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MILITARY HANDBOOK

PEST CONTROL FACILITIES

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CONTENTS

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Page

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FACILITY PLATES

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1.0 INTRODUCTION

1.1 Scope. This handbook contains basic criteria to plan, program and design Navy, Marine Corps and Air Force pest control facilities, with respect to operational procedures or requirements for these facilities.

1.2 Related Criteria.

1.2.1 Facility plates and definitive drawings. Facility plates (schematic drawings) for pest control facilities are contained in this handbook. These include a functional relationship diagram, facility floor plans, door sill details, exhaust hood detail and utility requirements (pages 17 through 25). Pest control shops should be isolated structures, however, current drawings (Definitive Drawings for Naval Shore Facilities, NAVFAC P-272, Part One) locate pest control shops in public works maintenance shops. The drawings in this handbook supersede those in NAVFAC P-272 for pest control facilities. These plates and drawings are an integral part of the Naval Facilities Engineering Command's (NAVFAC) planning and design programs. Definitive drawings are listed in numerical sequence by the Navy Category Code Number assigned to that facility.

1.2.2 NAVFAC design manuals. See references listed at the end of this handbook for criteria related to pest control facilities, but appearing elsewhere in the Design Manual series.

1.2.3 Planning criteria. Planning criteria for pest control facilities covered by this handbook are contained in Facility Planning Factor Criteria for Navy and Marine Corps Shore Installations, NAVFAC P-80, Navy Category Number and Title (219-10 Public Works Shop).

1.2.4 Pesticide storage criteria. References herein to Title 40 Code of Federal Regulations, Part 165 (40 CFR 165) are for background information unless otherwise stated. The 40 CFR 165 design-related criteria and procedures are primarily for pesticides and containers whose uncontrolled release into the environment would cause unreasonable adverse effects on the environment, and for those which bear the signal words DANGER, POISON, WARNING, or skull and crossbones on their container labels. All the CFR criteria and procedures may not be required for facilities if the stored pesticides are registered for use in home and garden environments.

2.0 PLANNING

2.1 Purpose. This handbook provides the best available technology for basic design guidance of pest control facilities on Navy, Marine Corps and Air Force activities. It is presented for use by experienced architects and engineers, and consultants involved in guiding pest management programs at Navy, Marine Corps and Air Force activities. The contents include design data for facilities to provide for the storage and handling of pesticides and related pest control equipment.

2.2 Required guidance. Requirements are presented as essential (mandated by Federal regulation, consensus standard or justified by good practice) and recommended (in the interest of: safety and health, cost-effective operations, efficiency or unique operations). In this handbook, the terms "shall" and "should" equate to essential and recommended requirements, respectively.

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2.3 Users. The primary users of pest control facilities are the activity pest manager (APM) (responsible for the overall pest control program) and pesticide applicators (perform pest control operations).

2.4 Facility size. Guidance on the actual size and components of pest control facilities is available from the NAVFAC Engineering Field Division (EFD) pest management consultants and in the pest management plan established for each shore activity. Facilities shall provide adequate space for personnel and equipment necessary to address activity pest problems. In general, a small facility serves one to three pest controllers, a medium facility serves four to nine controllers and a large facility serves 10 or more persons. For essential space, the initial criteria is approximately 1,000 gross square feet (93 m^2) for a small facility with an additional 500 gross square feet (46 m^2) for each additional pest controller over three. The additional increment, however, diminishes as the number of controllers increases. A 10 person facility should require approximately 3,000 gross square feet (279 m^2) or approximately 300 gross square feet (28 m^2) for each person. Table 1 below lists the approximate size of facilities up to ten controllers.

TABLE 1. FACILITY SIZE

Number of Personnel	Approximate Size (X gross 1,000 sq. ft. (93 m^2))	
1 to 3	1.0	(small facility)
4	1.8	(medium facility)
5	2.1	" "
6	2.3	" "
7	2.5	" "
8	2.6	" "
9	2.8	" "
10	3.0 (or larger)	(large facility)

If two pest control functions (for example, public works and the golf course) require facilities, the design should be modified to include separate storage areas, a second small office, and sharing a common formulation room. Additional variations shall be included to plan for staffing and climatic differences and to comply with individual state or host country requirements for pesticide handling.

2.5 Location. Pest control facilities contain toxic chemicals and may be required to provide interim storage for pesticides classified as hazardous wastes. Isolated single purpose structures are essential. Pesticide storage and formulation facilities that are integral parts of multiple-occupied buildings present actual and potential problems. Unless the pest control facility is very tightly sealed off from adjacent spaces, noxious vapors will permeate nearby spaces. Pesticides are attractive to unqualified and unauthorized users which creates unique security problems. When locating a facility in a multiple-use building is the only alternative, it should be located on the end of the structure. This alternative is recommended only as an interim measure and construction of a separate structure should be initiated.

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2.6 Cost. Pest control facilities are expensive to construct and unless they are designed economically, funding through the military construction program will be required. This is attributable to the high square footage costs for utility connections, specialized ventilation and safety requirements. Small facilities do not cost proportionately less since the major difference is in storage space which is a less expensive consideration. It is essential that Navy, Marine Corps and Air Force activities design and construct minimum sized facilities to meet their mission requirements.

Consideration shall also be given to future use of a pest control facility. If activity disestablishment or contracting out is anticipated, resources for a new facility should not be obligated. Under certain situations the Navy may be required to provide pest control facilities for contractor use. The policy is that a cost study shall be completed indicating retention of the function in-house before construction or major rehabilitation projects are approved.

2.7 Operational procedures. Many operational procedures apply to pest control functions which bear on the design of pest control facilities. These are identified in applicable sections by "Operational Note." Numerous other operational requirements, determined through experience, have been identified and all information currently available on pest control facilities is provided or referenced.

2.8 Environmental concerns. Pesticide use is closely regulated by the Environmental Protection Agency and pest control facilities are subject to Occupational Safety and Health Administration regulations as well as Department of Defense, Navy and Air Force instructions and criteria. Facilities must be planned with regard to health and environmental protection. The storage and use of pesticides is regulated by Title 40 Code of Federal Regulations 165 (40 CFR 165) and often by state or local pollution abatement regulations as well. The use of water to extinguish fires in facilities generates hazardous liquid wastes which can readily contaminate materials, soil and ground water. Air Force facilities will include automatic sprinkler fire protection systems and will be designed to contain all water runoff. Another concern is for the proper disposal of wastes generated with normal pest control operations. Pesticide spills and cleanup procedures are addressed in Armed Forces Pest Management Board (AFPMB) Technical Information Manual #15. Waste pesticide concentrates may need to be stored prior to disposal as Resources Conservation and Recovery Act (RCRA) hazardous wastes (40 CFR 260-265).

> Operational Note: A pesticide spill kit (requires approximately 9 square feet (.84m^2)), located in the formulation area, is essential. The kit should be conspicuously identified and made readily available for emergency use. The kit should be inventoried periodically to ensure completeness and condition of all contents in 40 CFR 165.10(d)(2).

2.9 Collateral equipment. Several items of collateral equipment are required; these are listed in the appropriate sections of this handbook.

2.10 Bid Items. Bid items are listed in the appropriate paragraphs of this handbook.

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2.11 Energy conservation. Energy conservation shall be a major consideration in the design of building envelopes, mechanical systems, and electrical systems for pest control facilities. (See Heating, Ventilating, Air Conditioning and Dehumidifying Systems, NAVFAC DM-3.3 and Energy Budgets for New Facilities, NAVFACINST 4101.1). Each building envelope shall be insulated to provide the minimum heat transmission ("U") factors practical to meet energy budgets.

2.12 Building Protection. The vehicle entrance to the pesticide area shall be protected from damage by vehicles and moving loads by the installation of concrete filled pipe guards, bumpers, railings, corner guards, and similar protective features.

2.13 Safety/Security. Because of the hazardous nature of various pesticides (insecticides, herbicides, rodenticides, fungicides, wood preservatives, etc.) stored and used in pest control facilities, it is essential that such materials are secured and available only to qualified individuals. Security fencing and security gates and other measures are required.

3.0 DESIGN CRITERIA

3.1 Architectural

3.1.1 Style (character). Design the pest control facilities in accordance with NAVFAC DM-1, Architecture, Chapter 1, Section 4 and Chapter 2, Section 2, paragraph 6, or AFM 88-15 for Air Force projects.

3.1.2 Size. Obtain guidance on the actual size and components of pest control facilities from the cognizant NAVFAC EFD pest management consultant. Facility plates are available for small and large pest control facilities. These plates should be modified for local requirements. See also Table 1 on Page 2 for small, medium and large facilities.

