

STATE OF CALIFORNIA — THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF FLOOD MANAGEMENT

SUPERINTENDENTS GUIDE TO OPERATION & MAINTENANCE OF CALIFORNIA'S FLOOD CONTROL PROJECTS



INTRODUCTION

The Guide has been prepared to help supervisory personnel of reclamation districts, levee districts, flood control districts, and other local agencies with flood control responsibilities in acting as superintendents of flood control projects in California. The Guide is also intended for use by Supervisory personnel of the Department of Water Resources who have similar responsibilities.

The Guide explains the duties and responsibilities of those who supervise the maintenance and operation of flood control facilities in their areas of jurisdiction. It also identifies the federal, State, and local regulations that superintendent is required to know and comply with. All personnel who supervise flood control workers should familiarize themselves with this information. It will help them understand the importance of properly operating and maintaining the projects that millions of Californians rely on for protection of their lives and property.

At the time the Guide was released, the U.S. Corps of Engineers was conducting experiments and pilot studies to determine how well certain types of vegetation prevented erosion from occurring on levee slopes. When the study is completed, the results may differ from the recommendation outlined in this document, which are based on The Reclamation Board's Guide for Vegetation on Project Levees. In the interim, the Board's program will apply.

The Guide has been prepared specifically for use in the Central Valley. This is because the flood control supervision, maintenance, and inspection authority of the Department of Water Resources, under statute or in cooperation with The Reclamation Board, is limited to the drainage of the Sacramento and San Joaquin rivers. However, this Guide should be applicable and useful to all federal flood control projects in the State. Federal projects both inside and outside the Central Valley are authorized in the Water Resources Law of 1975 (as amended) and are listed in Section 12639 and following sections of the Water Code.

The Guide is arranged so that it can be readily revised and updated as needed. Comments regarding the contents can be sent to:

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SECTION 1

RESPONSIBILITIES AND DUTIES OF THE SUPERINTENDENT

Superintendents, Local Agencies 1.10

The superintendent of a reclamation district, protection district, drainage district, municipality, maintenance area, or other public agency within the limits of any federal flood control project in the Sacramento and San Joaquin River watersheds is responsible for maintaining and operating the project works lying within the boundaries or jurisdiction of such an agency. These activities must be performed in accordance with Sec. 208.10, Title 33, of the Code of Federal Regulations, approved by the Secretary of the Army on August 9, 1944.

Superintendents, Department of Water Resources 1.20

Personnel of the Department of Water Resources (DWR) who are designated as superintendents in charge of operations and maintenance of federal flood control projects are also required to meet the requirements of the Code of Federal Regulations.

The Superintendent's Area of Responsibility 1.30

Local Agencies. Under the direction of a local agency's board of directors or board of trustees, local agency superintendents are responsible for maintaining and operating all portions of the projects within the Sacramento and San Joaquin valleys within the boundaries of their jurisdiction, except those works charged the Department of Water Resources under Water Code Sec. 8361 and the maintenance areas that are maintained by DWR, with local beneficiaries paying the costs (Sec. 12878). 1.31

The Department of Water Resources is responsible for maintaining, at State expense, certain channels of the Sacramento River Flood Control Project and Sacramento River Major and Minor Tributaries Project, the American River Flood Control Project, and the Middle Creek Project (Sec. 8361). This responsibility is defined as channel capacity maintenance. It does not include protection of the levees or private property from erosion or other damage. That work is the responsibility of the local levee maintenance agency or property owner.

1. Assistant

To appoint and train an assistant to act in the superintendent's absence.

2. Staff

To maintain and develop a staff of trained personnel who can (a) safely and effectively operate and maintain flood control project structures and facilities and (b) assume responsibility during a flood crisis.

3. Supplies

To keep on hand a reasonable supply of flood fight tools and materials for flood emergencies, and to have 24-hour access to sources of additional supplies.

4. Emergency Personnel

To have readily available an up-to-date list of telephone numbers of State and local officials and personnel with special expertise in meeting flood emergencies.

5. Inspections

To make periodic inspections of all project structures and facilities, including any notable changes in levee crown elevation (subsidence) to ensure these control works will provide the designed flood protection.

