BSp	CSp	CSp
Root rot			D	F
Rose (Rosa)				
Black spot	P	BSp	CSp	CSp-R-P
Crown gall	P-X*			
Cankers	P			
Powdery mildew			BSp	CSp
Rust	P-R	BSp	CSp	R
Spruce (Picea)				
Cytospora canker	P		I	I
Needlecast		BSp		

Attachment 17-A4 (Cont'd)
Important Diseases on Common Landscape Plants and Timing
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	Dormant	Budbreak	Summer	Autumn
Sycamore (Platanus)				
Anthracnose	P			
Powdery mildew				NT
Viburnum (Viburnum)				
Leaf spot				R
Vinca (Vinca)				
Phoma stem blight	P	BSp	CSp	P
Walnut (Juglans)				
Anthracnose	P			R
Bacterial blight		BSp		
Willow (Salix)				
Crown gall	P-X*			
Leaf blight	P			R

Attachment 17-A4 (Cont'd)
Important Diseases on Common Landscape Plants and Timing
Appropriate Control Measure Implementation

CHAPTER 18. VEGETATION CONTROL

Section C.10 of FAR - PWS. Weeds are plants that are undesirable. A plant may be considered an ornamental in one place and a weed in another. Usually a plant is considered a weed when it becomes:

- a safety, fire, or security hazard
- a nuisance
- unsightly
- or a detriment to maintenance, other plants, and traffic

State certification may be required for turf and ornamental, right-of-way, forestry, industrial and institutional, and/or aquatic weed control depending on the site and operation. The appropriate state category for aerial application will be required if herbicides are applied aerially. Assistance in interpreting state categories and ensuring proper contractor certification is available from your Command PMC. Weed control in a contract may be included as a firm fixed price or indefinite quantity item.

Extensive information on weed control is available in NAVFAC MO-314, Weed Control and Plant Growth Regulation.

18.1 PEST RECOGNITION.

18.1.1 Aquatic Weeds.

18.1.1.1 Emersed Weeds. These are weeds that grow rooted in the bottom and stand out of water, or they grow in water-saturated soils. Examples are water lily, pickerel weed, and cattail (Figure 18-1)

18.1.1.2 Submersed Weeds. These plants grow under the water surface and obtain nutrients directly from the water, rather than from roots in the soil. Examples are pondweeds, coontail, and milfoil (Figure 18-1). If these plants do have roots, they are used for anchorage only.

18.1.1.3 Floating Weeds. (Figure 18-1) These are weeds that float on the water surface and obtain nutrients directly from the water. Examples are duckweed, water hyacinth, and some water lilies.

18.1.1.4 Algae. Algae are primitive plants without true stems, leaves, or vascular systems. Based on their size and shape, algae are subdivided into three groups.

MICROSCOPIC ALGAE

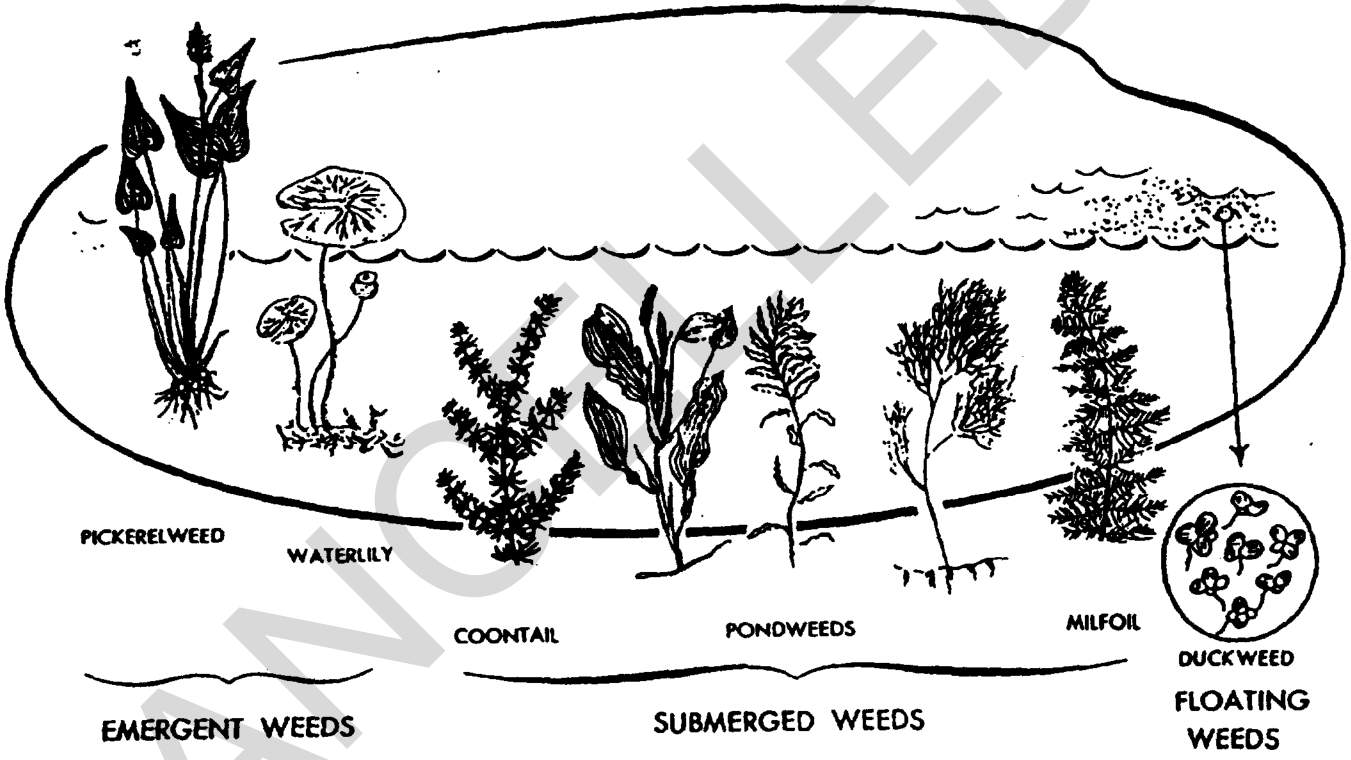
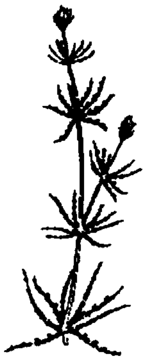
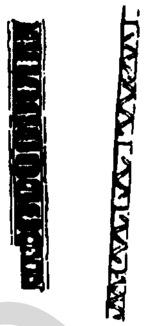


Figure 18-1
Aquatic Weeds



BRANCHED ALGAE

- **Single Celled and Colonial Algae.** This group includes the microscopic phytoplankton species. These plants are generally beneficial because they act as primary producers of food and oxygen. Excessive fertilization or organic pollution can cause explosive population growth (algal blooms) which may eventually lead to oxygen depletion in the water.
- **Filamentous Algae.** Filamentous algae is frequently a problem in pond management. These plants are plainly visible as floating mats of thread-like filaments often called "pond moss".
- **Branched Algae.** Branched algae resemble flowering plants but do not flower or produce seeds. They usually do not extend above the water surface.



FILAMENTOUS ALGAE

18.1.2 Turf, Ornamental, and Right-of Way Weeds.

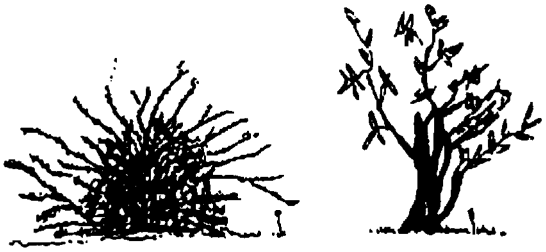
18.1.2.1 Grasses. Grasses are plants that have one leaf emerging from a germinating seed. Grasses are generally narrow, upright, have parallel veined leaves, and a fibrous root system.

GRASS

18.1.2.2 Broadleaf Plants. Broadleaves are plants that have two leaves emerging from a germinating seed. They generally have broad net-veined leaves and tap roots, or a coarse root system.

18.1.2.3 Woody Plants. These are perennials that do not die back to the ground in winter, but may lose their foliage. These plants include brush, shrubs, and trees. Brush and shrubs have several stems and are less than 10 feet tall. Trees usually have a single stem (trunk) and are over 10 feet tall.

BROADLEAF WEED

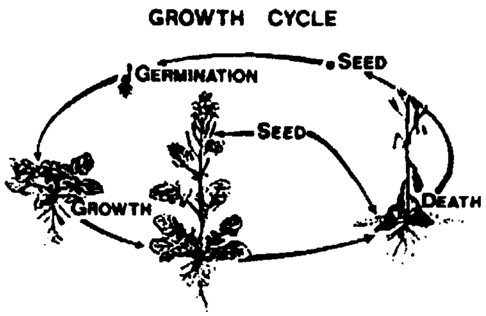


BRUSH

18.2 GROWTH HABITS. Plants grow from seed to maturity in several different ways, and are classified on the basis of their development. Knowing the growth habits of plants is important in planning control measures.

18.2.1 Annuals. Annuals are plants that complete their life cycles from seed to maturity in less than one year.

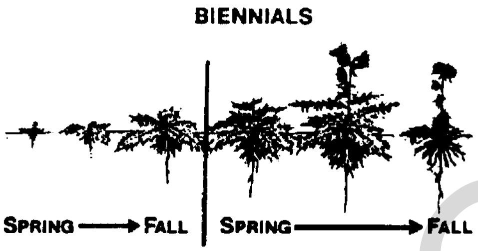
18.2.1.1 Winter annuals. Winter annuals are plants that germinate in the fall, overwinter, mature, set seed, and die in the spring or early summer. Examples are henbit, common chickweed, and annual bluegrass.



THE ANNUAL LIFE CYCLE IS ONE YEAR LONG FROM SEED TO DEATH

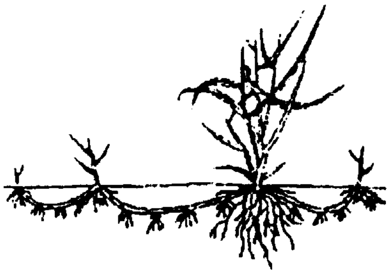
18.2.1.2 Summer annuals. Summer annuals are plants that germinate in the spring, make growth, set seed, and die before fall.

18.2.2 Biennials. Biennials are plants that require two years to complete their life cycle. In the first year the plant forms rudimentary leaves (rosettes) and a strong tap root. In the second year the plants sends up flower stalks and produce seed. Thistle and wild carrot are biennials.



BIENNIALS REQUIRE TWO YEARS TO COMPLETE THEIR LIFE CYCLE

18.2.3 Perennials. These plants live three or more years and reproduce by vegetative means as well as by seed. Vegetative growth takes place above and below the ground through structures called rhizomes, stolons and tubers. They are especially difficult to control because of their persistent root systems. Examples are dandelion, wild onion, wild garlic, quackgrass, and woody plants.



VEGETATIVE GROWTH BY STOLONS

18.3 METHODS OF CONTROL.

18.3.1 Biological Control. Animals such as goats, sheep, geese, fish, and insects have been used with some success.

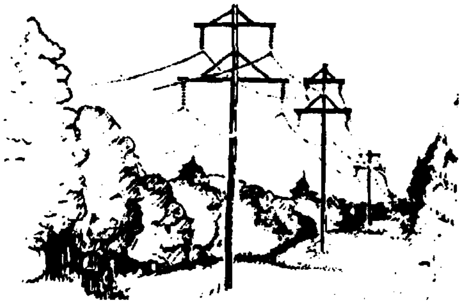
18.3.2 Mechanical Control. Mechanical control methods include:

- hand-pulling, hoeing or blading
- chaining, mowing or burning
- flooding or draining
- mulching and tillage

18.3.3 Chemical Control. Chemical control which is the primary method of weed control, involves the use of herbicides. Herbicides [which include the Plant Growth Regulators (PGR)] are classified by:

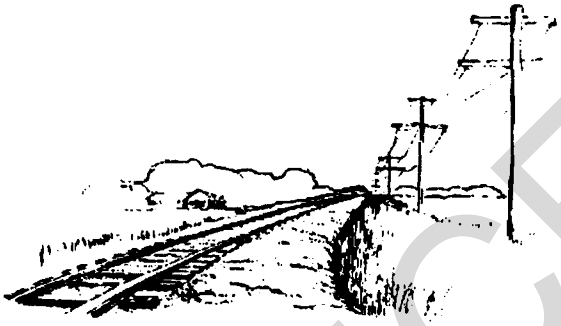
- how they are used
- how they work

18.3.3.1 Classification by Use.



SELECTIVE HERBICIDE APPLICATION

- **Selective herbicides.** Selective herbicides kill certain kinds of plants but do not injure others. A good example is using a selective herbicide to kill broadleaf weeds and brush while leaving desirable grasses. Use of selective herbicides requires accurate weed identification, and application at the right time. The selective action of many herbicides is rate dependant. Thus, calibration is extremely important.



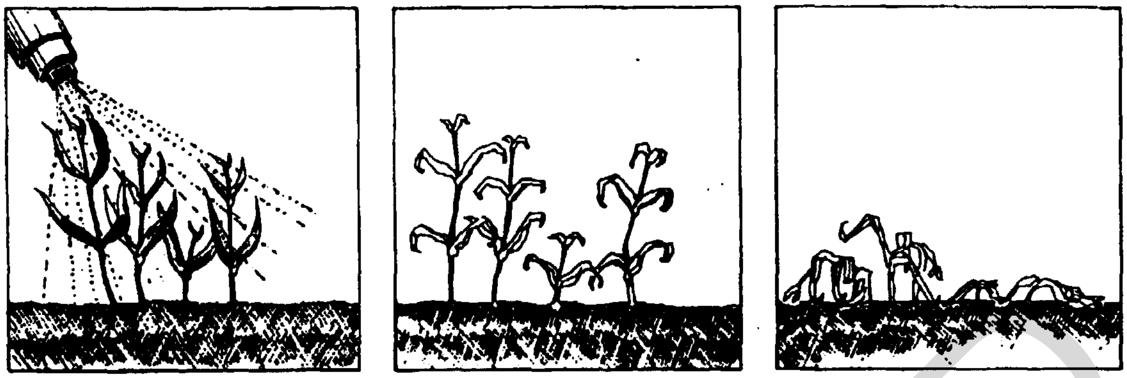
NON-SELECTIVE HERBICIDE APPLICATION

- **Non-Selective Herbicides.** Non-selective herbicides are toxic to plants without regard to species. Maintaining a vegetation free railroad right-of-way is a good example of non-selective herbicide use. Not all plants react the same way to any one herbicide. Selection and application rate depends on the plant to be controlled.