3.1.3 Functional. Arrangement of spaces and corridors shall allow workers to arrive in a clean area, dress for hazardous exposure in the change area, leave through a chemical area doorway, and retrace their path at the end of the workday. It is essential that there be no direct access between the office and the chemical area and that doorways shall be arranged so that no pesticide need ever be carried through clean areas. It is essential that the mixing room be located adjacent to the storage area and the equipment storage area (if indoors) and be accessible through the corridor to the shower and locker rooms and the exterior. Functional relationship diagrams are provided as Facility Plate (FP), sheets 2 and 4, Pages 18 and 20. Divide the facility into the following three areas:

a. Clean area - Clean areas include an office, vestibule/airlock, and mechanical/electrical.

(1) Vestibule and airlock. Provide a vestibule and airlock, where appropriate, to conserve energy for facility.

(2) Office space. An office space for one person to do paperwork is essential. Heating, ventilation and air conditioning is recommended for effective workplace habitability. A break space is suggested in or adjacent to the office area only.

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Operational Note: Employees should not be allowed to eat in areas where pesticides are mixed, stored, or handled. Where there is exposure to toxic materials, a food storage area that is physically separated from such materials must be provided. This applies to coffee areas as well as storage of lunch boxes or bags. Waste containers must be provided for the disposal of all waste food. Such containers must be equipped with covers and, in accordance with OSHA standards, must be emptied daily (Ref: Title 29 of the Code of Federal Regulations Part 1910.141 (29 CFR 1910.141)). It is essential that there be no direct access between office and chemical formulation areas. Delete the office space, also, from secondary shops if there is a primary pest control facility on the activity.

(3) Equipment storage/cabinet/locker. Provide a separate storage area for space to store personal protective gear (new gloves, respirator cartridges, etc.) away from the chemical area.

(4) Mechanical/Electrical room. Provide a room to contain a water heater and mechanical and electrical equipment.

(5) General storage. Provide a storage closet for uniforms and other items not contaminated with pesticides for large facilities only when required by state or local regulations.

(6) Pump and tank room. Provide a room to house a pump and above-grade holding tank for medium and large facilities.

(7) General purpose room. Provide an area for personnel training, conferences and break room in medium and large facilities.

3.1.4 Chemical handling area - Chemical handling area includes pesticide storage and formulation and mixing rooms. Here, also, is the area of greatest exposure and hazard to applicator personnel from toxic materials.

a. Storage.

(1) General. Pesticide storage areas are essential to safely protect and store pesticidal chemicals in various sizes of glass, metal, plastic and fiber containers. Storage areas shall be secured from unauthorized entry (essential). Minimum storage is approximately 500 square feet (46 m^2) with an additional 50 square feet (5 m^2) per worker, again, diminishing as the number of personnel increases. Storage space may also be combined with, or accommodated in the vehicle and equipment space.

(2) Indoor storage. Pesticides shall be stored in an area sealed or separated from clean areas, with access to the exterior. All pesticides stored indoors shall be off the floor so that all labels are visible and with lanes to provide effective access and inspection. Insecticides should be separated from herbicides and within the storage room, provisions should be made to separate phenoxy herbicides from insecticides (recommended). Pesticides shall be stored in a dry room or building where fire detection devices are provided and where temperatures above 40°F (4°C) and below 100°F (38°C) are maintained. Pesticide storage shall be separated from formulation/mixing areas, shower and locker room, offices, or

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any area where personnel work for prolonged periods (essential). Pesticide concentrates shall not be stored in rooms containing a floor drain. See paragraph d. on page 13 for ventilation requirements. Metal cabinets within the storage area are recommended for nonchemical equipment storage (bait, traps, drills, other tools, etc.). A mechanism for off-loading drums and mounting sprayers on vehicles in the vehicle and equipment or storage area is suggested for medium or large pest control facilities. A workbench made of nonabsorptive material for equipment maintenance in the storage area and another in the formulation room is recommended. Nonabsorptive shelving to hold small containers of pesticides, application equipment, etc. is essential.

Operational Note: Recommended practices for storage areas include:

A clear, 3-foot (914 mm) aisle or passageway.
Pesticides shall not be stored within ten feet (3048 mm) of an opening.
Containers of flammable or combustible liquids that exceed 30 gallons (114 L) in volume must not be stacked one upon the other.
Dispensing must be by pump or by self-closing faucet devices bearing United Laboratories (UL), FM, etc., listings.
All storage rooms and cabinets must be locked when not in use.
Suitable fire control devices, such as proper types and sizes of portable fire extinguishers, must be available and adequately maintained.
Leakage and spillage must be cleaned up.
Drip trays containing absorbent material placed under pesticide container spigots.
Adequate precaution must be taken against igniting flammable vapor through spontaneous combustions and through contact with hot surfaces, frictional heat, mechanical sparks, etc.

(3) Vehicle and equipment storage. Provide space for storage of one vehicle and one trailer-mounted equipment item in small facilities. In larger facilities additional space shall be provided for parking vehicles and storing trailer-mounted application equipment.

(4) Outdoor storage. Pesticides stored outdoors shall be under cover and protected from radiant heating, freezing temperatures and moisture. All fumigants shall be stored outside of occupied buildings.

b. Pesticide formulation or mixing room - Provide a room with a work area to formulate or mix concentrated pesticides into ready-to-use formulations. Formulation rooms shall have electricity and hot and cold water. Nonabsorptive shelves should be situated near the pesticide storage racks, drum stands, exterior personnel door and in the formulation areas. Pallets to hold pesticides off the floor are essential. Steel stands to keep drums off the floor are recommended. The work area shall contain a fiberglass or a similarly chemically-resistant sink with a contiguous self-draining drip-proof counter top at least 5 feet (1524 mm) long, sideboards splash panel on back and an adjacent shelf for holding measuring devices and concentrates. An additional unhooded deep sink for washing small equipment, gloves, etc., is recommended for larger facilities. Galvanized metal fixtures are acceptable. Extra nonabsorbent shelving, 12 inches (305 mm) deep is recommended to store mixing equipment items.

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c. Transitional areas - Provide a dressing area for changing clothes, men's shower and lockers, toilet, laundry and cleaning gear room and women's shower and lockers (alternate).

(1) Men's shower and locker room. The room serves as a transition area between clean and chemical handling areas. It contains lockers for street clothing on one side, storage for work clothing (shoes, coveralls, caps, etc.) on the other side and a third area for protective equipment (respirators, etc.). The room shall be accessible to the showers and lockers, toilet and laundry and cleaning gear areas. Personnel locker space is essential. Provide a hot water shower for personal decontamination at the end of the day. Additional shower stalls may be recommended for medium and large shops.

Operational Note: Items of protective clothing and protective equipment shall be stored separately from pesticides. Personnel shall have at least three sets of clothing per person, two pair of gloves, and one respirator with additional respirator cartridges. An extra set of clean clothing should be maintained in the pest control facility for each employee. It is essential that each individual have two lockers: one for street clothing and another for work clothing to preclude contamination of street clothing by work clothing or protective gear.

(2) Toilet. Provide at least one toilet for number of employees (male and female) from 1 to 15. Toilet may be used by male or female and should be locked from the inside. Provide at least one lavatory with hot and cold water, water closet and urinal, see also Table 1 on page 2 and Facility Plate (FP), sheets 1 and 3 on pages 17 and 19 and these should be located in the transitional area. These facilities are essential unless suitable toilet facilities are convenient, for example, in an adjacent building.

Operational Note: Individual hand towels of paper shall be provided in proper receptacles. Provide some sanitary means maintained for the disposal of used towels. The provision of a towel for common use is prohibited. Roller towels, if properly maintained, are considered acceptable.

(3) Laundry and cleaning gear room. Provide a room adjacent to or near the shower and locker rooms.

(4) Alternate plan for women's shower and locker room. Convert storage room into a women's shower and locker room if at least one female is employed. (See FP, sheets 1 and 3 on pages 17 and 19 and paragraph 14 on page 12.

3.1.5 Construction materials.

a. Foundations and floor slab and floor finishes. Foundations shall be slab-on-grade with flat (flushed) door sills at interior and exterior doors. Slope floor from sills to interior floor drain. If interior floor drains are not installed, a 4 inch (102 mm) concrete curb shall be provided to contain spills and facilitate spill management. Slope exterior ramps downward from exterior flat (flushed) door sills. These slopes and drains are essential to contain spills and facilitate cleanup operations. (See FP, sheets 1, 3 and 5 on pages 17, 19 and 21 for layouts and details.) The

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thickness of the slab shall be designed to accept live loads of 500 lb (227 Kg)/mixing 55 gallon (208 L) drums in the interior storage area and garage. For other areas existing standards suffice. The installation of utility, heating or ventilation ducting is prohibited in or below slabs. Concrete floors shall be finished with a nonabsorbent nonskid finish. Refer to NAVFAC TS-03300, Cast-in-Place Concrete, for detailed criteria. The floors in both the storage and formulation/mixing areas shall be covered with nonskid epoxy sealant or otherwise made impermeable to absorption. Pesticide concentrates and formulated materials shall be prevented from entering the main drainage system. The change room and office floors may be tiled.

b. Exterior walls. Exterior walls shall be either constructed of pre-engineered components or insulated concrete masonry units. Wood construction shall not be used in chemical areas. Interior surface of exterior walls shall be either panels, concrete, metal pre-engineered or masonry units.

c. Doors and windows.