6. Budget

To submit an annual budget that will provide funds adequate for maintenance of the district's flood control responsibilities, (Procedures for review and approval of local district budgets may vary from agency to agency.)

7. Safety

To support and enforce safety rules and programs.

(Regulations on operation and maintenance of project facilities are stated in the U.S. Corps of Engineers' Standard Operation and Maintenance Manual and Supplements, Title 33) Chap. 2, Part 208, Flood Control Regulations. Special duties of the superintendent during flood emergencies are outlined in Section 6, "Emergency Operations," of this Guide.)

Maintenance Policies

1.40

All superintendents of flood control project, maintenance units, whether they are employed by a local agency or the Department of Water Resources, are required to observe The Reclamation Board's policy to maintain and protect the environment in a manner that is consistent with the protection of lives and property from floods. The protection of wildlife mitigation areas, especially revegetation easements, is essential to environmental protection.

Superintendents are also required to promote good relations with the public by considering the value of property adjacent to project facilities. Superintendents are responsible for ensuring that certain maintenance and operation procedures such as burning, herbicide spraying, crown roadway maintenance, and bypass flooding do not inconvenience or endanger nearby landowners or endanger wildlife mitigation easements. Although not necessarily required, a courtesy visit or phone call to persons who might be affected by such work can do a great deal to promote favorable relationships between project maintenance personnel and property owners.

Authority to Carry Out Duties

1.50

Operation and maintenance of flood control projects In California are governed by two agencies, the U.S. Army Corps of Engineers and The Reclamation Board, as provided for under provisions of the California Water Code. The Corps of Engineers works with other public entities as sponsors of flood control projects, water conservation districts, water districts, and conservation districts.

U.S. Army Corps of Engineers. By an act of 'Congress in 1917, the Corps of Engineers was empowered to study and adopt a major flood control plan to minimize the seasonal overflow of navigable streams and their tributaries In the Sacramento and San Joaquin Valleys. After many proposals were considered, a modified version of the 1911 California Debris Commission Plan was adopted. The revised plan consisted of a system of flood control reservoirs, leveed streams, bypasses, weirs, canals, and drainage pumping plants. Although It has never been fully completed, the plan in use today is essentially the same as the one that was adopted in 1917.

1.51

The Corps was originally charged with constructing facilities to provide the maximum flood protection for thousands of acres of agricultural land and the many communities situated on major streams in the Central Valley. Later the Corps was commissioned to establish rules, codes, and standards for maintenance of certain project levees, to be performed by State and local agencies wholly at their expense. The Corps' responsibility for planning and building flood control facilities was later expanded by Congress to include other parts of California outside the Central Valley.

Congress has recognized the impacts of flood control development on fish and wildlife. The construction of bank protection units now includes mitigation measures to compensate for environmental losses. Mitigation programs are coordinated with The Reclamation Board and include acquiring prime wildlife areas In fee or through easement and improving marginal areas through revegetation efforts.

1.51
(Cont.)

The Reclamation Board. The Reclamation Board was created in 1911 and reorganized in 1913 as a" agency of the State of California to develop and carry out a plan to control flooding along the Sacramento River and its tributaries. The Board's Jurisdiction was later extended to include the San Joaquin River and its tributaries.

1.52

Recent legislation has increased the scope of the Board to include more active participation in federal flood protection projects and designated floodplain management in the Central Valley.

Changes in federal participation and policy have altered the operation of the Board from time to time, until now Its functions include approving plans, acquiring rights of way and flowage easements, providing assurance of local cooperation, and enforcing maintenance requirements established by the Corps of Engineers. The Board takes lead responsibility for the long-term management and perpetuation of mitigation areas. The Board also reviews applications for any alteration or encroachment of any adopted plan of flood control in the Central Valley and approves or denies the request.

The Board has been administratively part of the Department of Water Resources since 1958, but it functions as a separate agency in exercising its original flood management responsibilities on the Sacramento and San Joaquin rivers and their tributaries.

Staff of the Flood Control Project Branch of the Department of Water Resources has the lead role in representing The Reclamation Board with the Corps of Engineers in developing and maintaining mitigation lands. Questions regarding the location and management of revegetation easements and other mitigation properties should be referred to the Flood Control Project Branch.