18.3.3.2 Classification by Mode of Action.

(NOTE: These may be either Selective or Non-Selective)

- **Contact Herbicides.** Contact herbicides control weeds by directly contacting the plant parts and invading the plant at the site of contact. They are generally applied to the leaves (Figure 18-2). Thorough coverage is necessary because only that part contacted is controlled. Most contact herbicides are non-selective.
- **Translocated Herbicides.** Translocated herbicides move through the entire plant system. The plant actually transports the herbicide. Translocated herbicides are generally effective during periods of active growth or seed germination. Some are most effective when applied to the plant foliage. Others must be applied to the soil where they are taken into the plant through the root system. These are referred to as soil residuals (Figure 18-2). The length of time

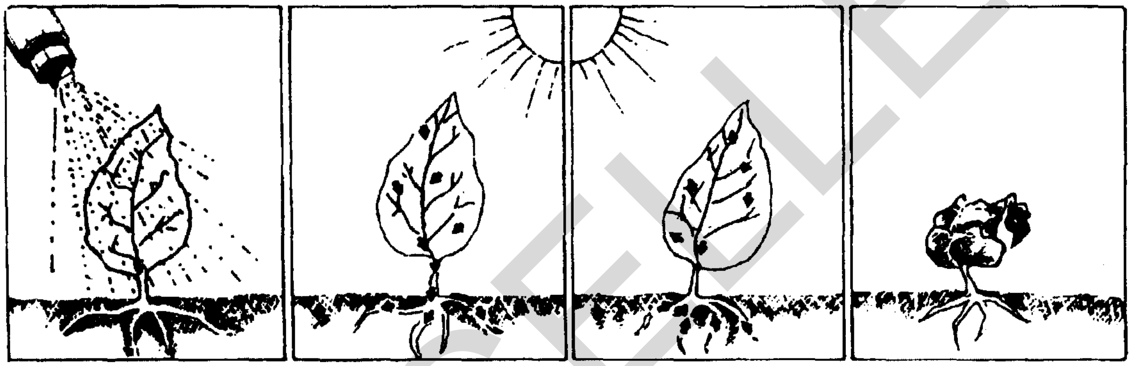


Spraying of visible plant foliage initiates action of contact herbicide. Use spray wand or boom.

Herbicide enters plant leaves where it affects growth processes. Plant curls, withers, turns brown.

Visible weed growth is stopped. Many weeds won't reappear. Others may as some seeds, roots escape.

HOW A FOLIAGE TRANSLOCATED HERBICIDE WORKS

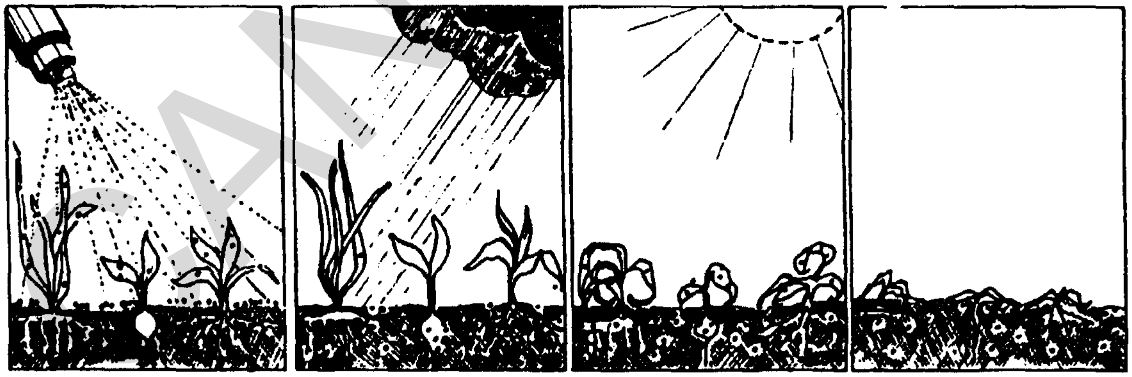


Spray growing vegetation for complete coverage.

Chemical translocated down to roots, growing points, and throughout entire plant system.

Susceptible plant then slowly withers and dies.

HOW A NONSELECTIVE RESIDUAL WORKS



Apply to soil and young plants in early spring.

Rain washes herbicide into soil where it is available for absorption by shoots or root systems.

Herbicide is translocated to growing points, plant yellows and gradually dies.

Plants die and ground is bare for year or so.

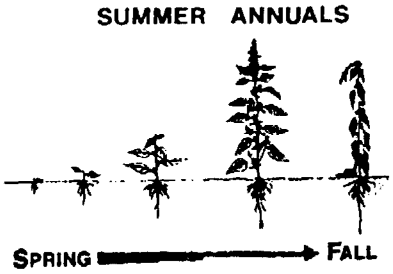
Figure 18-2
Contact Herbicides Halt Visible Plant Growth, at Least for a Short Time

the soil remains free of weeds depends on the herbicide, amount used, rainfall, soil type, and plant species. Soil residuals can be either selective or non-selective depending on the chemical and/or rate of application.

18.4 FACTORS AFFECTING CHEMICAL WEED CONTROL.

18.4.1 Phase of Growth. When plants "grow" they go through a vegetative (growth) and reproductive phase. The phase of growth usually has a direct effect on chemical control results (Figure 18-3).

18.4.1.1 Vegetative Phase.



SPRING HERBICIDE APPLICATIONS ARE MOST SUCCESSFUL

- **(Annuals)** The seedling stage is the beginning of the vegetative phase. At this point, the plants are small and susceptible to herbicide attack. Foliar and/or soil herbicides can be used with good effect. During active periods of vegetative growth, plant energy goes into production of stems, leaves, and roots. Control at this stage is still possible but may be more difficult than at the seedling stage. Cultivation, mowing, and post-emergence herbicides are effective control techniques.
- **(Perennials)** When the plant is small, part of the energy used to produce stems and leaves comes from energy stored in the underground roots and stems. As the plant grows, more energy is produced in the leaves, and some of this is moved to the underground parts for growth and storage. Herbicides provide some control at this stage.

18.4.1.2 Reproductive (Flowering) Phase.

- (Annuals and Biennials) When a plant changes to the flowering stage of growth, most of its energy goes into production of seed. Plants at this stage are harder to kill by either mechanical or chemical methods . In addition, the plant dies soon after flowering, making herbicide applications at this time ineffective and wasteful.
- (Perennials) At this stage, the plant's energy goes into production of seeds. Food storage in the roots begins during this stage and continues through maturity. Chemical control is more effective before the reproductive phase.

18.4.2 Time of Year. Fall is one of the best seasons for treating perennial weeds and woody plants. At this time of year, the weeds must survive the effects of the herbicide, the future effects of winter, and the heavy demand for nutrient caused by the rapid growth in the spring.

Fall treatments are also safer for the environment because many crops and other

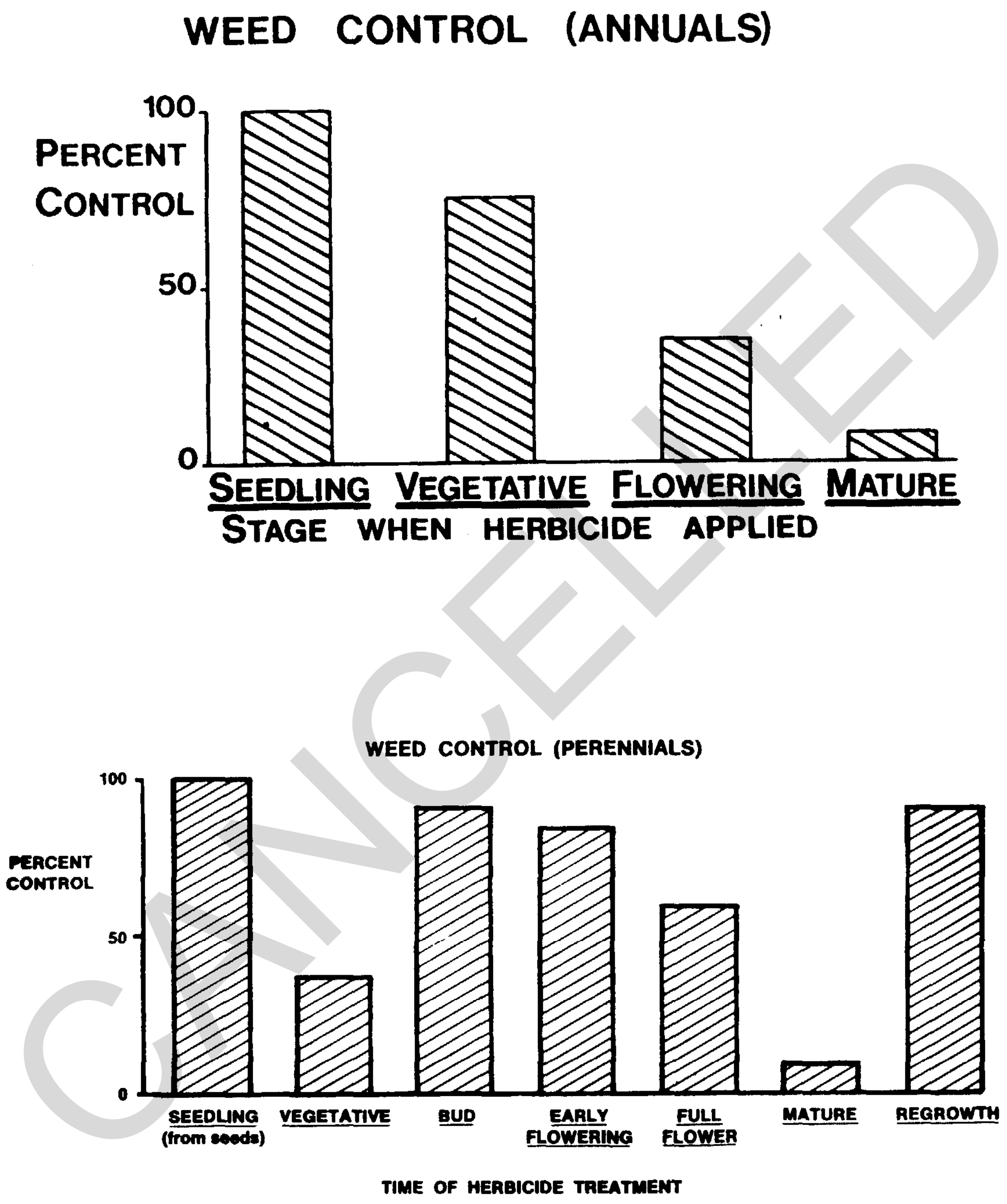
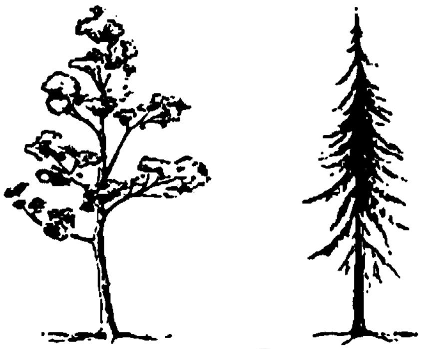


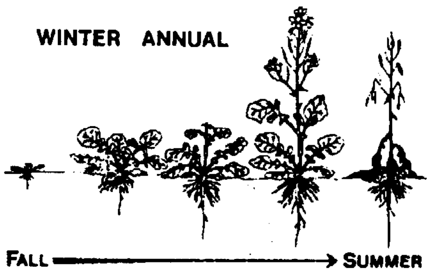
Figure 18-3
Weed Control: Percent Control vs. Phase of Plant Growth

desirable plants have completed their growth. At this time of year herbicides reach underground plant parts through natural translocation (the movement of materials within a plant). Winter annuals are easily controlled at this time because they are in the seedling stage.

Weed control (including the application of PGR's) for summer annuals and perennials should be performed in the spring. It is important to monitor contractor per-formance in regards to timing. Examples of summer annuals are crabgrass, goosegrass, and many turf broadleaf weeds.



FALL IS THE BEST SEASON FOR TREATING WOODY PLANTS



CONTROL OF WINTER ANNUALS IS MOST EFFECTIVE IN THE FALL

18.4.2.1 Timing of Treatments. Within the correct time of year for the application of a herbicide, the timing of treatments will depend on:

- mode of action of the herbicide
- the herbicide and its persistence
- characteristics of target species
- cultural practices
- climate
- soil conditions

Herbicides can be classified as either <u>Pre-emergence</u> (before seed germination) or <u>Post-emergence</u> (after germination and initial growth).

18.4.3 <u>Growing Points: Foliar Applications.</u> The growing points of weeds are an important factor affecting the success of foliar applications.

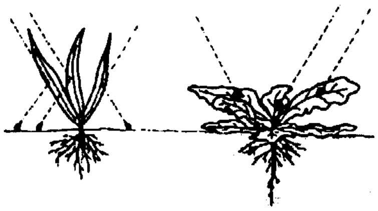
18.4.3.1 Grass. The growing point of seedling grass is below the soil surface (Figure 18-4). The plant will grow back if herbicide or cultivation does not reach the growing point. Creeping perennial grasses have protected buds below the soil surface.

18.4.3.2 Broadleaf Plants. (Figure 18-4) Seedling broadleaf weeds have an exposed growing point at the tip of the young plant. Growing points are also located in the leaf axils (where the leaf attaches to the twig). Herbicides and cultivation easily reach these points. The perennial broadleaf is more difficult to control because of the many buds on the creeping roots and stems.