(1) Doors. Exterior doors shall be insulated, self-locking and self-closing with waterproof weather stripping. Doors shall be kept locked to prevent unauthorized entry. Provide flat (flushed) sill to all doors between the formulation/mixing and storage areas.

(2) Overhead garage door. Provide a 9 foot (2743 mm) high by 9 foot (2743 mm) wide insulated door with waterproof weather stripping. Higher doors may be required if vehicle mounted mist application equipment is to be used in the activity pest management program. Provide a flat (flushed) sill for the garage doorway.

(3) Windows. Provide metal framed windows, double or triple glaze, where appropriate, with a thermal barrier feature. Equip windows with interior security bars (mesh) if the facility is not enclosed (surrounded) by a climb-resistance chain link (security) fence and security gates as indicated in paragraph 3.4g on page 10.

d. Interior partitions and ceilings. Partitions shall be gypsum board on metal studs extending to a gypsum board ceiling 8 feet (2438 mm) high.

e. Roofing. For general roofing criteria, refer to NAVFAC DM-1, Architecture, Chapter 2, Section 4, Part 4 and Chapter 3, Section 2, Part 4. Only include roofing systems as contractor's options that will be compatible with the chemicals that may be discharged from the exhaust hood onto the roof.

3.2. Structural. Construct facility of pre-engineered exterior walls and roof or masonry bearing walls and steel roof joists.

3.3. Interior design. Coat interior partitions and interior surface of exterior walls with nonabsorbent finish from floor to ceiling in the chemical areas only. Collateral equipment includes a desk, bookcase, file cabinet, telephone (essential), a small table with one chair per worker (recommended), and benches (essential).

3.4. Site.

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a. General. Isolate pest control facilities from congested areas for reasons of health and safety, fire protection, environmental protection and security. This is based on the similarity of requirements for the isolation of storage facilities for chemicals, flammable or explosive materials (hazards), and sewage treatment plants (vapors and odors). Pest control facilities contain toxic chemicals and in special circumstances may be required to provide interim storage for pesticides classified as hazardous wastes in accordance with 40 CFR 165.10 and 40 CFR 261. The most compelling reason for isolation of pest control facilities is fire safety. If a fire should occur in a facility within a building complex, extensive decontamination of nearby spaces from the drift of toxic vapors, smoke, liquids, and particulates will be required. This condition is confined to one structure when the facility is isolated. Isolated single purpose structures are essential.

b. Siting. Site pest control facilities a minimum of 200 feet (60960 mm) from streams, other natural water sources, or 100 year flood plains. Siting a pest control facility downhill from the sensitive areas noted above, or diking is a suggested alternative where space is limited. Consideration must be given to prevailing wind conditions and the location of populated areas. Facilities shall not be located uphill from potable water sources or continuously occupied structures. Facilities should not be sited over aquifers (subsurface potable water supplies) unless the aquifer is adequately protected through construction measures. Facilities should be sited at least 500 feet (152400 mm) from other structures. Siting should be approved by an industrial hygienist or a sanitary engineer. Where siting requires that the facility be part of a multiple-use building (not recommended), it must be located on the end of the structure. Utility connection costs, access, security and subsurface conditions should be considered in siting. Funding limitations will not support excessive utility runs, long access roads or extensive site preparation costs. Select a site that, based on previous experience or soil tests, allows slab-on-grade construction.

c. Accessibility. Provide access to pest control facilities by vehicles carrying supplies or pulling trailer mounted dispersal equipment. The facility must be accessible to vehicles and pedestrians on at least two sides.

d. Grading. Runoff from fire-fighting must not reach standing water. Diking is recommended for large pest control facilities only.

e. Parking. Provide adequate space to park all pesticide dispersal equipment inside the pest control area, under cover. That part of the compound to be used for travel and vehicle parking shall be gravelled or paved.

f. Fire hydrant. Access to fire hydrants is not essential if the pest control facility is small (less than 1,000 sq. ft. (93 m^2)) and is isolated since it is environmentally safer to let pest control facilities burn down rather than to put the fire out with water and thereby generate considerable hazard from toxic liquid wastes as runoff. An exception to this would be if pesticidal chemicals are stored separately. If the other structures are located within 500 feet (152400 mm) of the facility, fire hydrants are essential for exposure protection. Air Force projects shall include a fire hydrant preferably located both uphill and upwind from the building.

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Additionally, the high temperatures resulting from uncontrolled incineration grossly reduce the toxic vapors and smokes that would otherwise pose a severe hazard to firemen and other exposed personnel. Siting requirements shall include a fire hydrant within 350 feet (106680 mm).

g. Security fencing and security gates. Provide a climb-resistance chain link fence to prevent unauthorized entry. The fence shall be a minimum of 7 feet (2134 mm) high, without top rail. Also, the fence fabric shall be twisted and barbed at the top and bottom. Refer to NAVFAC TS-0244, Fence, chain link for detailed criteria. Security gates to the fence shall be kept locked. The fence may be omitted when the facility is located in secure area. In such situations, bars or heavy gauge wire mesh over the windows are required (see paragraph c.(3) on page 8 for security of windows). Provide sign on fence as indicated in paragraph 3.8 on page 16.

h. Outdoor formulation/mixing and washdown areas. Provide outdoor areas for medium and large pest control facilities consistent with provisions for the safe filling, formulation, and decontamination of vehicular and trailer- mounted equipment. See also paragraph i. below and paragraph 3.5.b below.

i. Washstands. Provide an outdoor washstand consisting of a curbed (4 inches (102 mm) high) concrete pad sufficiently large enough to hold a truck and trailer (minimum 15 feet by 25 feet) (4572 mm by 7620 mm)). An elevated water fill pipe is essential.

Operational Note: Washstands are recommended for use during cleaning or filling truck or trailer mounted dispersal equipment.

3.5. Mechanical.

a. General. Provide a ventilation system for the facility. Heating for effective workplace habitability may be required depending upon the geographic area. Provide air conditioning (cooling) for office.

b. Plumbing.

(1) Disposal of Pesticides. The disposal of pesticide wastes must be considered. Disposal of small quantities of dilute pesticides into the sanitary sewage system is recommended unless otherwise prohibited by local water quality boards' regulations. The term "dilute" pesticide refers to the waste water generated from the daily laundry of work clothing, and the washing of protective equipment and small items of dispersal equipment. Waste water from emergency deluge showers and eye lavages may also be included. Small quantities in this context are interpreted as 50 gallons (189 L) per day discharged into sanitary sewer systems with flow rates greater than 50,000 gallons (189 271 L) per day. No pesticide concentrates or formulations may be discarded down the drain.

Operational Note: NAVFAC P-20.E provides guidance on reducing pesticide disposal requirements.

(2) Spills and contaminated water. Design storage and

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formulation/mixing areas to contain spills and water. See paragraph 3.1.5a on page 7. Pesticide spills and cleanup procedures are addressed in AFPMB Technical Information Manual #15.

Operational Note. A spill kit, per AFPMB TIM #15 should be available to use for pesticide spills.

(3) Holding tanks. Do not design drainage to a holding tank. Holding tanks are prohibited in new construction.

Operational Note: Procedures are available which preclude use of holding tanks. These include but are not limited to: (1) the practice of washing outdoor dispersal equipment at the application site and applying the wash water to the area treated, (2) saving wash water at the end of the work day to be used in the next days' formulation/mixing, and (3) substituting the more hazardous or toxic pesticides with safer, less persistent, biodegradable materials. NAVFAC P-20.E provides further guidance on reducing disposal requirements through prudent use.

(4) Closable drains. Provide closeable drains leading to the sanitary sewer to provide environmental protection against spilled concentrate pesticides or formulated compounds. Determine before design and construction if drains to the sanitary sewer system are prohibited by state or local regulations.

Operational Note: Drains are maintained in a closed position to prevent accidental introduction of spilled pesticides. Conduct maintenance inspection of closeable drain system annually.

(5) Sediment trap. Provide a sediment trap in the drain lines from the storage and formulation/mixing areas. Recommend that the sediment trap capacity be four times the maximum or peak drain pipe flow.

(6) Wash water. Provide drainage from indoor and outdoor washstands to the sanitary sewer system. Wash water from dispersal equipment ranging from manually carried to trailer-mounted items does not normally constitute a hazard to sewage treatment plants.