(The Reclamation Board, a booklet published by the Board, describes the Board's history and its present involvements.)

The California Water Code. The rules, regulations, and standards set by the Corps of Engineers for operation and maintenance of federal flood control projects are incorporated into the California Water Code. They cover all phases of the use, rights, and distribution of California's water resources.

1.53

(Secs. 8520-9377 codify the law governing The Reclamation Board. Secs. 8340-9577 and Sec. 12878 assign certain responsibilities to the Board regarding maintenance of flood protection works following construction.)

Responsibilities of the Department of Water Resources

1.60

Since 1947t the Department has inspected project facilities semi-annually for- compliance with federal, State, and local maintenance requirements. The Department also prepares annual reports that rate the degree of compliance (Water Code Sec. 8371)' This work is part of the assurances The Reclamation Board gives the federal government that certain flood control facilities built by the Corps of Engineers are properly maintained. In areas of the State beyond the limits of the Sacramento-San Joaquin Valley and outside the jurisdiction of The Reclamation Board, the Department has the authority to form maintenance areas for federal flood control projects, when necessary, and to assume responsibility for their maintenance (Water Code Sec. 12878 et seq.).

Maintenance Areas

1.70

The California Water Code (Sec. 12878) empowers The Reclamation Board to establish a maintenance area within its area of jurisdiction when the Department has determined that a unit of the project is not being properly maintained by the local agency having that responsibility. Maintenance costs in a maintenance area are apportioned to property owners in the protected area on an ad valorem basis (according to the value), or on a land use basis, and the assessment is collected as a Special benefit assessment with county taxes.

Responsibility for operation and maintenance of a maintenance area is assigned to the Department of Water Resources. Such responsibility may be returned to a local agency when it has demonstrated the desire and financial ability to meet the obligation.

Local Agencies

1.80

Local agencies-may be organized under any of several designations, depending on the purpose for which they were formed. These include water, reclamation, levee, irrigation, drainage, protection, water storage, flood control, or special districts. As used in this Guide, "local agency" refers only to those organizations that have a direct flood control maintenance responsibilities.

The procedures for dissolving a local agency are contained In Water Code Sees. 56000 et seq. ("Cortese-Knox Local Government Reorganization Act of 1965"). To begin dissolution proceedings, a petition signed by at least 5 percent of the registered voters must be filed with the Local Agency Formation Commission. The responsibilities and maintenance procedures set forth in this guide refer principally to federal flood control projects. However, local agencies whose responsibilities may include non-project and privately owned flood control facilities may also follow these guidelines.

SECTION 2

SAFETY

Permit Requirements

2.10

The superintendent is usually required to obtain a permit before certain maintenance or flood control work can be performed. Permits are issued by city, county, State, or federal agencies, any of which may impose restrictions and regulate other conditions related to the proposed work. Permits may be issued on an annual basis or for some other limited term.

Following is a partial list of maintenance operations for which permits must be obtained.

Equipment Transportation. Moving equipment and vehicles that exceed the legal limits for height, width, and weight requires a permit from the California Department of Transportation (Caltrans) and/or the city or county through which a vehicle unit must pass. A blanket permit may be obtained in some cases. Requirements for legal tie-downs will vary. The California Highway Patrol requires that all regulated loads follow the specific procedures contained in the California Administrative Code, Title 12, Subchap. 7. When DWH personnel are transferring equipment (a non-regulated load), they are required to follow the DWR Maintenance Safety Rules Manual, Sec. 3.17. The California Vehicle Code defines a legal load and the conditions under which such loads may be carried.

2.11

Traffic Control. When traffic must be controlled as a safeguard during maintenance operations on or next to a public street or highway, a notification and approval permit must be obtained from Caltrans or the city or county involved. Proper warning signs must also be placed in accordance with state and local codes. Burning operations, tree removal, levee erosion repair, slope mowing, and herbicide spray programs are among the projects that may require traffic control.

2.12

Restoration and Repair. Riverbank and levee stabilization activities that require more than one' cubic yard of material per running foot for a distance of more than 500 feet or more than 1,000 cubic yards of import material are covered under Sec. UM of the Federal Clean Water Act. However, in California, approval is required from the Regional Water Quality Control Board. Maintenance work exceeding the foregoing specifications will require permits from the Corps of Engineers. Other permits may be needed from the California Department of Fish and Game (Sec. 2.14). Work of this type may be performed by the Corps of Engineers.