18.4.3.3 Woody Plants. (Figure 18-4) Many woody plants, either cut, or uncut will sprout from the base or roots.

18.4.4 Leaf Shape and Surface.

18.4.4.1 Leaf Shape. Herbicide sprays tend to bounce or run off plants with narrow vertical leaves. Broadleaf plants tend to hold the spray. If recommended on the label, add an adjuvant to increase spray retention.



LEAF SHAPE AFFECTS HERBICIDE SPRAYS

18.4.4.2 Wax and Cuticle. The thickness of wax and cuticle of the leaf affect herbicide penetration of the leaf surface. Leaves with thin waxy surfaces provide for good contact of herbicide to leaf.

Thick waxy surfaces tend to cause spray solutions to stand up in droplets. Wax and cuticle are thinner on young weeds. Surfactants may be needed for applications to thick, waxy leaves.

18.4.4.3 Leaf Hairs. Hairs on leaf surfaces tend to keep the spray solution from being effective. The droplets stand up on the hair and do not contact the leaf surface. Seedling weeds have fewer and shorter hairs.

18.4.5 Other Factors Affecting Herbicide Applications.

18.4.5.1 Soil Moisture. Soil-applied herbicides must be in moist soil (herbicide must be diluted) to be absorbed by plant roots. This requires water in the form of precipitation or irrigation.

18.4.5.2 Temperature. Herbicide activity tends to increase with temperature to a certain extent. Herbicides which are highly volatile may drift to non-target plants during periods of high temperature.

18.4.5.3 Humidity. A foliar applied herbicide will enter a leaf more easily and rapidly at high humidity than at low humidity. At high humidity, a leaf is more tender and has a thinner layer of wax and cuticle. In addition, the stomata (openings) of the leaf remain open during periods of high humidity.

18.4.5.4 Precipitation. Rain soon after a foliar application will decrease or negate the effectiveness of a herbicide because it will wash the herbicide off the plant. With a soil applied herbicide, rain increases the soil moisture, thus the herbicide is more readily absorbed by the plant's roots. However, too much rain following application may move the herbicide deep past the root zone.

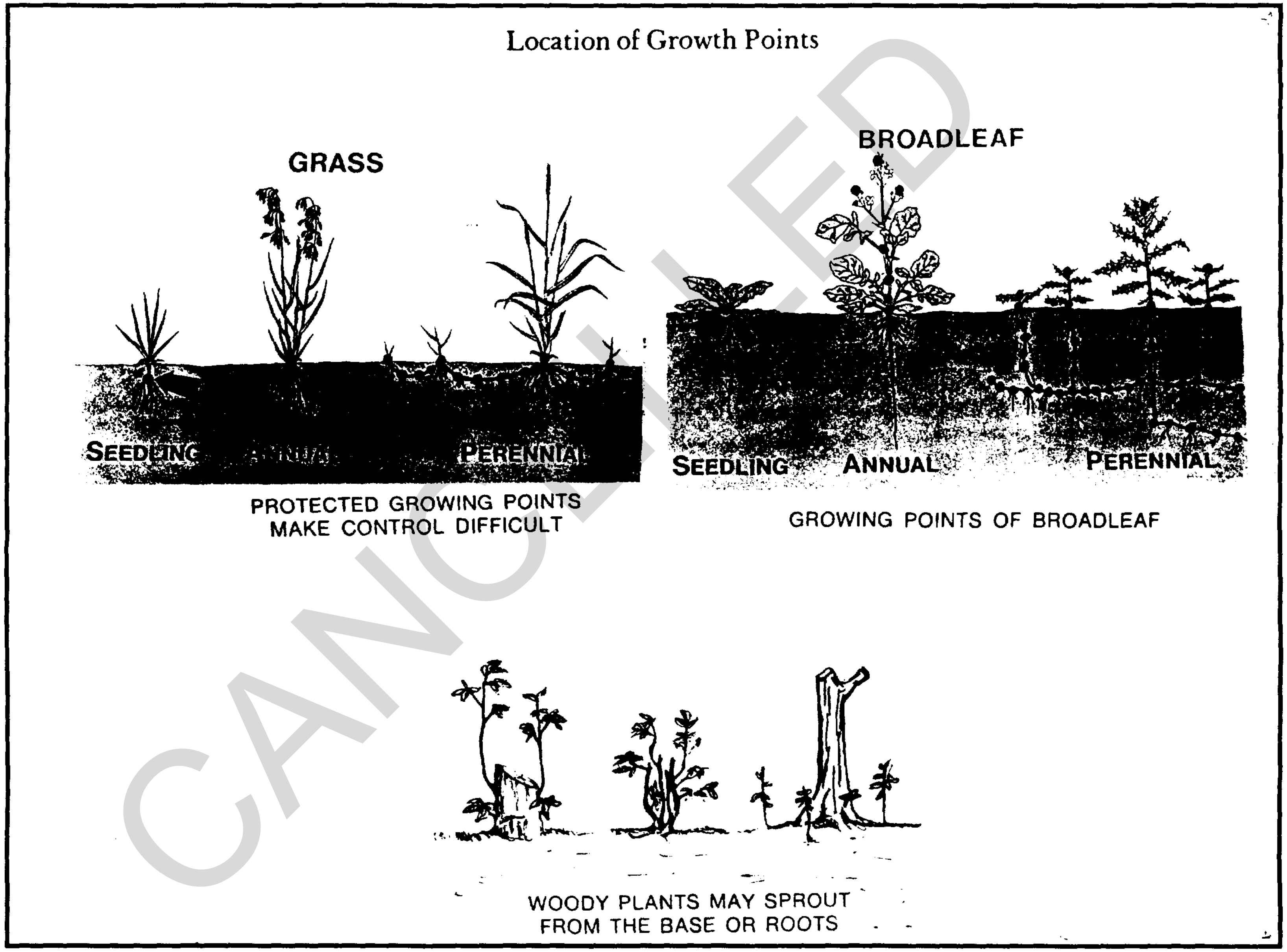


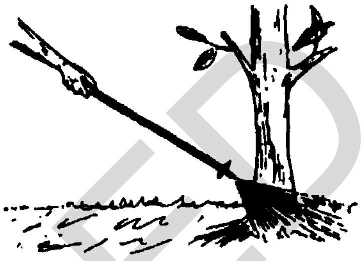
Figure 18-4
Factors Affecting Foliage Application

18.5 WOODY PLANT CONTROL.

Woody plants can be controlled with herbicides at any time, but control is most effective when the plants are small. Woody plants may also be controlled mechanically.

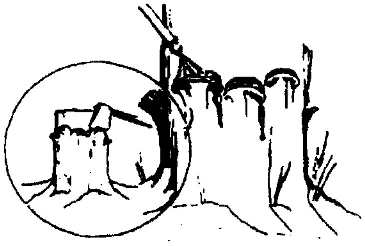
18.5.1 Foliar Spraying. Foliar application of herbicides is best accomplished when the plants are young.

18.5.2 Basal Spraying. In this application technique, herbicides are applied, generally, as an oil solution to the lower parts of stems and crowns. There are both low volume and high volume techniques. For large stems, the best results are obtained by cutting and treating the stump.



BASAL SPRAY

18.5.3 Cut-Surface Treatment. In this method, the herbicide is applied to the sapwood through frills or notches. Another alternative is injection.



CUT-SURFACE TREATMENT

18.5.4 Stump Treatment. Close cut stumps and exposed roots may be treated with basal spray mixtures in oil. It is best to treat immediately after cutting. All sprouts must be treated.

18.5.5 Soil Treatment. Applications are made to the soil at the base of plants. Generally, granular formulations are used. Granules must be activated by water from precipitation or irrigation.

18.6 AQUATIC WEED CONTROL.

Because of the sensitivity of aquatic environments, extreme care must be exercised when aquatic weed control operations are performed. Mechanical, biological, and chemical control methods are available.

WOODY PLANT SOIL TREATMENT

18.6.1 Mechanical Control. There is a wide variety of dredging and weed harvesting equipment that can be contracted. This method of control is expensive compared to other methods. It is very effective in the short term. Mechanical control tends to threaten the environment least. Mechanical fountains and aerators are also useful in combatting many aquatic weeds by providing oxygen and wave action. Liners can also be used on small bodies of water to prevent rooted aquatic weeds from becoming established.

18.6.2 Biological Control. The most widely known biological control agents for aquatic weeds are the white amur (chinese grass carp or triploid grass carp), and the alligator flea beetle which feeds on alligatorweed. Introduction of biological organisms into systems is a project which requires much planning, study, and consideration. The Command PMC should be contacted before any introduction of a biological control organism into an aquatic ecosystem.

18.6.3 Cultural Control. Drawing down, or raising the water level of ponds or lakes changes the habitat available for different types of aquatic plants. For example, draw-downs expose and kill submersed plants. Flooding may reduce stands of emergent vegetation.

18.6.4 Chemical Control of Aquatic Weeds. A number of herbicides are registered for use in aquatic environments. Herbicides used to control algae are called algicides. Aquatic formulations are either liquid or granular.

18.6.4.1 Treatment Zones. Four (4) zones of a body of water may be treated.

- **Surface Treatment**. Generally, only 1/4 to 1/3 of the surface area of the body of water should be treated at one time. This helps protect fish from a possible oxygen shortage caused by the decay of dead plant material.
- **Total Water Volume Treatment**. This is when the whole body of water, from the surface to the bottom is treated. The concentration of herbicide required to kill aquatic plants is generally very small, and is usually stated in parts per million (ppm). Therefore, equipment calibration and the application of aquatic weed herbicides must be done carefully. Consult the label directions for application rates.
- **Bottom Layer Treatment**. Treating the deepest 1 to 3 feet of water is especially useful in deep lakes where it is impractical to treat the entire volume of water. Such treatments are made by attaching rigid booms to hoses reaching to the desired depth. The booms may require weight to keep them at the desired depth while being towed by a boat.
- **Bottom Soil Treatment**. Herbicide applications may be made to the bottom soil of a drained pond, lake, or channel.

18.6.4.2 Control of Floating and Emersed Weeds. Liquid formulations are most preferred for floating or emersed weeds. These weeds are killed by direct foliar applications made by:

- aircraft
- ground equipment operated from the bank
- boat using various booms or spray guns

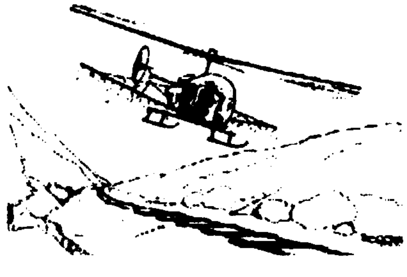
18.6.4.3 Control of Submersed Weeds or Algae. Granular or liquid applications of herbicide may be used.

- **Liquid Formulations.** These are most often applied as water surface treatments. The herbicide is dispersed throughout the water by diffusion, currents, and wave action. Control depends on good dispersion. Some liquid formulations may be applied by aircraft at low volumes of 5 - 10 gallons per acre.
- **Granular Formulations.** These are applied to the surface of the water then settle to the bottom acting as a bottom soil treatment. The herbicide should be broadcast evenly over the surface. Applications may be made by boat or aircraft.
- **Coloring Agents (Dyes).** These products reduce the penetration of light into the water, thus affecting the depth at which algae and submersed plants can grow. They are most commonly used in artificial bodies such as fountains and reflecting pools with no outlets and limited inflow of water.

18.6.4.4 QAE Responsibility. Aquatic application of any pesticide requires 100 % inspection. The Command PMC should be consulted before any aquatic applications are made.

18.7 CONTROL EQUIPMENT. Herbicide application equipment is of two general types:

- Airborne Equipment. This is carried by either fixed winged aircraft or by helicopter.
- Ground Equipment. This also includes floating equipment. When treating large areas, conventional boom type applicators may be used. However, in hard to reach areas or wherever obstacles are encountered, hand guns and long hoses or special equipment may be required. Equipment should be adequate to provide thorough coverage at the lowest possible pressures. Nozzles should be angled toward the ground and slightly forward in the direction of travel. The nozzles should also have the largest orifice possible for the rate and pressure required.



AERIAL
APPLICATION

18.8 CONTROL HAZARDS. The principal concern with the use of herbicides is containment within the target area. The operator should know what the target is, and be able to identify it. He should be able to get the material on the target at the right time, and in the right amount. Drift may occur when small spray particles are carried away by air currents. Drift is the most common type of chemical control hazard.

Drift can also occur when a herbicide vaporizes after application and is carried by air currents. Vapor drift seldom occurs, but when it does, it can travel further than particle drift with more disastrous results. Selection of the right herbicide is extremely critical in preventing vapor drift.

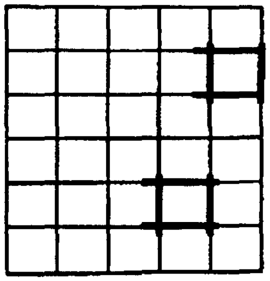
In addition to drift, there are off-target applications made by careless or unknowing operators. Misuse should be avoided at all times. If the PCQAE notes drift or the potential for environmental contamination, the operation should be stopped immediately.

18.9 SAMPLING TECHNIQUES.

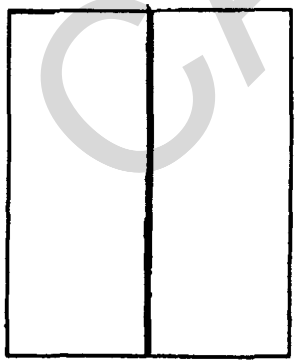
Sampling techniques for monitoring the effectiveness of weed control include inspecting:

- measured plots
- transects
- percent cover

Inspecting a measured plot (length x width) is an effective method for determining effectiveness. The inspector can determine the number of weeds in the area or estimate the percent of weed cover. The plot could be as small as a square yard for inspecting broadleaf weed control in turf or as large as an acre in a lake when inspecting for aquatic weeds.



SAMPLE BLOCKS



TRANSECT

Transects are lines across a given area. For example, the inspector follows an established path across a field, counting the number of weeds in a one (1) foot side swath. Since this imaginary field was 100' x 100', (thus a 10,000 sq. ft. area) and the inspector's path was 1' x 100' (a 100 sq. ft. area) the number of weeds in the entire field can be estimated. A transect may be a successful measuring technique when inspecting a utility line right-of-way, a fenceline, or the surface weeds in a pond.