Operational Note: Adverse effects on the environment can be avoided by using wash water as the diluent for soil treatment for subterranean termites or dispersing the wash water over the same outdoor area where the initial pesticide was applied. However, wash water containing herbicide residue should be used to make up termiticide applications for subslab application where contact with desirable vegetation is unlikely.

(7) Sanitary sewer system and drains. Connect all plumbing fixtures to a sanitary sewer system and ensure that only rain or snow-melt water is routed to storm drains. Pesticide wastes are generated routinely from equipment washdown, laundry of work clothing and personal decontamination. Other wastes may occur through disposal of unused pesticides at the end of a workday and, rarely, from actual pesticide spills. Disposal of small quantities of dilute pesticides into the sanitary sewage system is recommended unless otherwise prohibited by local water quality board regulations. Pesticide spills are addressed under "Closable Drains" noted above as paragraph b.4.

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Operational Note: Water resulting from washing the exterior of dispersal equipment and vehicles may be drained into the sanitary sewer provided standard operating procedures preclude release of concentrates or sprayer contents into the drain.

(8) Sink. Provide a deep sink to fill and wash small equipment items 24 inches (610 mm) high and standard 5 gallon (19 L) cans. Install the hot and cold water faucets so that an airgap of at least two diameters (minimum of 2 inches (51 mm) of discharge opening exists between the outlet of the faucets and the top rim of the sink. The sink should be connected to the sanitary sewer. Swing-type spigots are recommended. Provide a hood or canopy to each sink in the mixing area designed to enclose the mixing operation as much as possible and to exhaust the vapors and dusts away from personnel. Provide at least 2 linear feet (610 mm) of counter top next to the sink, (2 linear feet (610 mm) of counter top on each side for double compartment sinks).

(9) Water heater. Provide a water heater if a source of hot water is not availsble.

(10) Washer and dryer. Provide all plumbing connections and floor drain for washer and dryer.

Operational Note: It is essential that work clothing be washed in separate loads from uncontaminated clothing.

(11) Back-Flow prevention device. Install reduced pressure backflow prevention device in accordance with American Water Works Association (AWWA) Standard C506-69. Plumbing which provides a source of water for filling pesticide dispersal equipment tanks must be provided with a back flow prevention device so that a water hose attached to a faucet can be used to fill the spray tank. For activities which purchase water from municipal sources, install the device in conformance with local plumbing standards. Some communities prohibit such devices.

(12) Overhead filling spigot. Provide permanent overhead filling spigot (frost-free) at outdoor washstand with air-gap between discharge orifice and the top of the dispersal equipment tank to be filled.

(13) Emergency eye wash and deluge shower and drain. Provide emergency eye wash and deluge shower (30 gpm (2 L/s) shower head) (Fed. Spec. WW-P-541/7A) with manually-operated, delayed-closing valves located adjacent to the mixing counter. If a floor drain is provided, the floor shall be sloped towards the drain and it shall be fitted with a closable valve which drains into a sump to permit chemical treatment of the spilled effluent before release. An eye wash and deluge shower is essential for emergency washing of individuals accidentally contaminated with pesticides (Ref: 40 CFR 165.10(c)(4)).

(14) Rough-in plumbing. Provide rough-in plumbing (shower drain, shower fixtures for hot and cold water) for storage. Also, provide rough-in plumbing (shower drain, shower fixtures for hot and cold water) for men's shower and lockers in the large facility.

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c. Heating and cooling. Provide adequate heating and cooling for personnel using the facility. Northern and southern activities will require special heating, ventilation and air conditioning considerations. Connection to existing central steam system is generally preferred; however, remoteness of the site may make cost prohibitive. Compare with cost of independent heating system. The storage area must be heated to 50°F (10°C) and cooled below 100°F (38°C); other areas heated to a maximum of 68°F (20°C) and cooled to a minimum of 78°F (26°C). Do not design for maintaining 40°F (4°C) in the storage room with exhaust system running. An independent heating system for the storage room is unnecessary. Consider the following: (1)(central steam available) steam unit heaters for storage and perimeter radiation for other areas; (2)(remote site) electric unit heaters in storage and oil-fired furnace/forced hot air in other areas; and (3) oil-fired unit heaters. Other cost effective systems may include comfort heating in office, formulation/mixing or toilet area and freeze protection in storage. Design structures for addition of unit air conditioning in office. Recirculated air shall not be used in chemical handling areas. Due to above features, wall insulation shall be provided. The garage or vehicle storage area may be heated by electrical unit heaters and remainder of spaces may have forced hot air or electric heat, if cost effective. Heating and/or cooling systems shall be designed to supply 100 percent outdoor air and shall not be recirculated.

d. Ventilation.

(1) Building. In the interest of conserving energy required for heating, cooling, and exhaust ventilation, room sizes of storage facilities should be minimized. Wall-mounted exhaust fans shall not direct exhaust air directly over sidewalks, or be less than the height provided by local building codes. Equip facility with outside air louvers with a gravity damper. All offices and eating areas shall be designed in such a manner which would preclude contamination with pesticide vapors. Normal ventilation in office, shower and locker room is suggested. All entrances to the facility should be posted, warning that the facility should be ventilated continuously during occupancy. Wall mounted exhaust fans are recommended to minimize roof penetrations. General room make-up and local exhaust make-up air systems should be separate to allow shutdown of local exhaust ventilation systems when pesticides are not exposed.

(2) Chemical handling areas. Provide an exhaust air ventilation system which provides at least six fresh air changes per hour. This ventilation system need only operate when the storage and formulation areas are occupied. The light and exhaust switch with a pilot light shall be located outside the door and marked with a sign reading "OPERATE VENTILATION SYSTEM DURING OCCUPANCY." An outside air louver with gravity damper shall be installed above exterior doors. Where work areas are adjacent to storage areas and interfacing doors exist, the storage area must have a negative pressure (when occupied) with respect to adjacent areas. Ventilation in formulation area shall be tempered systems supplying 100 percent outside air. All exhaust devices shall have two-way switches with one in the clean area or outside the entrance to the facility. Negative pressure in formulation area relative to the rest of the shop and adjacent structures, if any, is essential.

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Operational Note: In actual operation, especially after a weekend or in hot weather, the ventilation system should be turned on before entry into the facility.

(3) Canopy or hood ventilation system. The actual area for mixing pesticides shall be designed with local exhaust ventilation to contain, capture and exhaust toxic vapors and dusts (i.e., pesticide and solvent vapors). Facility Plate, sheet 6, page 22, provides a schematic and specification for local exhaust ventilation of the back draft-slot type. The height, 2 feet, (610 mm) of this ventilation system should be designed to accommodate containers normally used by pest controllers. Where a sink is used for mixing, a hood that encloses the sink on both sides and exhausts from the rear should be utilized. The bottom of hood should be 6 inches to 12 inches (1829 mm to 3658 mm) above counter top and fitted with end baffles. Negative pressure in the formulation/mixing area is created by an exhaust system or hood located over the mixing counter. Additional exhaust systems may be needed depending upon the size of the space. It is essential that "drag-through" from wall exhaust systems is prohibited. Motorized louvers are suggested for the exhaust hood and exhaust fan(s). The exhaust hood shall provide an air velocity of 150 linear feet per minute (fpm) (.76 m/s) at face of the hood (29 CFR 1910.106). Baffles or plenums should be used to maintain a uniform face velocity (150 fpm (.76 m/s) $\pm$ 30 fpm (.15 m/s) variation) at the hood opening or at the outer edge of the counter or sink top. If multiple stacked slots are used, those slots closest to the plenum will have a higher air volume (cfm) unless provisions are made to ensure that the lower slots provide 150 fpm (.76 m/s) capture velocity at the outer edge of the counter or sink top. A bypass sash or door between the worker and the material being mixed may be used to restrict the size of the hood opening and further protect the worker.

Operational Note: For upgrading existing facilities, exposure hazards from toxic vapors shall eventually be engineered out with the installation of an exhaust fan or duct directly opposite the mixing surface from the worker. Personal protective equipment (respirator, face mask or shield, gloves, apron and work clothing) may be used to provide interim protection during formulation/mixing operations, but proper engineering controls such as hooded ventilation systems must be ultimately installed.

3.6. Electrical. Design shall be in accordance with the National Electric Code (NEFC) 70 and NAVFAC DM-4 series.

a. Explosion proofing. Pesticide concentrates ordinarily used in structural pest control work have flashpoints above 140°F (60°C). They may be combustible (flashpoint above 100°F (38°C)) but are not flammable (flashpoint below 100°F (38°C)) products. A hazardous area classification is not applicable if flammable pesticides (flashpoint below 100°F (38°C)) are not stored or used.

Operational Note: Explosion proofing can be avoided by not using (or storing) any pesticides with flashpoints less than 100°F (38°C).

b. Lighting.