2.13

Channel Clearing. Any project that involves moving soil, sand, or gravel in or near a body of water requires the agency planning the project to reach agreement with the Department of Fish and Game (DFG Code, Secs. 1601-1603). Sec. 1601 applies to government agencies and public utilities. The agency uses Form FG 2023 to notify DFG of its plans.

2.14

The superintendent should coordinate with the nearest U.S. Fish and Wildlife Service, Endangered Species Office, to determine any requirements for avoiding or mitigating Impacts to endangered species.

Once the agency has reached agreement with DFG, routine maintenance work in or near a body of water does not require any further notification or agreement, unless there has been substantial change in vegetation or the fish and game resource. However, by a memorandum of understanding between the two departments, DWR does obtain agreement from DFG for every routine maintenance proposed each year. DFG has similar understandings with other agencies regarding this type of work.

Work of this nature may require additional permits from the Corps of Engineers and the Water Resources Control Board.

Burning. Burning of vegetation on levee slopes or debris left by floods or channel clearing is generally restricted to rural areas. This work requires permits from local fire districts and the local air pollution control board. These agencies must also be notified when the work is to begin. In special cases, when burning is banned for environmental or other reasons, a variance may be obtained, provided the need for the work can be justified.

2.15

Rodent and Vegetation Control. The use of certain "restricted use" materials to control rodents and vegetation on levee slopes and in channels requires a permit from the county agricultural commissioner in the county where the work will be done. To obtain a permit to purchase and apply restricted use materials, applicants must possess a Qualified Applicator Certificate Issued by the Department of Food and Agriculture.

2.16

When a seasonal or annual permit is obtained for restricted use materials, a notice of Intent containing specific information about the proposed project must be submitted to the county agricultural commissioner 24 hours before the start of work. The commissioner may waive the 24-hour requirement or modify some of the Information required, if assurance is given that the work will be performed according to proper safety and environmental considerations.

A monthly report summarizing pesticide use must be submitted to the county commissioner by the 10th of each month following the use of any pesticide.

A special permit is also required from the California Department of Fish and Game to take beavers, badgers, and other large rodents that can damage levees.

2.16
(Cont.)

Worker Safety

2.20

Maintaining flood control project facilities generally involves using heavy equipment, vehicles to transport heavy equipment, and cutting tools, and handling and using toxic materials. Also, workers are sometimes exposed to weather extremes that create physical hazards.

The importance of taking all reasonable steps to ensure the safety of workers should be kept in mind at all times. Statements such as "No Job is so important that it cannot be performed safely" and "All accidents are avoidable" are sometimes challenged, but they are, nevertheless, excellent bases for adopting safety practices.

The Department of Water Resources, acting on behalf of the State of California, is serious about holding injuries to its employees to the lowest possible level. In keeping with this policy, DWR employees who work on flood control project facilities are required to attend safety training classes (Sec. 2.26). DWR superintendents are expected to fully enforce all safety rules and regulations and support safety measures.

Similar programs to promote safety are recommended for local maintaining agencies.

Safety Training

2.30

The Department of Water Resources trains its flood control project personnel in all phases of flood control project maintenance. Employees whose jobs involve such work must satisfactorily complete all relevant training courses before they may assume field maintenance duties.

The superintendent should not assign any employee too potentially hazardous work until the employee is properly trained and considered to be qualified or can be assigned to work under the direction of a properly qualified person.

The superintendent will schedule courses to meet operational needs and will keep complete and accurate records of courses completed by employees.

When it is convenient i DWR crew leaders are expected to supplement classroom training by providing new employees with field duties that relate to their class work. Superintendents should require each employee to prepare a training development plan.

Employees whose duties require handling pesticides must be trained thoroughly in the laws and regulations related to the handling of pesticides and the use of protective clothing and equipment. They must also be well informed about the common symptoms of pesticide poisoning and be warned that it is dangerous to eat, drink, or smoke while engaged in such work. 2.30 (Cont.)