Assistance in establishing PCQA plans for weed control can be obtained from the Command PMC.

18.10 RECORDS AND REPORTING.

One NAVFAC Form 6250/3 should be used for each outdoor pest management operation performed at each site or location. If more than one pest, operation, or control agent are involved in a specific pest management operation, then a separate form should be completed for each. If the control agent has more than one active ingredient, one form for each should be filled out. After a record is completed, the bottom (yellow) copy should be retained at the installation as a daily legal record of pesticide usage, and as a maintenance record. The back of the yellow copy may be used to record additional details about the operation.

When large or valuable trees or shrubs are included in an operation, their location and numbers should be included. Copies of inspections, survey reports, site maps and charts, etc. should be permanently attached to the yellow copy.

At the end of the month all of the top (green) copies are assembled and submitted to the Command PMC. The PCQAE should review records on a regular basis to ensure that records are completed and submitted in accordance with contract specifications.

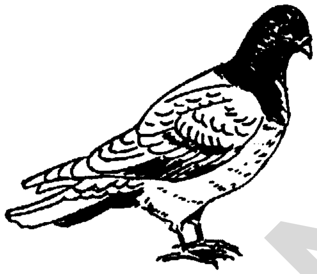
The PCQAE shall complete a separate report for each PCQAE inspection performed, including the time required for the inspection. At the end of the month the PCQAE should assemble and submit all green copies to the Command PMC.

CHAPTER 19. MISCELLANEOUS VERTEBRATE PEST CONTROL

Section C.11 of FAR - PWS. A number of animals normally associated with fields and woods can occasionally become pests. Many of them are beneficial but become pests when they invade or destroy military property, or interfere with operations. Many of these animals are protected species. Control of vertebrate pests is normally included as Indefinite Quantity Items. Many states and even cities have unique certification and/or licensing requirements for vertebrate pest control. In addition, State or Federal permits may be necessary for controlling birds and mammals. The Command PMC should be consulted when determining certification and licensing requirements for vertebrate pest control.

19.1 PEST IDENTIFICATION. Most of the miscellaneous vertebrate pests are birds, mammals or reptiles. Because of the wide variety of animals encountered and the nature of damage they do, it is very important that correct identification of the animal be made before any action is taken. "Prevention and Control of Wildlife Damage" published by the Nebraska Cooperative Extension Service for the Great Plains Agricultural Council provides excellent information for the identification of miscellaneous vertebrate pests.

19.1.1 **<u>Birds.</u>** Figure 19-1 provides a pictorial key for identification of most pest birds. Birds are considered pests when they:



PIGEON

- deface and destroy structures
- interfere with air operations
- damage plants and other property
- cause disturbances with their noise and droppings
- contaminate food supplies
- carry diseases and ectoparasites

Only pigeons, English sparrows, and European starlings may be controlled <u>without</u> a federal permit. Some states and/or cities have special regulations for controlling these species or using certain control methods.

TREE SQUIRREL

19.1.2 **<u>Mammals.</u>** The most common mammal pests are rodents. Figure 19-2 provides a pictorial key for identification of some common rodents. Rats and mice are covered in Chapter 16. Other rodents which can become pests are woodchucks (groundhogs), gophers, squirrels, and chipmunks. Comprehensive information about the identification, habitats, general biology and damage

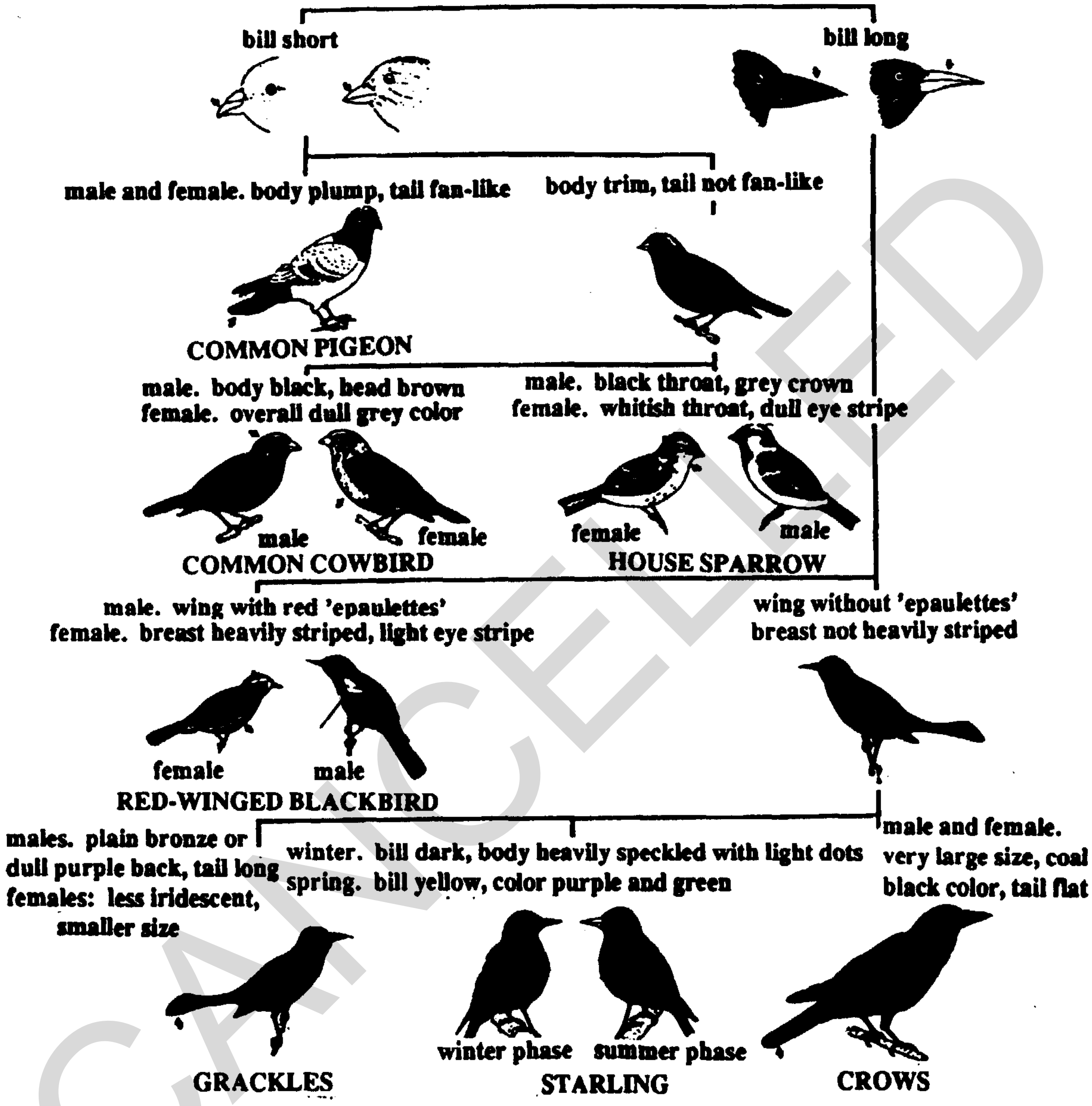


Figure 19-1
BIRDS
Pictorial Key to Some Common Pest Species
of Public Health Importance

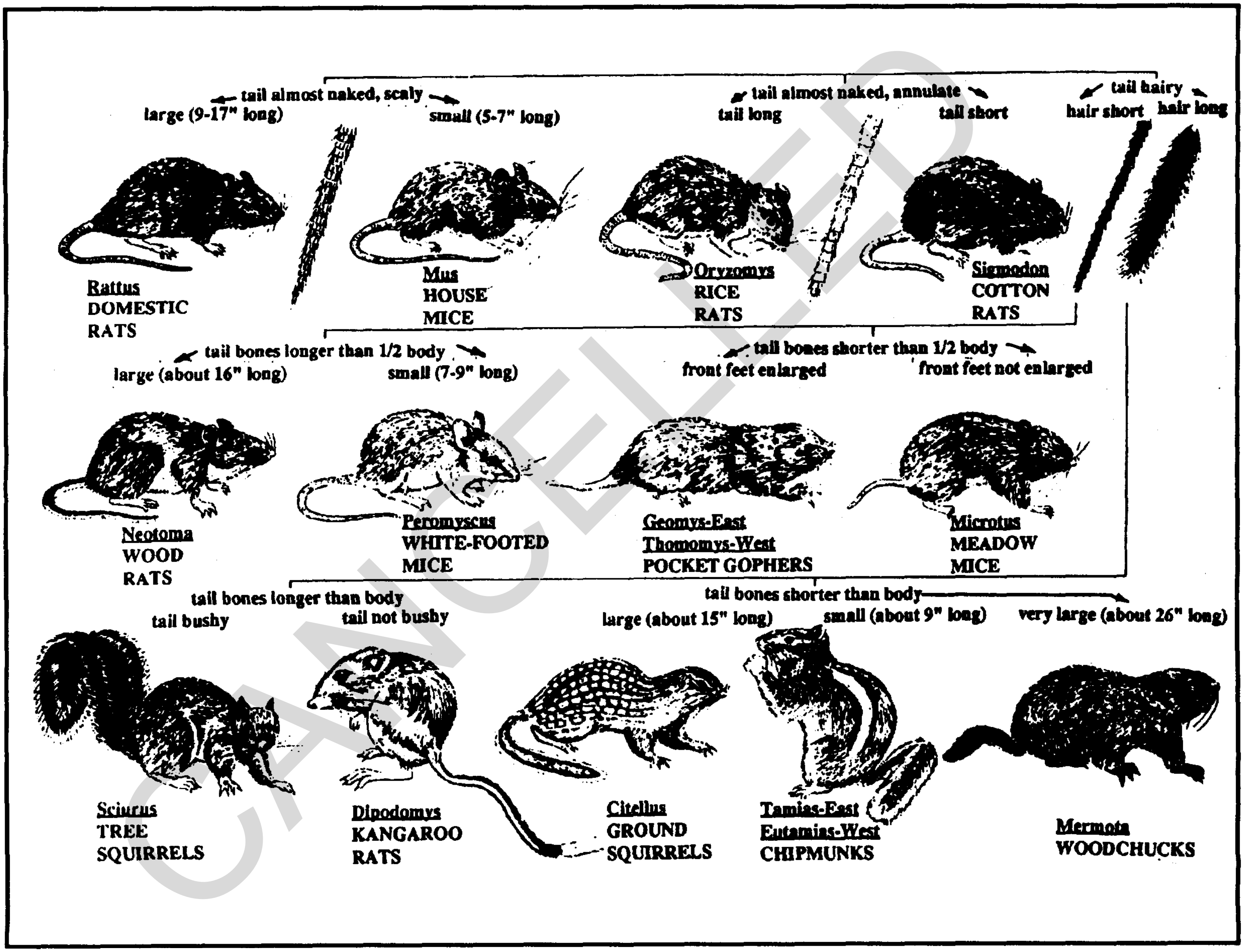
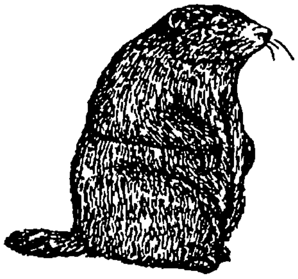


Figure 19-2
RODENTS
Pictorial Key to Some Common United States Genera

control of vertebrate pests is available from the Cooperative Extension Service publications on Identification and Control of Wildlife Damage



GROUND HOG
(WOODCHUCK)

Many other mammals may become pests   Prairie dogs (Figure 19-3) can excavate an extensive tunnel network causing unwanted terrain changes   They may also serve as a reservoir for plague carrying fleas   Rabbits and hares (Pictorial key Figure 19-4) may damage ornamental plants or vegetable plantings in their quest for food

RACCOON

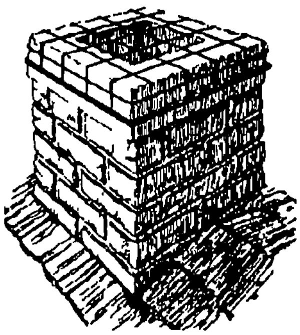
Pest problems involving larger mammals such as raccoons, skunks, and deer are increasing in frequency as people move into their natural habitat   Cooperative Extension Bulletins provide more detailed information about these mammalian pests

States may require permits to control all or certain species of mammals

19 1.3 <u>Reptiles</u>   The most common reptile pests are the snakes   Snakes may gain entry to structures, as they search for food, and frighten occupants   Most snakes are not poisonous but can bite when disturbed

19.2 CONTROL METHODS   Control decisions should not be made independently   Proper identification of the species is essential   Since many species are protected under federal, state or local regulations, it may be prudent for the PCQAE to contact the Command PMC to discuss the control actions proposed/performed by the contractor   The U S Fish and Wildlife Service and applicable State fish and game agencies may require that permits or licenses be obtained

19 2 1 **Mechanical Control**   Exclusion is the best method of controlling vertebrate pests   This requires closing all entry points   It may be necessary to observe the animal's activity to identify behavioral patterns   Trapping and netting will frequently take care of an occasional invading animal pest   Sometimes scare devices may be useful in repelling them   Fencing can be very effective in excluding some vertebrate pests



CHIMNEY
SCREEN

Pest proofing may not be included in pest control contracts   Repairs may need to be coordinated with activity