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(1) Indoor. Switching for the exhaust hood shall be located adjacent to counter. Lighting shall be 50 foot candles (538 lux) in the office and formulation rooms and 20 foot candles (215 lux) in the storage area and washroom (Illumination Engineering Society (IES) Lighting Handbook).

(2) Outdoor. Provide outdoor lighting for dawn/dusk operations such as mosquito fogging are performed.

(3) Security. Outside security lighting should be considered. This may be a bid item.

c. Corrosion resistance. Use of corrosion resistant fixtures (raceways, receptacles, etc.) is recommended due to the effects of pesticidal chemicals.

d. Appliances.

Operational Note: Appliances commonly found in offices including electric heat, microwave ovens, coffee makers, etc. are the responsibility of the Government, regardless of ownership, and shall comply with OSHA standards.

3.7 Fire protection.

a. Fire extinguisher. Provide a fire extinguisher by the door between the storage and mixing areas in accordance with 29 CFR 1910.106.

b. Fire detection system. Provide a fixed temperature/rate of rise heat actuated device (HAD) detection system connected to the Fire Department.

c. Sprinkler systems. Do not install sprinkler systems in chemical handling area due to potential for environmental damage from contaminated water. Where sprinkler systems are installed, other detection systems are not required. Air Force facilities will include automatic sprinkler fire protection systems and will be designed to contain all water runoff.

d. Other fixed systems. Not recommended. The installation of other fixed systems in chemical handling area can be avoided by limiting the types of pesticides in storage to compounds with flash points of 100°F (38°C) or more (fixed fire protection systems are not required if flammable liquids are not used or stored).

Operational Note: It is more practical and economical to eliminate the few flammable pesticides in use (substitutes are available) than provide fixed fire-fighting systems and explosion-proof equipment, fixtures, etc. This can be required through the pest management plan monitored by a pest management consultant. Where pesticides with flashpoints below 100°F (38°C) must be used, fire protection can be provided with specialized lockable storage cabinets. After construction of a pest control facility, subsequent operating procedures, detailed in the installation pest management plan, must identify pesticides suitable for the level of fire protection provided in the facility. Storage areas of combustible and flammable liquids (pesticides) must be segregated from other storage areas. Depending on the amount of liquids stored and their flashpoints, special handling and storage are necessary. If no more than

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60 gallons (277 L) of flammable or 120 gallons (454 L) of combustible liquids are stored, a storage cabinet of metal or wood, as described in the regulation, will be adequate. If larger quantities are to be stored, a separate room, outside metal shed, or warehouse meeting the required fire resistant rating of the material must be provided. In these situations, it would be advisable to seek additional guidance on fire protection (Ref. 29 CFR 1910.141). The storage cabinets may be bid items.

e. Interior partitions. Provide 1 hour (3600s) protection.

3.8 Signs. Provide identification signs such as "DANGER," "POISON," and "PESTICIDE STORAGE" on appropriate rooms, buildings, and fences to advise personnel of the contents and warn of their hazardous nature. Install a sign over the sink which reads: "DO NOT DISCHARGE PESTICIDES OR PESTICIDE SOLUTION INTO THE SINK." Provide warning signs on the the exterior of the building at each entrance except the utility room.

Operational Note: a. If the facility is also used to store hazardous materials or toxic substances, a list of the types of materials shall be posted on the outside of the storage area. b. All movable equipment used for handling pesticides which might be used for other purposes should be labeled "contaminated with pesticides" and should not be removed from the site unless thoroughly decontaminated. Unless hood ventilation is provided, a sign shall be posted at the actual mixing area requiring the use of protective gloves, aprons and boots, protective eye wear or face shields, coveralls, and an approved pesticide respirator. All pesticide containers shall be labeled.

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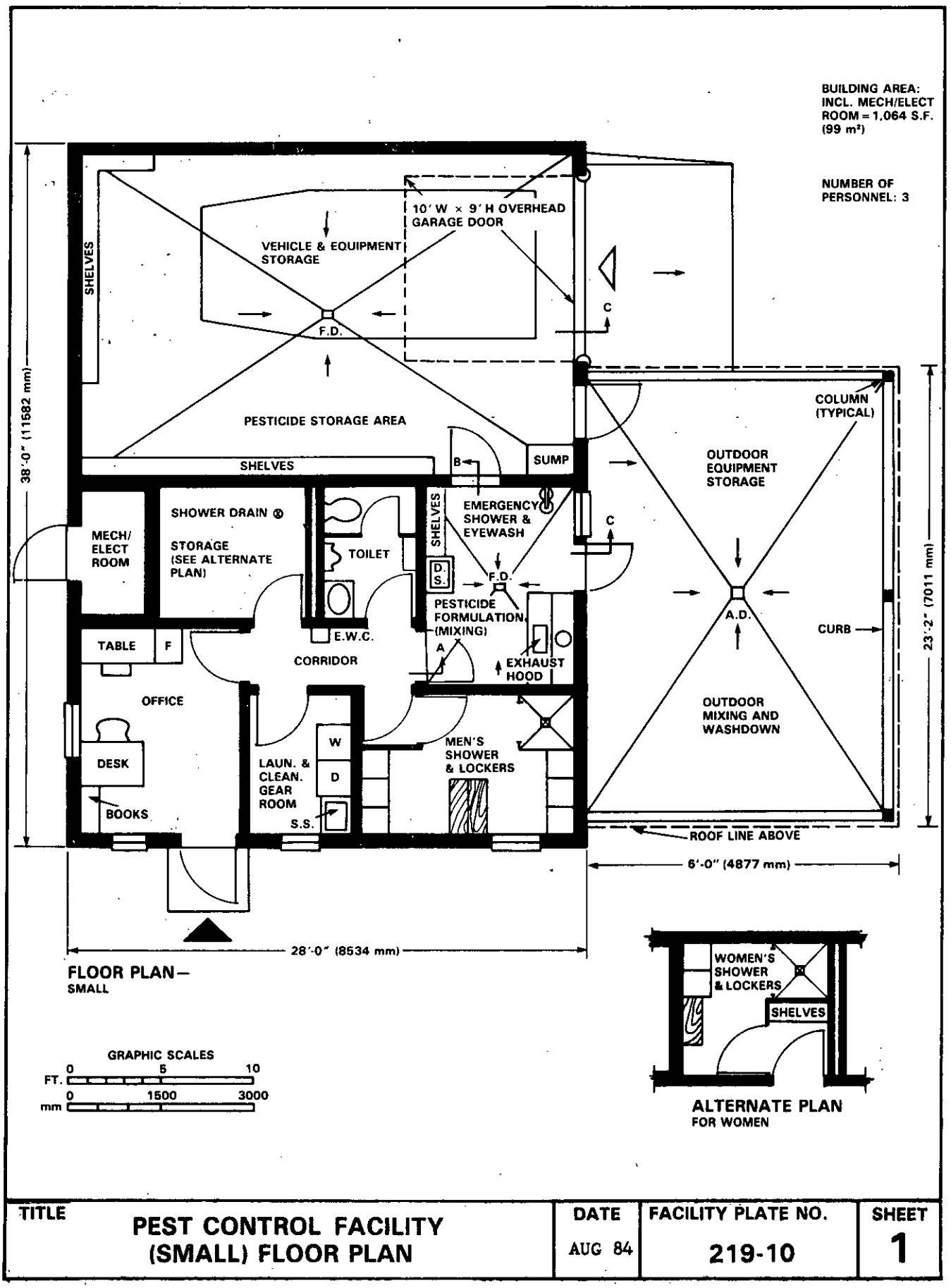