Safety Meetings. All DWR employees who work on flood control project facilities must attend regular safety meetings. The superintendent on the job is responsible for arranging the meetings and providing instructional material for the topic of discussion. Active participation by all personnel is encouraged, and the date, subject matter and names of those present are kept on file. 2.31

The Department also encourages frequent tailgate meetings at the job site. The crew leader conducts informal discussions of safety practices that apply to the work at hand. Procedures for performing the work are reviewed, possible dangers are brought to light, and preventive measures fully discussed. The Department recommends that superintendents of local agencies adopt similar useful practices.

The Department sponsors a Flood Fight School, scheduled annually, at the Bryte maintenance yard in Sacramento. Attendance is mandatory for all DWR flood control project employees. All local agencies personnel with flood control responsibilities are strongly urged to attend this class. Classes will be scheduled at other times upon request.

Protective Gear. The Department issues required protective gear to flood control project employees, along with directions for recommended and mandatory uses. This equipment is provided at no cost to the employees, who are responsible for using it as directed, keeping it in good repair, and requesting replacements when items are no longer serviceable. 2.32

All agencies must provide the following items of clothing and equipment. Other protective gear may also be necessary for certain types of tasks.

Hard Hats, Hard hats are worn to prevent head injuries. The use of an approved hard hat is mandatory for all personnel involved in flood control project maintenance activities, whether they are performing field work or only observing the work of others. A smaller, lighter-weight version of the hard hat, commonly called a bump hat, is acceptable for some operations.

Protective Face Wear. The use of safety glasses, goggles, or face shields are necessary to safeguard against eye injuries caused by flying objects, pesticides, or other environmental hazards. All workers are encouraged to wear appropriate protective face wear for all maintenance activities. Use of this equipment is required for certain activities.

Gloves. Simple cotton gloves or leather mittens can minimize painful burns, cuts, and bruises during use of hand tools.

Coveralls. Coveralls are issued to DWR field employees to protect their own clothes from undue damage, wear, and soiling. The coveralls are laundered regularly at the Department's expense and replaced when no longer fit for use. Coveralls offer some degree of safety against scratches and other minor injuries, but workers should be cautioned that loose clothing is hazardous when worn by someone who is operating machinery with exposed moving parts.

Particle Masks. The use of a particle mask prevents dust particles and other air-borne pollutants from entering the respiratory system.

Ear Plugs. Fitted ear plugs or approved ear muffs must be worn by DWR employees who are operating or working near machinery that emits noise above 85 decibels.

First Aid Kits. Approved first aid kits are installed in all State-owned vehicles. Drivers are responsible for seeing that kits are fully stocked with the appropriate items. The kit is only for temporary emergency care of injuries in the field. Both the injured person, if able, and management personnel should determine whether additional medical attention is advisable. A formal accident report is always required for all accidents. First aid training, including cardiopulmonary resuscitation (CPR), is required of all DWR field personnel.

Safety Belts. Safety belts are installed in all State-owned vehicles, and their use by the operator and all passengers is mandatory. The driver is empowered to enforce this regulation. Failure by driver or passengers to "buckle up" can result in a fine; suspension without pay, or termination.

Protective Gear, Pesticide Use. All flood control workers who handle pesticides must be equipped with protective clothing and equipment appropriate to this work, as directed on the pesticide label. This type of gear includes the following items:

2.33

Gloves. Appropriate protective gloves, worn as directed on a pesticide label, are mandatory when workers are handling pesticides or other hazardous material.

Aprons and Disposable Coveralls. DWR employees are required to wear protective clothing made of a nonabsorbent material when they are mixing and loading pesticides or rinsing emptied pesticide containers. Disposable coveralls should also be worn by any employees who may come into contact with the pesticide during application.

Particle Masks. A particle mask is required for any DWR employee who is handling herbicides.

Rubber Boots. Rubber boots are necessary for employees who mix and load pesticides and for pesticide applicators who may come into contact with the spray mixture.

2.33
(Cont.)

(See also Sec. 2.41.)

Foul Weather Gear. Foul weather gear is issued for use primarily during flood emergencies. Few, if any, field maintenance activities can be performed satisfactorily in stormy weather. During such periods) the superintendent should assign duties in locations that provide some protection from the elements. In a flood emergency, however, employees are expected to accept many weather-related hardships.