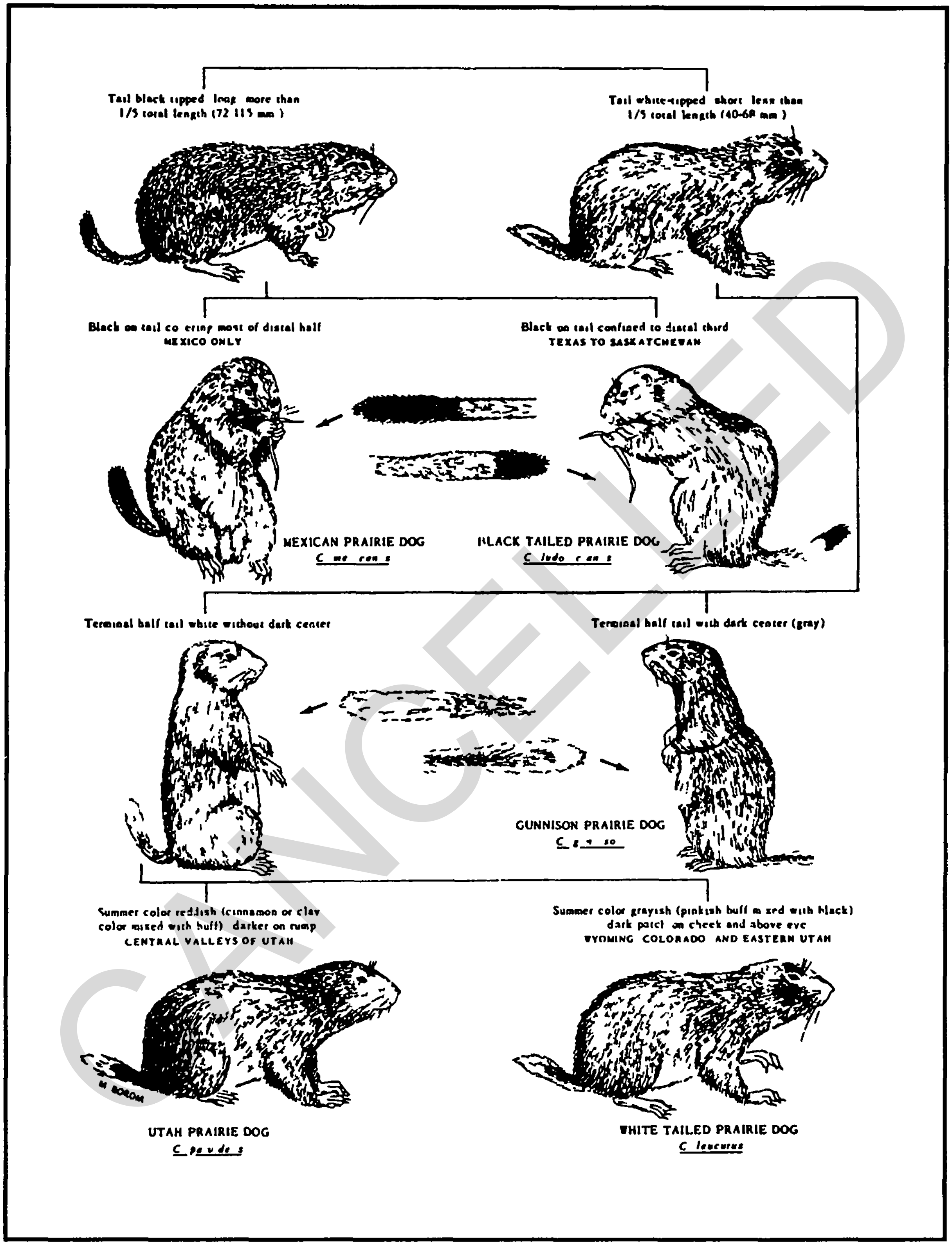


Figure 19-3
PRAIRIE DOGS
Pictorial Key to Common North American Species

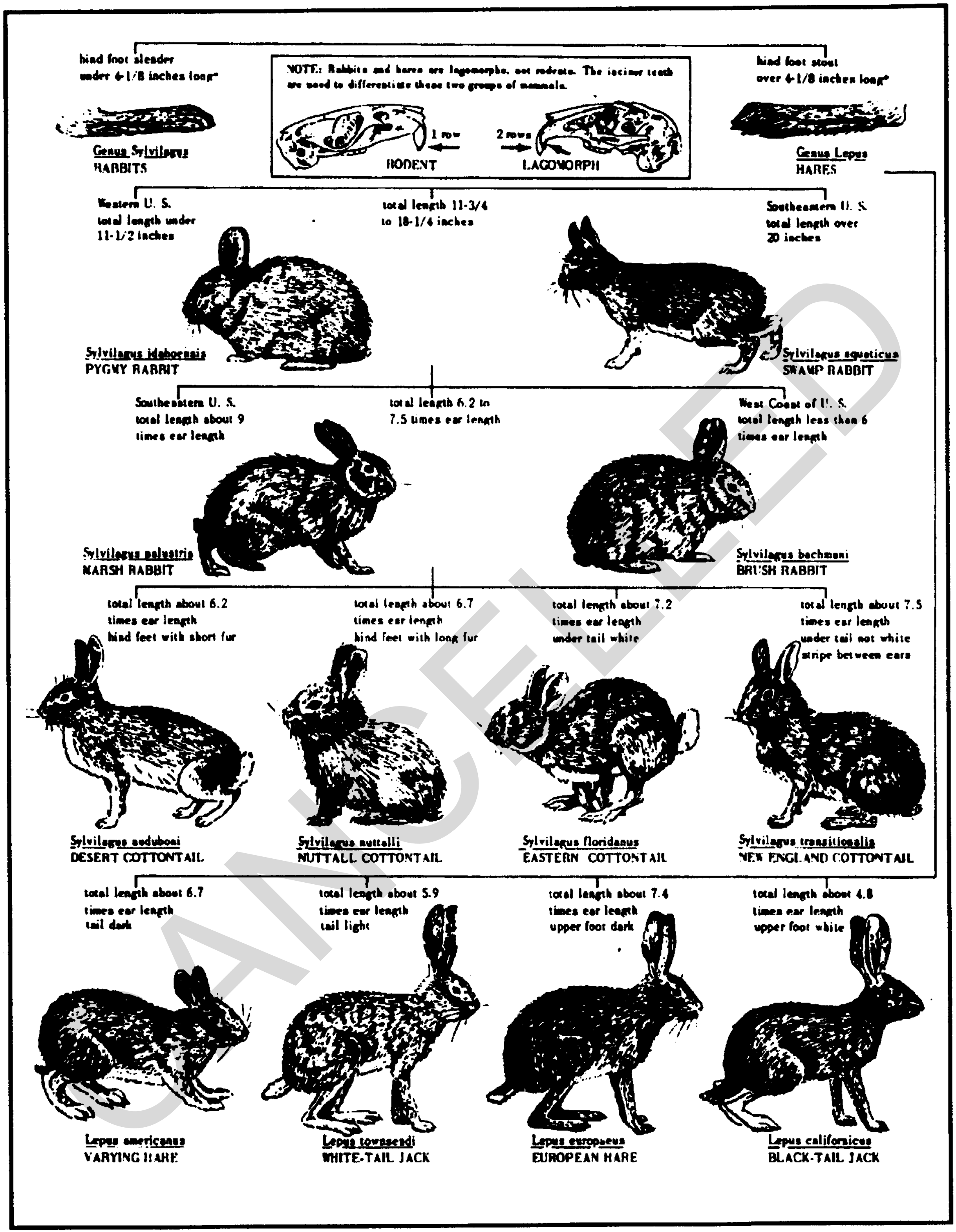
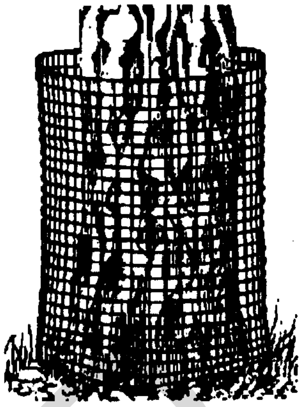


Figure 19-4
RABBITS AND HARES
Pictorial Key to Common United States Species

public works maintenance personnel or maintenance contractors.

19.2.2 Cultural Control. Frequently a pest problem can be eliminated by altering the habitat of an organism. This may involve short-term vegetation control, changing waste disposal practices, and relocating specific sites attractive to the pests. Hunting can be used to manage certain wildlife populations. Hunting programs should be developed through consultation with the EFD Natural Resources Section.



TREE SCREEN

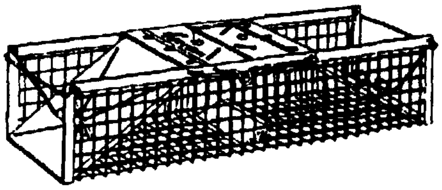
19.2.3 Chemical Control. There are very few registered vertebrate toxicants. Secondary poisoning and poisoning of non-target organisms are serious environmental considerations when using vertebrate toxicants. The PCQAE must ensure that label directions are followed, and that only certified personnel apply restricted use pesticides. Pesticides may be used as:

- poison baits
- repellents/feeding inhibitors
- burrow fumigants
- contact toxicants

PEST RESISTANT TRASH CAN

19.3 CONTROL EQUIPMENT. Equipment involved in control of vertebrate pests includes:

- traps
- nets
- fencing
- scare devices
- bait stations



LIVE TRAP

19.4 CONTROL HAZARDS. The main concern in control programs of vertebrate pests is the effect on non-target animals. Some considerations are:

- bait selection
- good baiting practices
- bait placement
- choice of toxicant

CHAPTER 20. PEST CONTROL QUALITY ASSURANCE PLAN DEVELOPMENT

Quality Assurance for contracted pest control services is different than quality assurance for other types of service contracts because of:

- the hazardous nature of the products used in pest control, and
- the potential of living organisms to avoid control efforts, or successfully reproduce despite control efforts

The basis of contractor performance is measured by the cessation of damage or reductions in the number of pests counted after the contractor has performed the work. Since pests are generally secretive, the PCQAE must know where to look and what to look for. Otherwise all contracted pest control jobs will look good.

20.1 BACKGROUND. The PCQAE contributes experience in the administration of the service contract. The PCQAE:

- provides guidance to the specification writer to ensure contract requirements are described in a manner which enables the Government to objectively assess contractor performance
- performs the actual surveillance of the contractor's work, and
- provides reports and recommendations to the Facilities Support Contract Manager (FSCM) which affects evaluation and payment to the contractor.

The scope of the PCQAE's authority is provided by a letter of appointment from the head of the contracting office. Specific responsibilities and limits of authority are in the Contracting Manual P-68 at Appendix E.

20.2 THE QUALITY ASSURANCE APPROACH. The QA approach adopted by NAVFACENGCOM is keyed to the performance oriented specification.

- it focuses on the quality of the product delivered by the contractor and <u>not</u> on the steps or procedures used to provide that product
- the PCQA approach includes appropriate inspection methods for that type of contract
- provides a reporting system which the PCQAE can use to objectively monitor contractor performance

20.3 THE QUALITY ASSURANCE PLAN. The Quality Assurance Plan (QAP) is used to monitor and evaluate facility support contractors. A QAP generally consists of:

- **Performance Requirement Summaries** which outline work to be done and define acceptable results. The performance requirement summary is not necessarily part of the QAP.

- **Surveillance Guides** which outline the contract requirements the contractor has to do along with inspection criteria
- **Evaluation Worksheets** which are filled out by the PCQAE to rate contractor's performance

A formal Performance Evaluation is used to summarize contractor performance for a designated period of time.

20.3.1 The Performance Requirement Summary (PRS). The performance requirement summary (which is part of the performance work statement) outlines what work is to be done, and defines acceptable results. It is found in Section "J" of the contract. Figure 20-1 is a sample performance requirement summary.

20.3.2 The Surveillance Guide. The surveillance guide is a working document. It provides a structured approach to inspecting, rating, and documenting contractor performance. It is developed using the information from the expanded PRS and contains:

- **contract requirements**
    - standards of performance
    - work requirements
- **Maximum Allowable Defect Rate (MADR)**
- **methods of surveillance/inspection** and the processes involved with that surveillance/inspection method(s)
- **amount and type of surveillance/inspections** to be performed (if appropriate)
- **overall quantity of work to be done** by the contractor in a given time frame
- **evaluation procedure**
- **analysis of results**
- **PCQAE's recommendations** to the FSCM

20.3.2.1 Inspection Methods. There are five widely accepted inspection methods in use by the Navy for Facility Support Contracts (FSC).

(1) Planned Sampling

(2) 100% Inspection

(3) Validated Customer Complaints

Contract Requirement: PREVENTION AND CONTROL OF ARTHROPOD PESTS IN FOOD HANDLING BUILDINGS

Line Items: 0001AA, 0001AB, 0001AC, 000AD, 000AE, 000AF

	WORK REQUIREMENT	% of CONTRACT	STANDARD OF PERFORMANCE	
A.	Adhere to schedule	10%	Service as scheduled (Para. C.6.4)	5%
B.	Eliminate pest	50%	In accordance with Para. C.6	5%
C. **	Compliance with legal requirements and specifications.	25%	Compliance with all state and federal laws and regulations, the pesticide label, certification requirements and the specifications. (Para. C.6)	0%
D. **	Records and Reporting	15%	Reports completed and submitted within 24 hours after spray work. (Para. C.6)	0%

** Unsatisfactory performance of this work item will result in an unsatisfactory rating for the entire contract requirement.

Example 1 illustrates:

- the percentage of acceptable defects for "timeliness and pest elimination" are 5% each, and
- there is no tolerance for any defects for legal compliance and record keeping. Failure in this area affects the entire contract performance rating.

Figure 20-1
Sample Performance Requirement Summary Table

(4) Random Sampling for Extrapolated Deductions (RSED) or without Extrapolated Deductions (RSWED)

(5) Incidental Inspection

A detailed description of each inspection method, and criteria for selecting that inspection method can be found in Attachment 20-A1. Generally, planned sampling and 100% inspection are used as primary methods in pest control because the sample sizes are too small for Random Sampling. Generally, validated customer complaints are used as the secondary method of surveillance/inspection.

20.4 WRITING THE SURVEILLANCE GUIDE. The writer of the surveillance guides (and the entire QA Plan) must be familiar with the various sources of information used to construct the surveillance guide. Figure 20-2 is a sample surveillance guide.

20.4.1 Pest Control Contract Requirements. The contract requirements are stated on the Performance Requirement Summary table (PRS). The contract requires specific services to be provided. Figure 20-2 gives an example of the contract requirement for "Household pest control in Lauret Village. Scheduled surveys with appropriate control measures as needed".

20.4.2 Surveillance/Inspection Methods. For this type of pest control contract, planned sampling supported by validated customer complaints and incidental inspections would be appropriate (See Attachment 20-A1 for more information on Surveillance/Inspection methods).