TITLE	DATE	FACILITY PLATE NO.	SHEET
PEST CONTROL FACILITY (SMALL) FLOOR PLAN	AUG 84	219-10	1

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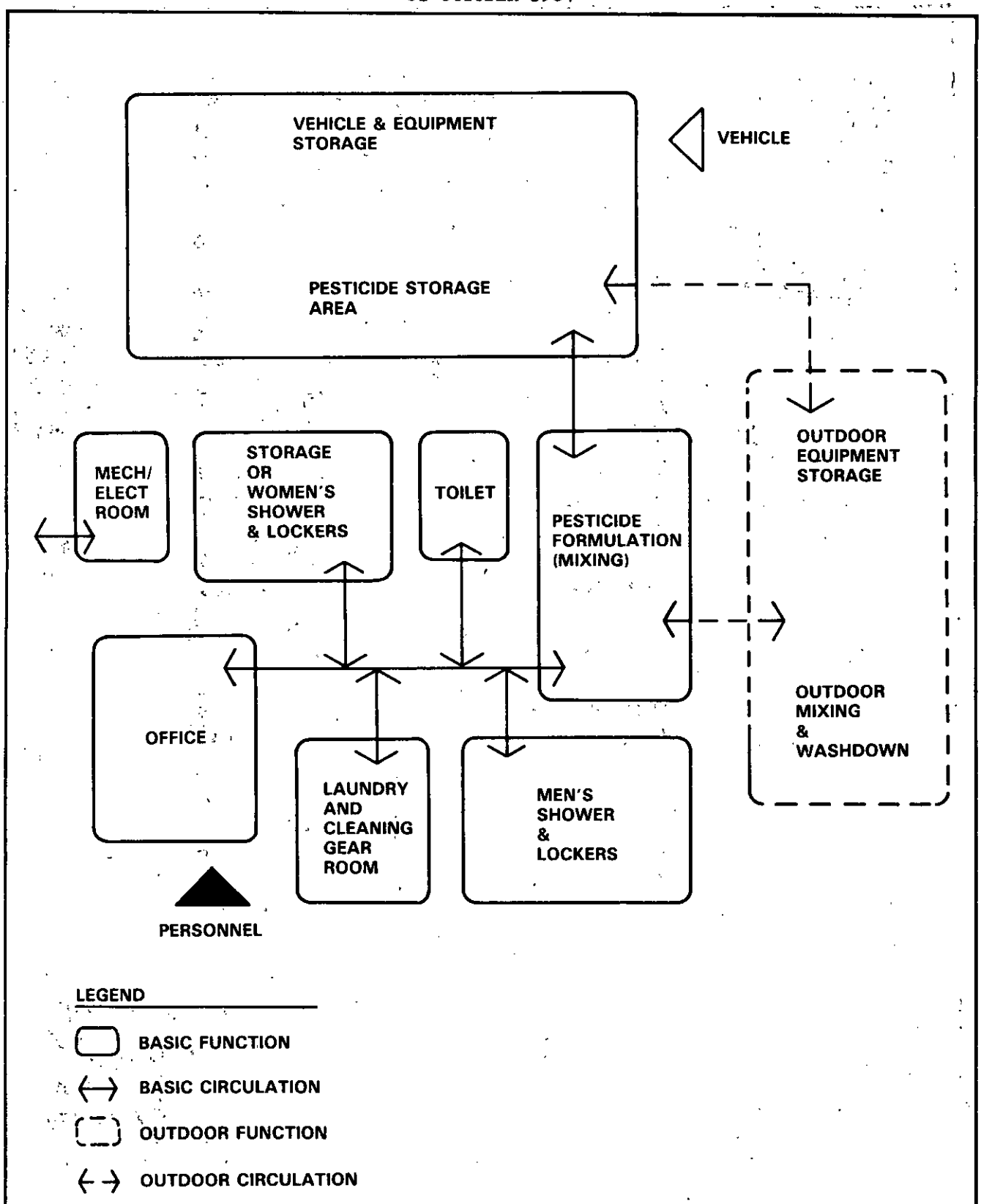

TITLE	DATE	FACILITY PLATE NO.	SHEET
PEST CONTROL FACILITY (SMALL) FUNCTIONAL RELATIONSHIP DIAGRAM	AUG 84	219-10	2

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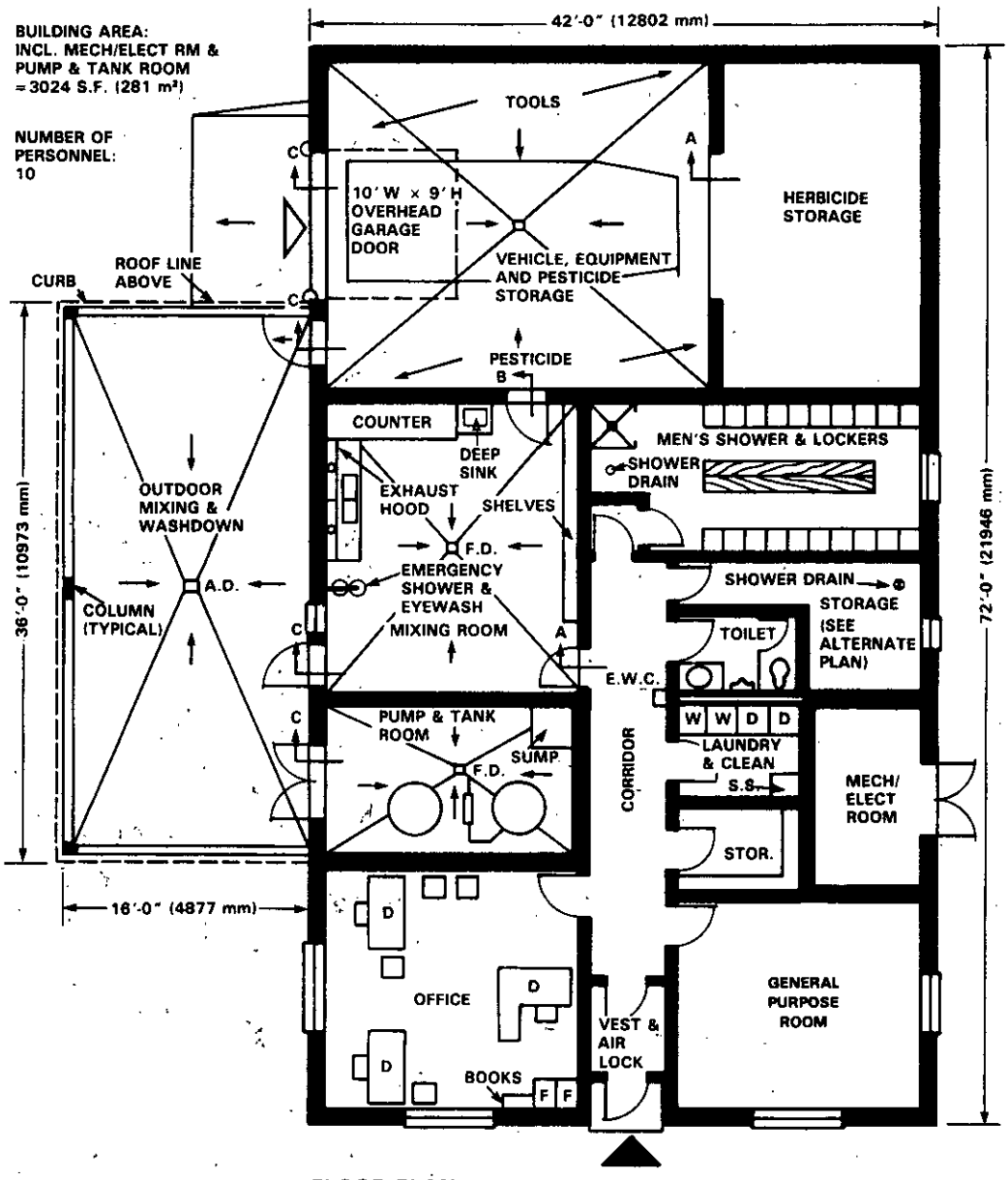
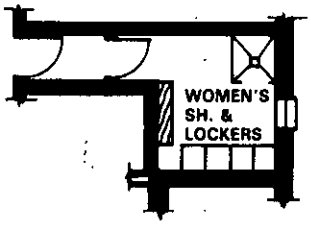