2.34

Foul weather gear issued to DWR employees usually includes water-proof parkas or jackets, rubber boots (ankle, knee, or hip height), water-repellent trousers, and life jackets approved by the U.S. Coast Guard.

Safe Storage and Handling of Pesticides

2.40

Any use of a pesticide requires strict observance of laws and regulations regarding safe application, control of storage transportation, disposal of empty containers, cleanup of spills, protective clothing and procedures for personal and equipment cleanup.

Because of the toxic characteristics of pesticides and the potential hazards involved in their application, both to users and their surroundings, all aspects of pesticide use are closely regulated by the California Department of Food and Agriculture and county agricultural commissioners' offices. Before DFA authorizes any pesticide for specific use, the pesticide must first be extensively tested for effectiveness and its possible effects on people and the environment.

Pesticides are rated by degree of toxicity; "Danger," "Warning," or "Caution". This must be prominently displayed on the pesticide label. The label must also display appropriate warnings, detailed directions for mixing and use, and Instructions to follow in case of injury by accident or misuse. The label is the law. Read it carefully before starting any application of a pesticide.

Safe Working Conditions. The superintendent is responsible for providing safe working conditions, adequate training, and proper supervision of all personnel who mix, load, transport, apply, or otherwise handle pesticides. Stringent controls adopted by the Department of Food and Agriculture regulate the handling, mixing, application, and cleanup of pesticides.

2.41

The superintendent is responsible for seeing that the mixing site at which employees are handling pesticides has a designated facility for changing into protective clothing and for washing when pesticide use is completed. It should be equipped with an ample supply of water, soap, and towels for personal use.

The superintendent must also provide employees with appropriate protective clothing, as the pesticide label directs. Also, equipment used to mix and apply pesticides must be in good

2.41
(Cont.)

repair and safe operating condition. This equipment is subject to inspection by county authorities.

Emergency Medical Care. The employing agency must provide emergency medical care for employees whose work includes mixing, loading, or applying pesticides. The name, address, and telephone number of the medical facility providing such care must be conspicuously posted at the work site and on the application vehicle. Whenever a pesticide related illness is suspected or whenever a worker has been apparently endangered by overexposure to a pesticide the superintendent must see that the employee receives immediate medical attention. 2.42

Restricted Materials. Certain pesticides are more dangerous than others. These are classified as restricted materials and are subject to limited use and more stringent controls. Their use requires special permits (see Section 2.16). Applicators must hold a certificate as a qualified applicator or work under the direct supervision of a qualified applicator. 2.43

Laws and regulations regarding the application of restricted materials and the Pest Control Licensing and Certification Program are subject to change or revisions without official notification. The superintendent is responsible for keeping informed of any changes. This information is available from the California Department of Food and Agriculture, 1220 H Street, Sacramento CA 95814, or the county agricultural commissioner.

Storage of Pesticides. Pesticide containers, both full and empty, must be stored in a locked enclosure in accordance with the label on the container. When pesticides in storage carry either "Warning" or "Danger" precautions on the label, warning signs in both English and Spanish must be posted on all walls of the storage area. The signs must be readable from a distance of 25 feet. 2.44

Transportation of Pesticides. Pesticides must not be transported in a compartment that is also occupied by people, food, or animal feed. Pesticides, empty containers, and equipment must be attended at all times while en route. Vehicles used to transport or apply pesticides must be thoroughly cleaned before they are assigned for other uses or are sent to be repaired. 2.45

Rinsing and Disposal of Used Pesticide Containers. A triple rinse and drain procedure approved by the Department of Food and Agriculture must be followed to prepare emptied containers for disposal. Contact the county agricultural commissioner's office for specific requirements on container rinsing and disposal. 2.46

Pesticide Service Containers. As defined by the Department of Food and Agriculture, a service container is any pesticide container, other than the original labeled container, that is used to store, 2.47

hold, or transport a pesticide or a use-diluted pesticide.

Each service container must carry the following labeling:

- * Name and address of the person or company responsible for the container.
- * Identity of the pesticide (common name or product name). If it is a use-diluted pesticide, the word "diluted" must precede the name.
- * A signal word from the original label ("Danger," "Warning," or "Caution").