20.4.3 Maximum Allowable Defect Rate (MADR). The MADRs are available from the PRS. If you were the one assigning a MADR, you might consider:

- how much will each defect interfere with the activity's mission?
- how many defects will the customer tolerate compared to the quantity of work?
- does the service involve safety, health, environment or other regulatory requirements?
- is the MADR reasonable/achievable (legally, functionally)?

Generally, MADRs are assigned by experienced personnel.

20.4.4 Identification of the Population. The population (or quantity of work) is defined as the total number of occurrences of an individual task or service carried out during a given period of time. The task or product will be clearly defined in the performance requirement summary.

CONTRACT REQUIREMENT: (from PRS) Household pest control in Lauret Village. Scheduled surveys with appropriate control measures as needed.

INSPECTION METHOD: Planned sampling supported by validated customer complaints and incidental inspections.

MADR per Month (from PRS)	%	Real No.
A. Adhere to schedule:	5%	3.6 lates/no-shows/month
B. Control pests:	5%	5 roaches/location
C. Legal compliance:	0%	0
D. Reporting:	0%	0

POPULATION SIZE: 72 single family units to be surveyed once a month and treated as required.

LEVEL OF SURVEILLANCE: (planned sampling)	Level I:	10% of scheduled service locations (7.2 units)
	Level II:	25% of scheduled service locations (18 units)
	Level III:	50% of scheduled service locations (36 units)

SAMPLE SELECTION PROCEDURE: Start at level II. Select 18 units of greatest importance (example: units with histories of trash problems, units with high ranking officer's families, etc.)

EVALUATION PROCEDURES:

TIMELINESS: (Primary) Check entry log at front gate. (Secondary), spot check contractor.

CONTROL PESTS: (Primary) Use pyrethrum aerosol injected into suspected cockroach harborage sites with emphasis on food preparation and service areas. (Secondary) Place cockroach sticky traps in suspected harborage areas. Pick up and perform count 24 hours after. Trap locations are located on floor plan.

LEGAL COMPLIANCE AND REPORTING: (Primary) Check contractor to see that vehicle is locked when contractor is not present. Check all incoming report forms. (Secondary) Observe contractor when pesticides are used. Check label and observe application.

ANALYSIS OF RESULTS: Defect rate = $\frac{\text{No. of defects}}{\text{Total population}}$

PERFORMANCE CRITERIA AND CONCLUSIONS:

If DR $>$ MADR, increase surveillance level
If DR $\leq$ MADR, cross check with secondary methods
If DR $\leq$ MADR for 3 months, decrease surveillance level
If DR $>$ MADR for 3 months, action indicated

Figure 20-2
Sample Surveillance Guide

The time period used should coincide with the interval for payments specified in the contract, usually one month.

If the number of occurrences is not fixed per time period, describe the process the PCQAE will use to calculate the population for the period. Examples of such occurrences might be Indefinite Quantity (IQ) work, emergency service calls, etc.

20.4.5 Level of Surveillance. Level of surveillance is the frequency that the contractor's work is checked. The use of two levels of surveillance is standard operating procedure. A third level may be incorporated for planned sampling surveillance.

- **level I.** Inspect less often than "normal" because the contractor is doing a fine job (called minimum level for RSED)
- **level II.** The "normal" level of inspection. Generally this is the level to start at.

20.4.6 Surveillance/Evaluation Procedures. Using Figure 20-2 as an example, the work requirement calls for:

- **Adherance to Schedule**: This can be performed by noting which days the contractor is scheduled to be on base, and checking on it.
- **Control of Pests**: Survey after the contractor has been there. Standard survey methods have been described in the Chapters of this manual.
- **Legal Compliance:** The contractor has submitted pesticide labels prior to the start of work. Is the contractor using that particular pesticide? Is the contractor applying the pesticide according to label directions? Are the contractor personnel certified in the proper State/EPA categories?
- **Reporting:** Is the contractor turning in the 6250/2/3 properly filled out, complete and on-time?

The level of detail must be adequate to allow others to continue the same method of inspection using that same criteria.

Detail and continuity are also essential to justify UNSAT ratings and deductions that will withstand challenges from the contractor. There is no "standard" Evaluation Worksheet or evaluation procedure. Figure 20-3 is a sample evaluation worksheet.

20.4.6.1 The Defect. The defect is "non-conformance with contract requirements." It describes failure of a given work occurrence to meet specified standards. In a well-written specification (PWS), the contract requirements will be clear.

For example, the contractor fails to show up in the proper time period. This is a "defect" and thus rates an unsatisfactory (UNSAT) on the evaluation worksheet. If the sticky trap survey shows that too many roaches are still present after survey or control

Evaluation of Administrative Requirements

QUALITY ASSURANCE PLAN #_

EVALUATION WORKSHEET
for Administrative Requirements

PEST CONTROL SERVICE

Page: ___

Date:				
Rating	S / U	S / U	S / U	S / U
Employee I.D.				
Contractor Vehicles				
Applicator Equipment				
Superintendent Certification				
Work Schedules				

REMARKS:

QAE:

Date:

Contractor:

Date:

Figure 20-3
Sample Evaluation Worksheet

procedures, then this also is a "defect" and rates an UNSAT on the evaluation worksheet.

For the purposes of this exercise, we will assume that there are only SATS (satisfactories) or UNSATS.

20.4.6.2 The Defect Rate. The defect rate is a numerical value. In **Planned Sampling**, it is computed as:

$$\text{Observed Defect Rate (\%)} = 100 \text{ X } \frac{\text{Total Number of Observed Defects}}{\text{Total Population}}$$

or

$$\text{Observed Defect Rate} = \frac{\text{Total Number of Observed Defects}}{\text{Total Population}}$$

For example, (using Figure 20-2), at Level II (25%) inspection for the period of one month, 18 units would be inspected [72 units X 0.25 (level II inspection frequency)]. If 4 units were recorded as being UNSAT (ie: the number of roaches observed were in excess of the stated MADR), then the defect rate would be:

$$\frac{\text{4 UNSATS recorded}}{\text{72 Units in the population}}$$

$$\text{Observed Defect Rate (\%)(ODR)} = 100 \text{ X } \frac{4}{72} = 5.5\%$$

Note that 5.5% ODR exceeds the MADR (5%) as stated in the sample surveillance guide (Figure 20-2).

Note that the number of observed defects recorded are all that can be used. Random Sampling (RSED) techniques would be required to extrapolate the total number of defects for the population. 100% surveillance would be needed to develop a true defect rate.

Figure 20-4 shows the relation of defect rates to different types of sampling procedures.

DIFFERENT DEFECT RATES IN RELATION TO SURVEILLANCE TECHNIQUES

(1) PLANNED SAMPLING (A PRIMARY METHOD):

$$\text{DEFECT RATE (\%)} = \frac{\text{NO. OF OBSERVED DEFECTS}}{\text{TOTAL POPULATION}} \times 100$$

This means that only the defects that you actually count can be used in calculation of the defect rate.

(2) VALIDATED CUSTOMER COMPLAINTS (A SECONDARY METHOD):

$$\text{DEFECT RATE} = \underline{\text{NO. OF VALIDATED DEFECTS}}$$

Only reported and validated defects can be used to calculate the defect rate.

(3) INCIDENTAL INSPECTION (A SECONDARY METHOD):

Generally, calculating the defect rate is not performed from incidental inspections because of inconsistency of sampling and the great chance for bias.

(4) ONE HUNDRED PERCENT (100%) INSPECTION (A PRIMARY METHOD):

$$\text{DEFECT RATE (\%)} = \frac{\text{ACTUAL NO. OF DEFECTS}}{\text{TOTAL POPULATION}} \times 100$$

This is the only method where the true defect rate can be calculated. 100% inspection is absolute accuracy of contractor performance. It is also very time consuming.

(5) RANDOM SAMPLING (A PRIMARY METHOD):

(A) $$\text{OBSERVED DEFECT RATE (\%)} = \frac{\text{NO. OBSERVED DEFECTS}}{\text{SAMPLE SIZE}} \times 100$$

(B) DEFECT RATE = OBSERVED DEFECT RATE - ADJUSTMENT FACTOR

Random Sampling procedure extrapolates the defect rate for the entire population without observing the entire population. To use it, a large population and strict procedures are needed. Generally this does not apply in pest control.

Figure 20-4
Defect Rates in Relation to Surveillance Techniques

20.4.7 **Performance Criteria.** The development of the MADR for a given contract requirement is a baseline for future actions. If the defect rate is the same as, higher than, or lower than the MADR, a specific course of action should be taken. Figure 20-5 are some sample performance criteria relating defect rates to MADRs.

For example: Using the example previously developed, the cockroach survey yielded 4 UNSATS in 72 units. This resulted in an observed defect rate (ODR) from planned sampling of 5.5%. The MADR for this specific contract requirement is 5.0% (from the PWS).

Using Figure 20-5 as our performance criteria, the above example fits into selection B or C (the defect rate is equal to, or higher than the MADR). Depending on confirmation by secondary surveillance methods, a contract discrepency report may be indicated. Regardless, Level II surveillance should be continued.

20.5 CONTRACT PERFORMANCE EVALUATIONS.

20.5.1 **Monthly Reports.** Monthly reports are mandatory. Generally this is an informal rating which is submitted to the contracting officer. These informal ratings will prepare the contracting officer for the formal performance evaluation.

20.5.2 **Contract Discrepancy Reports (CDR).** Contract discrepancy reports inform both the contractor and the contracting officer that contractor performance has been unsatisfactory. It is not mandatory to recommend a CDR for every defect observed. The CDR could be the result of a safety violation, failure to respond within the designated period, or just inadequate control over a period of time. The contract discrepancy report should be filled out as soon as the decision has been made. CDR's should not be "saved up" and delivered to all parties at the end of the contract. Figure 20-6 is a sample discrepancy report.

20.5.3 **Overall Contract Performance Evaluation.** At the end of the term (payment period), a final contract performance evaluation is submitted to the contracting officer. This final report is the basis for monetary deductions for unsatisfactory or unperformed work.

20.5.4 **Recommendations for Deductions.** Deductions can be recommended at any time. These should be included with the discrepency reports.

SAMPLE PERFORMANCE CRITERIA AND CONCLUSIONS

A. If the Observed Defect Rate (ODR) is less than the MADR, then contractor performance may be satisfactory. Compare this evaluation to validated customer complaints and incidental inspections. If all results show that the ODR is less than the MADR, then contractor performance is satisfactory.

- If contractor performance is satisfactory for 3 months in a row, then decrease the surveillance level.
- If there is a conflict between the primary surveillance method and the secondary surveillance method(s), maintain the current surveillance level.

B. If the ODR is greater than or equal to the MADR, but not confirmed by validated customer complaints and/or incidental inspections, then contractor performance may be unsatisfactory. Continue level II or go to Level III surveillance as appropriate.

C. If the ODR is greater than or equal to the MADR, and is confirmed by validated customer complaints and/or incidental inspections, contractor performance is unsatisfactory.

- If the ODR is equal to or more than two times (2X) the MADR, a contract discrepancy report is indicated
- If the ODR is more than the MADR and is supported by customer complaints and/or incidental inspection for 2 consecutive months, a contract discrepancy report is indicated.

Figure 20-5
Sample Performance Criteria and Conclusions

CONTRACT DISCREPANCY REPORT

1. CONTRACT NUMBER:

2. TO: (Contractor & Manager's Name) 3. FROM: (Name of FSCM)

4. DISCREPANCY OR PROBLEM: (Describe in detail: Include reference to PWS: Attach continuation sheet if necessary.)

5. SIGNATURE: (FSCM) 6. DATE:

7. TO: (Contracting Officer) FROM: (Contractor)

8. CONTRACTOR RESPONSE: (Contractor's proposed solution to correct future occurrences of the problem, use continuation sheet if necessary)

9. SIGNATURE: (Contractor's Rep.) Date:

10. GOVERNMENT EVALUATION: (Is the Contractor's response a viable solution to the problem?)

11. GOVERNMENT ACTIONS: (Does the Government accept, propose modification, or reject the Contractor's response?)

12. CLOSE OUT:

QAE Signature: Date:
FSCM Signature: Date:
OIC Signature: Date:

[NAVFAC Form #4330/48 (9/89), Re: MO-327, Appendix H-6]

Figure 20-6
Sample Contract Discrepancy Report

20.6 WRITING THE PEST CONTROL QUALITY ASSURANCE PLAN. The PCQA plan is the sum of:

- Performance Requirement Summary Table
- Surveillance Guide
- Evaluation Work Sheets
- Performance Evaluation Procedures/Reports

The following is an abbreviated example of a Pest Control Quality Assurance Plan.

20.6.1 Sample Performance Requirement Summary Table.

PERFORMANCE REQUIREMENTS SUMMARY TABLE

Work Requirement	Standard of Performance	% Contract Requirement	MADR
1. CONTRACT REQUIREMENT 0001AA: NUISANCE PEST CONTROL SERVICES (SCHEDULED) Para. C.7.a.			
a. Scheduled services	Service as scheduled.	10%	10%
*b. Control obtained	In accordance with Section C.7.a.(4)	75%	5%
*c. Proper treatment	In accordance with Section C.7.a.(1) and label directions.	15%	ZERO
2. CONTRACT REQUIREMENT: 0001AB RODENT CONTROL (SCHEDULED) Para. C.9.a			
a. Scheduled services	Service as scheduled.	10%	10%
*b. Control obtained	In accordance with Section C.9.a.(2)	75%	5%
*c. Proper treatment	In accordance with Section C.9.a.(1) and label directions.	15%	ZERO

*Unsatisfactory performance of this work item will result in an unsatisfactory rating for the entire contract requirement.

	Work Requirement	Standard of Performance	% Contract Requirement	MADR
5. CONTRACT REQUIREMENT: 0001AE RECORDS AND REPORTS (SCHEDULED) Para. C.14				
*a.	Daily records within 24 hrs.	NAVFAC 6250/2 or 6250/3 completed	75%	ZERO
b.	Monthly with invoice	Reports submitted Monthly	20%	ZERO
c.	Errors corrected	In accordance with Section C.14	5%	ZERO

*Unsatisfactory performance of this work item will result in an unsatisfactory rating for the entire contract requirement.