FLOOR PLAN-LARGE



ALTERNATE PLAN
FOR WOMEN

GRAPHIC SCALES
FT 0 5 10
mm 0 1500 3000

TITLE	DATE	FACILITY PLATE NO.	SHEET
PEST CONTROL FACILITY (LARGE) FLOOR PLAN	AUG 84	219-10	3

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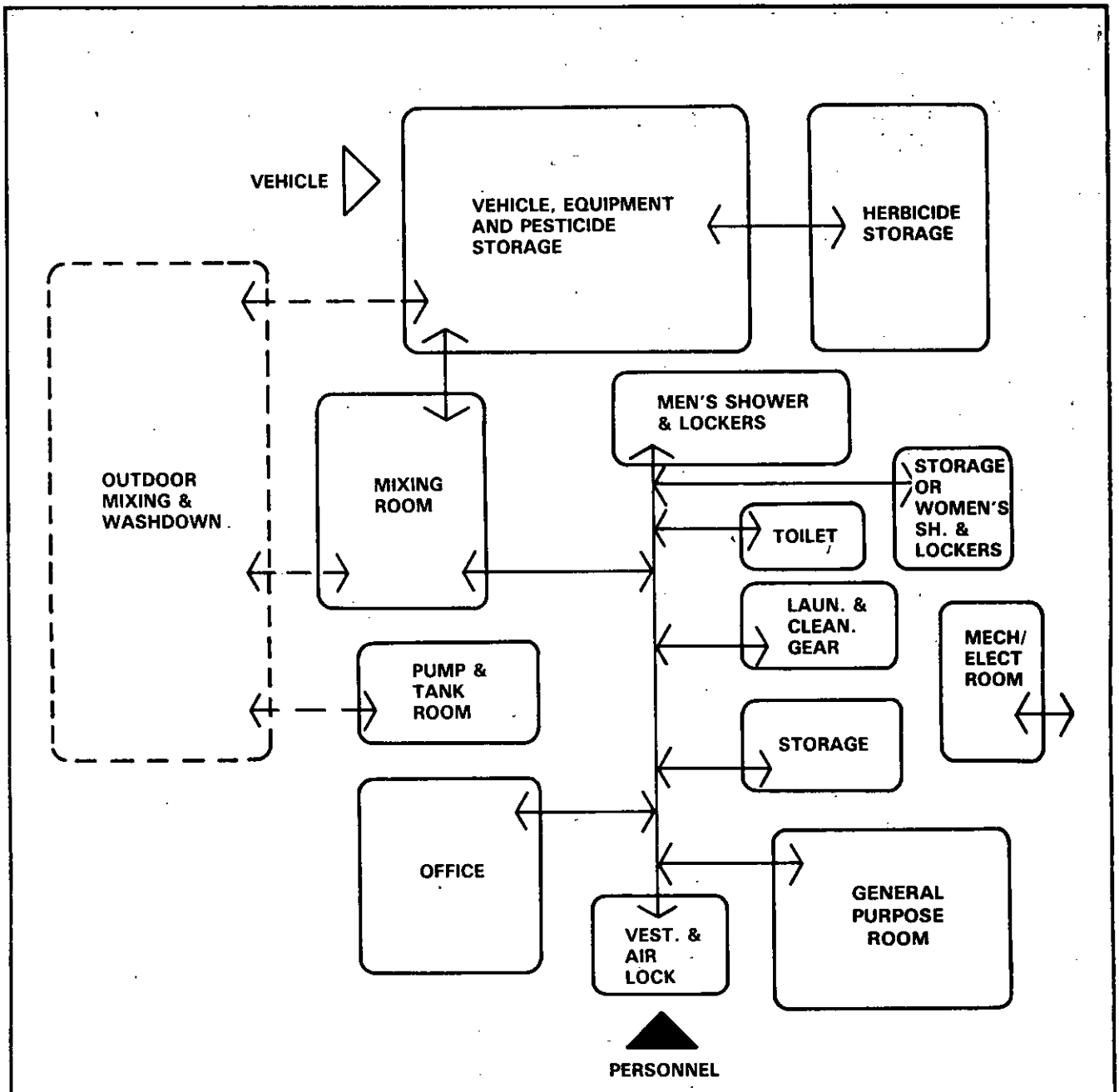

TITLE	DATE	FACILITY PLATE NO.	SHEET
PEST CONTROL FACILITY (LARGE) FUNCTIONAL RELATIONSHIP DIAGRAM	AUG 84	219-10	4

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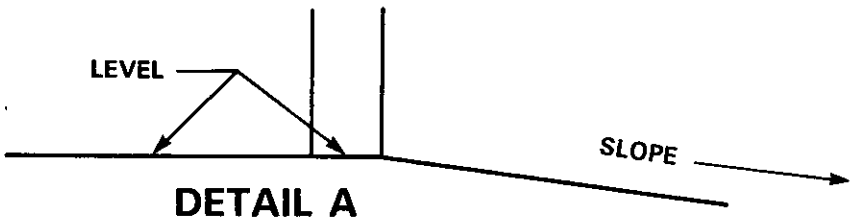
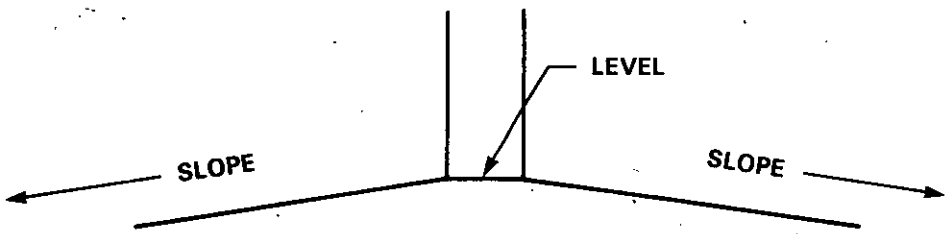
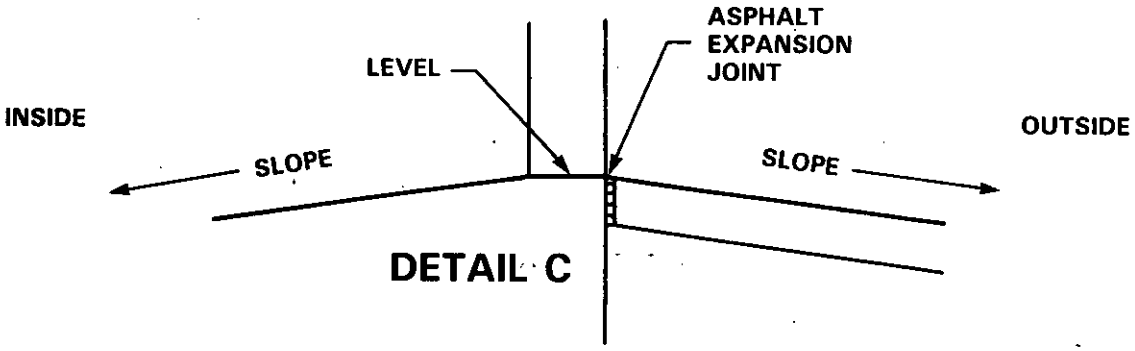


DETAIL A



DETAIL B



DETAIL C

NOT TO SCALE

NOTE: SLOPE = ⅛ INCH (3mm) PER FOOT

TITLE	DATE	FACILITY PLATE NO.	SHEET
PEST CONTROL FACILITY DOOR SILL DETAILS	AUG 84	219-10	5

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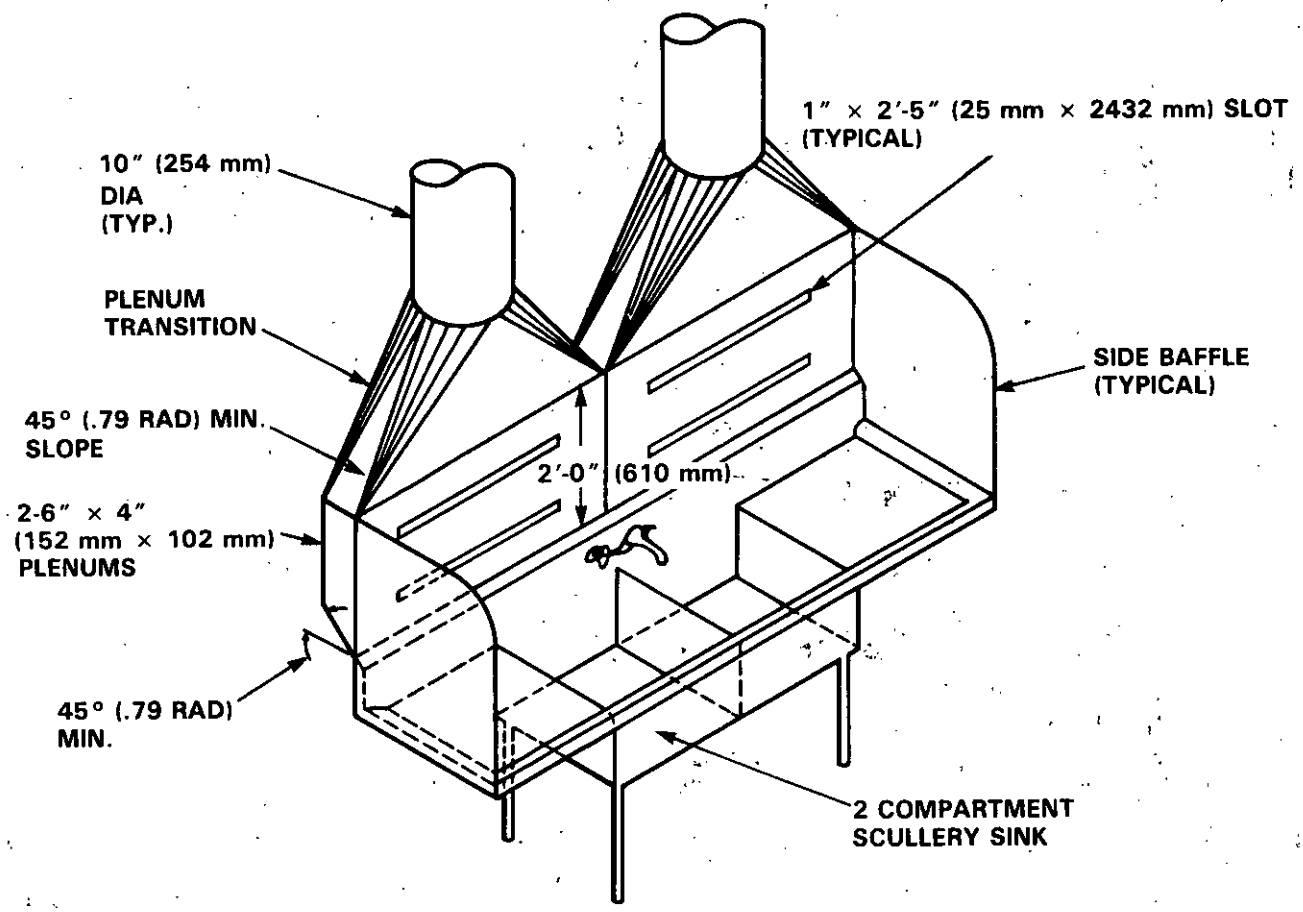