Pesticide Spills. Spillage of a pesticide or other hazardous material can rapidly become a major health or environmental problem. Whenever a spill occurs, immediate corrective action must be taken, regardless of the type of toxic substance or the amount spilled. The first priority is to give first aid and further medical attention to persons who were exposed to the pesticide. After that, the incident must be reported and the area must be decontaminated. Under no circumstances should pesticide spills be hosed down.

2.48

Contact the local county agricultural commissioner's office for specific requirements for spill cleanup.

The importance of a balanced vegetation management program that preserves the environment without sacrificing the Integrity of flood control structures can't be overemphasized. Natural or planted vegetation on or near project levee slopes can significantly enhance the effectiveness and appearance of a project. When properly managed, vegetation deters surface erosion from rain and runoff. The preservation of vegetation, especially in acquired easement areas, is essential to the management of the flood control project.

However, uncontrolled growth can interfere with routine maintenance and inspections, inhibit flood fight activities, and provide a haven and food sources that attract burrowing animals. Also, when large trees are toppled by wind, disease, or old age, they often dislodge broad areas of protective sod and earth and may divert water into a levee section.

Standards for vegetation control on landward levee slopes differ from those for water ward levee slopes, berms, and overflow areas. Vegetation characteristics, species, and methods of management may vary, depending on the area and soil conditions. Burning) mowing, dragging, spraying, pruning, brush-cutting, and planting are all effective vegetation management tools.

When a levee vegetation management program is being planned, several factors should be considered. Levee slopes must allow visibility for regular maintenance inspections and high-water patrolling. Levee personnel must be able to readily detect trouble spots from the crown roadway. No vegetation should be allowed to grow within 10 feet of the landside toe of the levee because this is where boils and excess seepage are most likely to occur, also, both landside and waterside toes are often used as access points for maintenance.

Levee slopes should also be kept free of large areas of bunched, woody, or clumped vegetation that would interfere with flood fighting or emergency repairs. Agricultural pruning and other debris are special targets for removal because they attract burrowing rodents. Crown roadways must be kept free of vegetation, and they should be graveled to provide a sound, drivable surface during floods.

Burning

3.10

Controlled burning of vegetation on levee slopes is an effective method of improving visibility for levee inspection and maintenance. However, in recent years, to minimize air pollution, municipalities and counties have adopted stringent burning regulations. Burning has been banned in some areas, especially in urban areas where air pollution is now recognized as a serious and growing problem. Where burning is permitted; the operation is normally scheduled in July and August when the grasses are thoroughly dry, the game bird hatch has been completed, and most nearby crops harvested. Local air pollution control boards are empowered to designate certain hours and days as suitable for agricultural burning.

On days when burning operations are scheduled, the foreman or other person in charge calls the local air pollution control board for clearance and, if permission is obtained, notifies the fire district

3.10
(Cont.)

having jurisdiction in the proposed burn area (see Sec. 2.15).

Because of the risks involved, a supervisor usually oversees extensive burning operations. The amount and type of equipment used and the size of the crew may vary in relation to the size of the area to be burned and conditions on and near the burn site. As an example, a major operation may include a 12-worker crew, with torch men, truck drivers, hose tenders, surveillance crews, and a water supply tank truck operator. Normally, three 500-gallon water tanks mounted on flatbed trucks, with appropriate hoses and pumps, are used to control the intensity and range of the burn. A 150-gallon water tank mounted on a four-wheel-drive pickup truck is used for surveillance and emergencies. When available, a 4,000-gallon tank truck stands by to refill the fire trucks. The supervisor drives a pickup truck carrying torch fuel and other supplies and directs the operation.

The fire should not be allowed to approach flammable structures. All such structures in or next to the area to be burned should be monitored after they have been chemically fire guarded or soaked with water. Wherever practicable, firebreaks should be placed at the toes of the levee to prevent the fire from spreading to adjoining areas.

All fires, including smoldering debris, must be entirely extinguished before the last employee leaves the burn site.

Mowing

3.20

Mowing levee slopes is an effective alternative where burning is either prohibited or would create an undue hazard to adjacent property or vegetation. Standard levees with uniform surfaces, few encroachments) and slopes no steeper than 2 feet horizontal to 1 foot vertical are ideal for mowing.