20.6.2 Sample Surveillance Guide.

QUALITY ASSURANCE PLAN NO._1_

Contract Number: N62472-88-D-4078
Contract Title: Pest Control Services
Location: Earle Naval Weapons Station
Colts Neck, NJ

1. Contract Requirements: Prevention and Control of Arthropod Pests and Rodents in Food Handling Buildings

Work Requirements / % of Contract Requirement

a. Adhere to Schedule (C.6.4 & C.7.4) / 10%
b. Eliminate Pests (C.6.1 & C.7.1) / 75%
c. Evaluation of Procedures (C.27) / 15%

2. **Method of Surveillance:** Primary method will be Planned Sampling supported by Validated Customer Complaints and Incidental Inspections

3. **MADR:** a. 3% b. 3% c. 0%

4. **Quantity of Work:** 12 bldgs. (6 bldgs. inspected twice/month)

5. **Level of Sampling:**

MINIMUM LEVEL: Used at the start of the contract. If the contractor's performance is UNSAT, go to NORMAL level during the next month's surveillance period

NORMAL LEVEL: If contractor's performance is SAT for 2 consecutive month's, return to the MINIMUM level

6. **Sample Size:**

MINIMUM LEVEL - 3 Bldgs.
NORMAL LEVEL - 6 Bldgs.

7. **Sampling Procedures:** Based on the sampling level in use, the PCQAE will select the appropriate quantity of buildings or formulation of ingredients to inspect. This subjective selection should take into consideration the relative importance of the buildings, the possibility for poor contractor's performance and health/safety aspect of proper formulation.

8. **Evaluation Procedure:** Prior to the contractor's application of pesticides, the PCQAE will pick certain mixing times to observe if the formulation of ingredients are in accordance with the specifications and applicable regulations. PCQAE will inspect selected buildings during and after contractor has completed the work, according to schedule, for pest elimination, adherence to schedule, and satisfying procedures. The procedural evaluation will consist of verifying compliance with instructions on labels and submittal of properly completed documentation. A rating of SAT (Satisfactory) will be made if items 1.b and 1.c are found in compliance with the contract, if not then an UNSAT (Unsatisfactory) rating will be given. Rating will be made on the Evaluation Worksheet for this QA Plan.

9. Analysis of Results: At the end of each month, the PCQAE will calculate the DR (Defect Rate) for each work requirement. When using Planned Sampling, this is equal to the ODR (Observed Defect Rate) which is calculated by dividing the quantity of work into the number of Unsat ratings.

$$DR = ODR = \frac{\text{No. Unsat}}{\text{Population}} \quad X\ 100$$

If the ODR is equal to or less than the MADR, then the Contractor's Q.C. for that Work Requirement is considered SAT. If the ODR is greater than the MADR, then the Contractor's Q.C. for that Work Requirement is to be considered UNSAT.

10. **Recommended Action**: The PCQAE will complete and submit to the FSCM the Monthly Summary (attached to this Q.A. Guide). The PCQAE should recommend to the FSCM that deductions be taken for all observed defects. The contractor should be notified of the SAT ratings and encouraged to keep up the good work. However, if the ODR exceeds the MADR, the PCQAE should recommend issuance of a Contract Discrepancy Report (CDR). If the contractor's poor performance warrants, a CDR may be issued, with the Contracting Officer's concurrence, at any time.

11. **Deduction Calculations**: Section B contains the monthly cost per bldg. (This would be the "Price for Specified Services" when using menu item #3 on the computer disk, RSED V3.01). Since there are two treatments each month, multiply this monthly cost/bldg. by 0.5 to get the cost/bldg./treatment. Next, multiply this amount by the "% of Contract Requirement" (shown in the PRS on page J-E1) to get the value for each Work Requirement. For example, if under the Schedule of Firm-Fixed Price Work, bldg. C-4 had a unit price of $2000 and an UNSAT rating for "Elimination of Pests" during a monthly inspection, the deduction would be:

$2000 X 0.5 X .75	=	$750
10% LD's	=	75
		$825

Note: LD = Liquidated damages (normally 10%)

If the contractor was permitted and satisfactorily reperformed the work, only $75 deduction will be recommended to the FSCM.

20.6.3 Sample Evaluation Worksheet.

QUALITY ASSURANCE PLAN #1

EVALUATION WORKSHEET

Contract No. N62472-88-D-4078
PEST CONTROL SERVICE
Earle Naval Weapons Station, Colts Neck, NJ

Month: Jan 1990

Date	1/10	1/17	1/25			
Bldg. No.	C-4	C-9	500			
Rating	S / U	S / U	S / U	S / U	S / U	S / U
Adhere to Schedule	S	S	S			
Elimination of Pests	S	S	U			
Evaluation of Procedures	U	S	S			

REMARKS: 5 Roaches sighted in bldg. 500. Last application was 2 weeks ago.

Form 6250/2 not submitted within 24 hour of application completion. Contractor employee not wearing station badge.

QAE: Sal Seeall

Date: 31 Jan 1989

Contractor: Big Bugstompp

Date: 31 Jan 1989

20.6.6 Sample Monthly Summary Report of All Plans.

QUALITY ASSURANCE PLAN

MONTHLY SUMMARY REPORT

Contract Number: N62472-88-D-4078
Contract Title: Pest Control Services
Location: Earle Naval Weapons Station, Colts Neck, NJ

CONTRACT REQ'T	WORK REQ'T	MADR	ODR	PERF. EVAL. (U/S)	RECOMMENDED DEDUCTIONS	ISSUE CDR
P/C Arthropod Pests & Rodents (Q.A. Plan #1)	Schedule	3%				
	Eliminate	3%				
	Procedures	0%				
Mosquito Survey & Control (Q.A. Plan #2)	Schedule	5%				
	Survey	5%				
	Eliminate	5%				
	Procedures	0%				
Stored Products Pest Control (Q.A. Plan #3)	Schedule	3%				
	Eliminate	3%				
	Procedures	0%				
Wood Infestation Inspections (Q.A. Plan #4)	Schedule	5%				
	Survey	5%				
	Report	0%				
Indef. Qty. Work (Q.A. Plan #5)	Response	5%				
	Eliminate	5%				

Procedures 0%

COMMENTS:____

____

Submitted By:____________________________ Date:______________________
(QAE)

SAMPLE DEDUCTION CALCULATIONS

Deduction Calculations on Contract 88-D-4078 for: Jan 1990

Assume the following monthly prices from page B-2:
Item No. 0001AA $500/mo.
Item No. 0001AB $800/mo.
Item No. 0001AE $300/mo.

1/10 (UNSAT for procedure defect, i.e. not submitting form on time. The "employee not wearing badge" UNSAT is not a deductable defect since the bid list did not include a unit cost for administrative functions)

$500 X 15% (from PRS) = $75

1/25 (UNSAT for pest elimination)

$300 X 75% (from PRS) = $225

	$300
10% LD (Liquidated Damages)	30
Total Recommended Deductions	$330

CHAPTER 20: EXERCISES

PEST CONTROL QUALITY ASSURANCE PLAN EXERCISES.

Since the Pest Control QAE is the "eyes and ears" of the Navy for pest control services, it is essential that the PCQAE know how to write, and interpret Plans. These exercises are provided to help the potential Pest Control QAE become familiar with typical operations that she/he will be inspecting.

CONTRACT CLAUSES. Every contract has a base paragraph which provides an overview of the services to be provided by the contractor. This paragraph will serve all of our exercises.

C.6. ESSENTIAL SERVICE COMPONENTS. Clauses C.7 through C.13 specify the specific services to be provided by the Contractor. Unless specified otherwise, all services designated as "scheduled" shall be included in the fixed-price portion of the contract, and all services designated as "unscheduled" shall be included in the indefinite quantity portion of the contract. Methods of control shall be selected from among those listed for each type of service to be rendered. Payment shall be based upon the effectiveness of control, not upon the volume of pesticide applied. The contractor shall use a variety of control methods in an effort to maximize the economy and efficiency in the use of pesticides to reach the acceptable level of control. Methods or equipment not listed may be used with prior approval of the ACO. All of the requirements of this contract shall include the following components each time service is rendered.

a. A complete inspection shall be made of the site.

b. Identify pests, visible pest damage, or any potential for pest infestation.

c. Determine the extent of the pest problem.

d. Render treatment as appropriate to control, prevent, or otherwise mitigate the pest(s).

E.1 EXERCISE NO. 1.

Below, find contract clauses describing nuisance pest control operations which the contractor is to perform. From this information, develop:

(1) A Performance Requirement Summary Table (PRS) for Scheduled Nuisance Pest Control

(2) A PRS for Unscheduled Nuisance Pest Control

(3) A PRS for Records and Reporting

A blank PRS table is attached for your convenience.

C.7 NUISANCE PEST CONTROL.

a. Scheduled Pest Control Service. The Contractor shall prevent and control infestations of all arthropod pests, including but not limited to roaches, ants, silverfish, spiders, fleas, crickets, mites, and other common arthropod pests [Arthropod pests are defined to include swarming termites, other structural pests are included in paragraph C.8] at the location(s)/site(s) indicated in Attachment J-C3. When infestations are found, he/she shall perform follow-up inspections and, if needed, re-treatment.

(4) Minimum Acceptable Level of Control.

(a) In buildings scheduled for service (Attachment J-C3), good cockroach control shall be consistently maintained. "Good control" is defined as two or less spot infestations in any one building. If more than two spot infestations are found or more than six cockroaches are found in any one spot, the Contractor will be notified. Within two workdays of notification, appropriate control action shall be taken by the Contractor to eliminate the infestation.

(c) Ants. Control shall be established within 30 days and the site shall remain virtually free of any infestation. If an infestation is located by Contractor personnel during the scheduled inspection and treatment, and a follow-up treatment is required, the follow-up treatment shall be scheduled and the schedule provided to the ACO.

(d) Other Arthropod Pests. Control shall be achieved within two treatments (except that additional treatments may be necessary for fleas). "Control" is defined as less than two sightings of the target pest during a 30 day period.

b. Unscheduled Pest Control Service. The Contractor shall provide pest control service on a call basis in buildings and areas of buildings not covered by the scheduled pest control services, around the exterior of buildings, and in adjacent exterior areas for the control of arthropods, and other crawling and flying pests. The Contractor shall perform follow-up inspections and, if needed, retreat the infested area at no additional cost to the Government.

(3) Minimum Acceptable Level of Control.

(a) For arthropods other than cockroaches and ants, elimination of most of these pests shall be established in one visit. Re-treatment may be necessary for fleas. If any re-treatments are necessary, they will not be considered as additional service calls and shall be accomplished at no additional cost to the Government.

(b) Elimination of cockroaches and ants shall be established within 30 days and remain free of any infestation for at least 30 days thereafter.

C.14 RECORDS AND REPORTS. The Contractor shall prepare, submit, and maintain daily records of all pest control operations including survey and chemical and nonchemical control on NAVFAC Forms 6250/2 and 6250/3. These forms shall be filled out daily as operations are performed, and all entries must be completed within 24 hours of performance. Completed forms shall be made available upon request for inspection, and shall be forwarded to the ACO with the monthly invoice each month following the month of operation. Forms which are rejected by the ACO due to improper preparation shall be resubmitted by the Contractor at no additional cost to the Government. See attachment J-C9 for additional information.

QUALITY ASSURANCE PLAN: EXERCISE # E1

PERFORMANCE REQUIREMENTS SUMMARY TABLES
FOR
NUISANCE PEST CONTROL

Work Requirement	Standard of Performance	% Contract Requirement	MADR
1. CONTRACT REQUIREMENT 0001AA: NUISANCE PEST CONTROL SERVICES (SCHEDULED) Para. C.7.a.			
a. Scheduled services	____________	____%	____%
*b. Control obtained	____________	____%	____%
*c. Proper treatment	____________	____%	____%
	____________		
6. CONTRACT REQUIREMENT: 0002AA NUISANCE PEST CONTROL (UNSCHEDULED) Para. C.7.b.			
a. Service response	____________	____%	____%
b. Control obtained	____________	____%	____%
c. Proper Treatment	____________	____%	____%
	____________		
5. CONTRACT REQUIREMENT: 0001AE RECORDS AND REPORTS (SCHEDULED) Para. C.14			
*a. Daily records	____________	____%	____%
	____________		
b. Monthly invoice	____________	____%	____%
	____________		
c. Errors	____________	____%	____%
	____________		

*Unsatisfactory performance of this work item will result in an unsatisfactory rating for the entire contract requirement.

E.2 Exercise No. 2.

Below, find a typical contract clause and the Performance Work Statement for scheduled bird control. Develop:

(1) a Surveillance Guide for Scheduled Bird Control on the following pages.

C.10. BIRD CONTROL

a. Scheduled Service for Prevention and Control of Birds. The Contractor shall provide services to prevent birds from roosting or nesting on exterior or interior surfaces of loading and off loading platforms, overhead structures, and buildings and structures indicated in attachment J-C3. Birds generally refer to Pigeons, Starlings, and English Sparrows. Great care will be taken to ensure that other species are not harmed. The contractor shall remove and dispose of all dead and dying birds resulting from the control program.

(1) Acceptable Control Methods: The contractor shall establish a bird control program combining trapping, physical removal, non-lethal repellents, physical barriers and toxic baits or perches (as approved by the ACO).

(2) Acceptable Level of Control: Control shall be established within 30 days after initiation of services. After that period of time no more than five pigeons, eight starlings, or eight sparrows or a total of eight birds (all species combined) shall be present in any specified area or structure.

3. CONTRACT REQUIREMENT: 0001AC BIRD CONTROL (SCHEDULED)
Para. C.10.a.

Work Requirement	Standard of Performance	% Contract Requirement	MADR
a. Scheduled services	Service as scheduled.	10%	10%
*b. Control obtained	In accordance with Section C.10.a.(2)	75%	5%
*c. Proper treatment	In accordance with Section C.10.a.(1) and label directions.	15%	ZERO

*Unsatisfactory performance of this work item will result in an unsatisfactory rating for the entire contract requirement.