EXHAUST HOOD DETAIL FOR LARGE PEST CONTROL FACILITY

NOT TO SCALE

NOTE:
PROVIDE 1 COMPARTMENT SCULLERY SINK WITH AT LEAST 2 LINEAR FEET (610 mm) OF COUNTER TOP EACH SIDE AND 1 EXHAUST HOOD FOR SMALL AND MEDIUM SIZED PEST CONTROL FACILITIES

TITLE	DATE	FACILITY PLATE NO.	SHEET
PEST CONTROL FACILITY EXHAUST HOOD DETAIL	AUG 84	219-10	6

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ARCHITECTURAL

1. For guidance in the selection of small, medium, or large facility sizes, see page 2, paragraph 2.4.

2. Provide exterior design and siting to suit project requirements. Provide air lock vestibule for large facility. Also, consider canopy and air lock at entrances of small and medium facilities to suit climatic conditions.

TOTAL GROSS AREA

Small Facility	1,064 SF. (99 m^2)
Large Facility	3,024 SF. (281 m^2)

MECHANICAL

Plumbing:

	Small	Large
Cold Water	38 GPM (2 L/s)	41 GPM (3 L/s)
Hot Water Recovery Rate (through 65°F (18°C) rise)	50 GPH (.05 L/s)	65 GPH (.07 L/s)
Storage	60 Gallons( )	80 Gallons ( )
Maximum Temperature	105°F (41°C)	105°F (41°C)

Heating: Small facility

Outside design temperature: Refer to NAVFAC P-89, Engineering Weather Data.

* Typical design loads in MBH at various outside design temperatures.

-5°F (-21°C)	+5°F (-15°C)	+15°F (-9°C)	+25°F (-4°C)
210	181	154	126

Heating: Large facility

Outside design temperature: Refer to NAVFAC P-89, Engineering Weather Data.

* Typical design loads in MBH at various outside design temperatures.

-5°F (-21°C)	+5°F (-15°C)	+15°F (-9°C)	+25°F (-4°C)
380	330	280	230

TITLE	DATE	FACILITY PLATE NO.	SHEET
PEST CONTROL FACILITY Utility Requirements	AUG 84	219-10	7

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Inside design temperature:	68°F (20°C)	minimum for small and large (excluded mech./elec. rooms, pesticide storage, tools, vehicle, equipment storage, pump and tank room).
	60°F (16°C)	minimum for pesticide, storage, tools, vehicle and equipment storage.

Cooling:

Inside design conditions:	78°F (26°C)	minimum for small and large (excluded mech./elec. rooms, pesticide storage, tools, vehicle and equipment storage and pump and tank room).
	90°F (32°C)	maximum for pesticide, tools, vehicle and equipment storage.

Requirement: Install window type A/C in office only. Heat gain for small facility = 4200 Btuh (3 370W). Heat gain for large facility = 11,500 Btuh (1 231 W).

1. Mechanical utility requirements indicated above are for estimating purposes only.
2. All mechanical equipment and fixtures shall be specified to withstand the corrosive atmosphere.

Notes:

1. Mechanical utility requirements indicated above are for estimating purposes only.
2. Mechanical equipment and fixtures shall be specified to withstand the corrosive atmosphere.
3. Access to mechanical equipment and fixtures shall be adequate for proper maintenance and repair.

Ventilation

* Heating loss at various outside design temperatures, as indicated above, includes heat loss of exhaust hood located in the formulation/mixing room. The estimated exhaust hood dimensions for small facility are: 2'wX6'L (610 mm x 1 829 mm) and for large facility dimensions are: 2'wX8'L (610 mm x 2 438 mm).

Pesticide Formulation (Mixing) and Mixing Room (small & large)	Minimum 6 air changes/hr. Exhaust 100% directly to outdoors
Laundry & Cleaning Gear (large)	Minimum 1-5 air changes/hr. Exhaust 100% directly to outdoors

TITLE	DATE	FACILITY PLATE NO.	SHEET
PEST CONTROL FACILITY Utility Requirements	AUG 84	219-10	8

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ELECTRICAL

Lighting:

	Small	Large
Connected Load	2.0 kW	4.5 kW
Estimated Demand	1.0 kW	2.0 kW

Power: (see note 2 below)

Connected Load	16.0 kW	43.3 kW
Estimated Demand	14.1 kW	28.5 kW

Total:

Connected Load	18.0 kW	48.8 kW
Estimated Demand	15.1 kW	30.5 kW

Notes:

1. Electrical utility requirements indicated above are for estimating purposes only.

2. Electrical equipment and fixtures shall be specified to withstand the corrosive atmosphere.

3. Access to electrical equipment and fixtures shall be adequate for proper maintenance and repair.

FIRE PROTECTION

The fire extinguishers snall comply with National Fire Protection Association (NFPA) 10.

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REFERENCES

Air Force Manual

88-15 Criteria and Standards for Air Force Construction

Obtain manual from Headquarters, U. S. Air Force, Washington, DC 20330.

AWWA Standard

C506-69 Back Flow Prevention

Obtain standard from American Water Works Association (AWWA), 6666 W. Quincy Avenue, Denver, CO 80235.

AFPMB Manual

Technical Information Manual #15

Obtain manual from Armed Forces Pest Management Board, Forest Glen Section, WRAMC, Washington, DC 20307.

Federal Specification

WW-P-541/7A Plumbing fixtures (sinks, kitchen and service and laundry tub, land use) (detail specification)

Obtain specification from the U. S. Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. TWX: 710-670-1685, Autovon: 442-3321.

IES Standard

IES Lighting Handbook

Obtain standard from Illuminating Engineering Society (IES), 345 East 47th Street, New York, NY 10017.

NFPA Standard

NFPA 10	Portable Fire Extinguishers
NFPA 30	Storage of Flammable Liquids
NFPA 43D	Storage of Pesticides in Portable Containers
NFPA 70	National Electrical Code
NFPA 101	Life Safety Code
NFPA 231	General Indoor Storage

Obtain standards from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

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National Pest Control Association Manual

Profit Through Safety

Obtain manual from National Pest Control Association, 8100 Oak Street, Dunn Loring, VA 22027.

NAVFACENGCOM Design Criteria

DM-1	Architecture
DM-3 Series	Mechanical Engineering
DM-4 Series	Electrical Engineering
INST 4101.1	Energy Budgets for New Facilities
P-20E, S, J	Shop Guide for Pesticide Disposal (in English, Spanish and Japanese)
P-80	Facility Planning Criteria for Navy and Marine Corps Shore Installations
P-89	Engineering Weather Data
P-272, Part One	Definitive Designs for Naval Shore Facilities (Public Works Maintenance Shops)
TS-02444	Fence, Chain Link
TS-03300	Cast-in-Place Concrete

Department of Defense activities may obtain copies of Design Manuals and P-Publications from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. Department of Defense activities must use the Military Standard Requisitioning and Issue Procedure (MILSTRIP), using the stock control number obtained from NAVSUP Publication 2002.

Other government agencies and commercial organizations may procure Design Manuals and P-Publications from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20420.

Title 29 - Code of Federal Regulation, Labor

Part 1910.106 Flammable and Combustible Liquids
Part 1910.141 Sanitation
Part 1910 - Subpart L, Fire Protection

Obtain Regulations from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402.

Title 40 - Code of Federal Regulations, Protection of Environment

Part 165 Regulations for the acceptance of certain pesticides and recommended procedures for the disposal and storage of pesticides and pesticide containers

Part 165.10 - Recommended procedures and criteria for storage of pesticides and pesticide containers

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Part 260 - Hazardous Waste Management System, General

Part 261 - Identification and Listing of Hazardous Waste

Part 262 - Standards Applicable to Generators of Hazardous Waste

Part 263 - Standards Applicable to Transporters of Hazardous Waste

Part 264 - Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

Part 265 - Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

Obtain Regulations from Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402.

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