QUALITY ASSURANCE PLAN: EXERCISE # E2

SURVEILLANCE GUIDE
FOR
SCHEDULED BIRD CONTROL

1. Contract Requirements. ____

Standards of Performance

____.

____.

2. Primary Method of Surveillance. ____

____

3. Maximum Allowable Defect Rate (MADR). ________%

4. Quantity of Work. As per schedule of work, attachment J-C3.

5. Level of Surveillance.

a. ____

____.

b. ____

____

____.

____

c. ____

____

____

____.

7. <u>Sampling Procedure</u>. ______________________________

8. <u>Evaluation Procedures</u>. ______________________________

9. <u>Analysis of Results</u>. ______________________________

ODR% = ______________________________ X 100

10. <u>Performance Criteria and Conclusions</u>. If the ODR is greater than or equal to the MADR: ______________________________

If the ODR is less than the MADR, but secondary surveillance method(s) indicate otherwise:

If the ODR is less than the MADR, and secondary surveillance method(s) reinforce contractor performance:

At the end of the invoice period, the QAE will:

PUT ANY COMMENTS HERE:

E.3 EXERCISE NO. 3.

Exercise Number 3 is a continuation of Exercise Number 2. A suggested surveillance guide is provided as reference. Also, note that data is provided in the evaluation worksheet. You are to:

(1) Develop the ODR

(2) Would you change the level of surveillance? If so, to what level?

(3) Decide IF a Contract Discrepancy Report is needed. If so, fill one out (blank enclosed).

(4) Would you recommend any deductions? If so, how much? Could this work be re-performed?

QUALITY ASSURANCE PLAN 6
SCHEDULED BIRD CONTROL

1. Contract Requirements. Scheduled Bird Control (Para. C.10.a)

Standards of Performance
Compliance with general contract requirements.
Service as scheduled.
Minimum acceptable level of control achieved.
Treatment per label directions.

2. Primary Method of Surveillance. Planned sampling supported by validated customer complaints and unscheduled inspections.

3. Maximum Allowable Defect Rate (MADR). 5%

4. Quantity of Work. As per schedule of work, attachment J-C3.

5. Level of Surveillance.

a. Level II (25% of scheduled service) until such time as the ODR indicates another level is appropriate.

b. Level I (10% of scheduled service) When the ODR has been less than the MADR for two months, with no more than two validated customer complaints during the previous evaluation period. Level I is to remain in effect as long as the ODR is less than the MADR and there are less than two validated customer complaints per evaluation period.

c. Level III (50% of scheduled service) If during level II the ODR is equal to or greater than the MADR increase to level III. If during level III the ODR is lowered below the MADR, reduce to level II. If at level III the ODR continues to increase, recommend that a CDR be issued. It may then be necessary to go to 100% Inspection until such time as the number of observed defects is equal to or less than 10% of the entire service. If at 100% Inspection the defect rate does not decrease the PCQAE should recommend to the FSCM that stronger action be taken.

7. Sampling Procedure. Select the sample size based on the level of surveillance. Use the Contractor's approved schedule to determine service locations for sampling. Place emphasis on locations of known or suspected problems. Utilize either worksheet #1 for work in progress or worksheet #2 for pest control results.

8. Evaluation Procedures. Complete worksheet at work site. Grade all checkpoints as "U" unsatisfactory or "S" Satisfactory based on compliance with the service requirements. Whenever a "U" is indicated give a brief explanation in the comments column to explain the nature and possible cause of the unsatisfactory work. If rework is ordered enter all pertinent data such as date Contractor was informed, action taken, and outcome.

9. Analysis of Results. At the end of the inspection period the PCQAE will summarize all evaluations on the worksheets. An ODR is then calculated using the following formula:

$$\text{ODR\%} = \frac{\text{Number of defects}}{\text{Population Size}} \text{ X } 100$$

10. Performance Criteria and Conclusions. If the ODR is less than the MADR, the evaluation indicates that the service may be satisfactory. This conclusion should be compared to the number of validated customer complaints and any unscheduled inspections as a further test of its validity. If this comparison yields conflicting information, the surveillance level may be increased during the coming evaluation period.

If the ODR is equal to or greater than the MADR the evaluation indicates that the service may be unsatisfactory. When this condition exists the level of surveillance is increased during the coming evaluation period.

If the ODR is greater than two times (2X) MADR, the service is unsatisfactory and a CDR should be issued.

At the end of the invoice period, for all observed defects, the PCQAE will calculate the appropriate deductions and provide the FSCM with a report which itemizes the amounts the Contractor's invoice should be reduced.

QUALITY ASSURANCE PLAN: EXERCISE #E3

SAMPLE EVALUATION WORKSHEET
Contract No. XXXXXX-XX-X-XXXX
PEST CONTROL SERVICE
QAE Naval Training Center, Training Area, NJ

(Prevention & Control of Birds in and Around Structures: Scheduled) (CONTRACT STARTED 01 JAN 91) (USING LEVEL II SURVEILLANCE: 25% OF SCHEDULED BUILDINGS): Billing Period = 1 month.

Month FEB 91

Date	FEB 04	FEB 04	FEB 04	FEB 04	FEB 04	
Bldg. No.	100	200	221	F4	522	
Rating	S / U	S / U	S / U	S / U	S / U	S / U
Adhere to Schedule	S	S	S	U	S	
Elimination of Pests	U	U	S	S	S	
Evaluation of Procedures	S	S	S	S	S	

REMARKS: **Building F4:** Contractor failed to show up for survey on specified date. However, Pest birds were within contract limits.

Building 100: 9 pigeons sited in building.
Building 200: 6 pigeons and 2 starlings sited in building.

Surveillance Change?:

Recommendations?:

QAE: Sal See-It-All PCQAE Date: 06 Feb 91

Contractor: Joe's Bird Corral Date: 10 Feb 91

QUALITY ASSURANCE PLAN: EXERCISE # E3

(1) What are the ODRs for this period?

Schedule: ________________

Elimination of Pests: _______________

Procedure Evaluations: ______________

(2) Is a change in the surveillance level called for? _________

(3) Is a contract discrepancy report called for? __________
If so, fill out the blank contract discrepancy report on the next page.

(4) Is there a major contract violation? _______

(5) If so, what is that contract percentage? _____________

(6) Can this major contract violation be corrected to minimize deductions? ________________

(7) Would you recommend any deductions?____________

(8) If so, show the calculations below using the following information:

- Scheduled Bird Control contract value = $12,000.
- 20 buildings covered in the contract.
- length of contract = 1 year (01 Jan 91 to 31 Dec 91)
- Assume liquidated damage value at 10%

Deduction Recommended: ________________

CONTRACT DISCREPANCY REPORT

1. CONTRACT NUMBER:

2. TO: (Contractor & Manager's Name) 3. FROM: (Name of FSCM)

4. DISCREPANCY OR PROBLEM: (Describe in detail: Include reference to PWS: Attach continuation sheet if necessary.)

5. SIGNATURE: (FSCM) 6. DATE:

7. TO: (Contracting Officer) FROM: (Contractor)

8. CONTRACTOR RESPONSE: (Contractor's proposed solution to correct future occurrences of the problem, use continuation sheet if necessary)

9. SIGNATURE: (Contractor's Rep.) Date:

10. GOVERNMENT EVALUATION: (Is the Contractor's response a viable solution to the problem?)

11. GOVERNMENT ACTIONS: (Does the Government accept, propose modification, or reject the Contractor's response?)

12. CLOSE OUT:
QAE Signature: Date:
FSCM Signature: Date:
OIC Signature: Date:

ADDITIONAL SHEET FOR CALCULATIONS OR ADDITIONAL INFORMATION

ATTACHMENT 20-A1
INSPECTION METHODS

20.A1 CRITERIA FOR SELECTING AN INSPECTION METHOD

20.A1.1 **General.** The contract requirements (from the PWS) and the work requirements (PWS) may be subdivided into key characteristics. They are listed followed by specific criteria you should consider for each of the five methods of inspection.

Key Characteristics

20.A1.1.1 Population to be Sampled. The size and type of the population which must be inspected is a key characteristic. The inspection technique must be based on number of locations, frequency of occurrence and geographic distribution of population.

20.A1.1.2 Nature of Requirements of the samples.

- will the samples be simple, complex, easy or difficult to do
- importance of the contract requirement to the mission
- importance of individual samples to overall contract performance requirements
- type of contract
- value of each occurrence
- is work scheduled or unscheduled?
- how timely must inspection be to be valid?
    - during work performance (guard service, bus routes)
    - shortly after completion (janitorial, grounds, etc.)
    - few days after completion (painting, roofing)
    - any time

20.A1.1.3 Other Considerations

- **Sources available for inspections.** Does the government have adequate personnel to conduct the method of inspection desired. Are they qualified by experience and training to evaluate this type of service?
- **Contractor's Qualifications.** Our perception of the contractor's experience and ability to perform a given service will affect the inspection method chosen to evaluate that service initially. If doubt exists and we have adequate personnel, a more rigorous form of

evaluation should be used.

20.A2 ONE HUNDRED PERCENT INSPECTION. One hundred percent inspection means the QAE inspects every work occurrence or output of service by the contractor to determine its conformance or nonconformance to the specifications. It does not mean that you inspect each and every phase or step of a job.

20.A2.1 Selection. One hundred percent inspection is good for critical services with major mission impact where inspection of each and every occurrence is important. An example is termite control operations. One hundred percent inspection is also appropriate for pest control operations that are periodic and infrequent with known times of occurrence.

- use when it's important to have precise measurement of contractor's level of performance.
- consider for services which, if rejected, are expensive to correct or re-perform, such as fumigations.
- use for services difficult to schedule, such as Indefinite Quantity (IQ) work.
- not well suited to large populations.

20.A3 PLANNED SAMPLING. Rather than inspecting all work occurrences, such as in 100% inspection, the PCQAE inspects work occurrences by using a pre-determined plan. Only part of the work is inspected. That part is selected by subjective judgement and analysis of what would be representative of the overall job.

The size of sample inspections and criteria for their selection are both subjective. If the inspections are performed consistent with the plan, they yield valid results. The results cannot be used to judge what has not been sampled. You simply subject each Contract Requirement to regular, pre-planned observation, document the results and recommend appropriate deductions for all defects observed.

20.A3.1 Selection.

- consider for medium to large populations where 100% inspection is too costly or manpower inadequate
- don't consider for small populations, as not enough samples will be taken
- use for contract requirements or items within a contract requirement that have command interest or are particularly complex, critical or expensive., i.e. bias your efforts to achieve your priorities.
- use as a follow up to random sampling or customer complaints, where specific areas show a need for added attention.

- consider where individual work occurrences are geographically dispersed (in lieu of random sampling to avoid excessive travel).
- use only if it will provide adequate trends in overall contractor performance
- use where contract requirement is critical enough not to rely on customer complaints.
- use where individual occurrences in a population vary enough in size or criticality that random sampling is invalid
- planned sampling is a good way to take a biased look at specific occurrences, evaluating contractors performance. You can emphasize important areas such as food service
- good approach when contractor's performance on a contract requirement varies geographically

20.A4 VALIDATED CUSTOMER COMPLAINTS. Validated customer complaints are an excellent secondary inspection method to both planned sampling and 100% inspection. In some cases, such as housing, it may even be used as the primary method of monitoring contractor performance. This would require careful planning and extensive education of the customer receiving the service.

Validated customer complaints consist of customers observing defects in the services they expect to receive and reporting these defects to the PCQAE using a predetermined procedure. To be valid, all such alleged defects must be examined at the site by the PCQAE within a reasonable time (depends on nature of service) and determined to be a true defect. Documentation of these validations provide the necessary justification for deductions.

Because this method depends solely on customer awareness and reaction, it is essential that the organization receiving the service be fully informed.

Validated customer complaints are particularly effective when applied to contract requirements in which the customer has personal interest or in which he is in close daily contact. Examples are services provided to family housing, food service, office pest control and mosquito control.

20.A4.1 Selection. Use validated customer complaints when:

- the customer understands the scope of the contract
- the customer has the necessary expertise, incentive and access to the work
- the customer is willing to participate in the program

- the customer is the direct recipient of the service (close contact, direct effect)
- as a supplement to other inspection methods
- do not use on important or costly contract requirements

20.A5 RANDOM SAMPLING. Random sampling is a surveillance method based on probability and statistical theory. Assessment of the contractor's performance for all aspects of the work is based on inspections of only a small part of the work. The process of deducting from entire population, based on the defect rate from a portion of the population is called extrapolation.

Setting up random sampling procedures is done according to set standards. The process cannot vary from the set procedures. If it does, the data is not valid and cannot be used (unless the surveillance method is changed to planned sampling).

The population to be sampled must be fairly homogenous (similar in aspect). Generally, random sampling is not used as a pest control inspection technique because the populations are too small.

20.A5.1 Selection.

- use if population (number of work occurrences) in the contract requirement is "large" (a subjective evaluation)
- use where occurrences are repetitive, frequent and continuous in nature
- is manpower sufficient that there will not be any missed samples
- the occurrences must be similar enough in importance that the location/customer will not influence sample selection
- validated customer complaints or other inspection methods cannot be incorporated into random sampling
- the size of the sample must be known prior to award of the contract
- the contractor is aware and accepts random sampling as the surveillance method

20.A6 INCIDENTAL INSPECTIONS. Incidental inspections (Unscheduled = outdated terminology) are inspections carried out in conjunction with inspections of other contract requirements or in an impromptu fashion. For example, you may be monitoring bus service for on-time performance. Incident to that inspection, you notice and document a designated plot of lawn on your grounds maintenance contract that fails to meet specified standards. This constitutes incidental inspection.

It is never used as a primary method. It is never planned. However, nothing prevents the PCQAE from a drive-by of some trash bins or a walk-through of an office while in route to your primary goal. Decisions on what to inspect are usually arbitrary. They are made simply "because you are there".

Incidental inspections are generally a supplement to other methods. In rare cases a contract requirement with just a few work occurrences and locations could conceivably be covered by incidental inspection but only if it is a relatively non-critical requirement and does not require inspection immediately upon completion.

20.A6.1 Selection.

- use for low priority contract requirements or as a supplement to other surveillance methods

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