The usual procedure is to mow the levee shoulder and a strip 4 feet on the upper part of the levee with a flail mower. A mower with a telescope boom and rotating mowing head is usually enough to mow slope surfaces up to 30 feet wide. Where a 10-foot right of way is available, slopes can be mowed from the levee toe. A push-type power mower or weed-eater is also beneficial for some irregular conditions. A mower operating in dry vegetation is a fire hazard. If the cutting blade strikes a hard object, creating sparks, the vegetation can be ignited. For that reason, a small water truck should be available.

Spraying

3.30

The use of herbicides to manage vegetation and control weeds can be extremely effective and economical. The wide variety of spray

possible for many maintenance activities.

Permits must be obtained for some herbicide applications, and all safety regulations, including those involving the use of protective gear, must be strictly followed. Care should be taken to prevent spray from drifting into non target areas. Only herbicides that do not vaporize readily should be used.

Broadleaf Selective. Many levee slopes are managed to encourage a solid cover of naturally occurring grasses. Broadleaf weed species on a grass-covered slope tend to be spiny and very tall, and obscure visibility, prohibits access, or otherwise interfere with maintenance and inspection. Broadleaf weeds can be eliminated from desirable sod by broadleaf selective herbicides. Several of these herbicides are also residuals, which means they are incorporated into the soil by rainfall and remain active for some time. Application rates of broadleaf selective herbicides must be closely followed. At higher rates, many of these herbicides will also damage or kill desirable grasses and young trees. These herbicides vary in time of application and the broadleaf species they kill. Special care is needed to keep these materials from reaching desirable vegetation. The county agricultural commissioner's office can supply specific recommendations. 3.31

Bare Ground. Some levee areas, including crown roadways, access points, toe roads, and fireguards, are usually kept free of any vegetation. Nonselective residual herbicides are an economical means of keeping an area free of vegetation for an extended period. Generally, the higher the application rate, the greater the number of species affected and the longer the period of residual activity. Extreme care should be taken to keep these material from drifting into areas where vegetation is desired. Careless applications can create large bare areas of ground that is susceptible to erosion. Careful applications can protect flammable structures from accidental or controlled fires, allow gravel reclamation and roadway maintenance, and make safe travel possible on roads, especially in wet weather. 3.32

Spot Treatment. Spot treatment of weeds is used in a variety of situations where the low density of the target species does not warrant a broadcast application or where the area is inaccessible or otherwise unsuitable for broadcast equipment. 3.33

Spot treatment is often used with residual herbicides for fire-guarding around structures (Sec. 3.32). It can be used to target a specific weed pest such as Johnson grass or to touch up areas that have been specially sprayed with a broadcast application. The choice of a specific herbicide or combination of herbicides depends on the target species and the area to be sprayed. Contact, residual, and translocating herbicides can all be used for this type of work.

(A translocating herbicide is one that moves through a plant into the roots.) The county agricultural commissioner's office can make specific recommendations.

Small-scale spot applications may only require a hand-held pump sprayer, while larger applications could require use of a truck-mounted spray unit with a hose and reel. Since spot applications are generally limited to small, precisely defined areas, special care is 3.33

(Cont.)

needed to minimize drift, especially with high-pressure spray rigs.

Brush and Vines. Brush and vines growing on levees obscure the slope, creating serious inspection problems. Low, dense, and entwined vegetation can prevent routine or emergency access, impede flood flows, divert currents) or plug pumps and drains. Where permissible, the use of herbicides to control brush and vines can be extremely effective, often more so than mechanical clearing, which may stimulate regrowth or break up existing plants into many new plants.

3.34

Spot spraying is generally the application method used to control vines (Sec. 3.33). To completely kill the unwanted plants, a translocating herbicide is necessary. Contact herbicides or incorrectly used translocating herbicides will kill only the above-ground part of the plant, resulting in substantial regrowth in the following season. Special attention should be given to correct timing of application and to obtaining thorough spray coverage. The addition of an Inactive water-base dye can assist spray applicators to achieve uniform spray coverage. Poor coverage is likely to result when plants are dormant, stressed by drought, or covered with dust.

Larger trees can be controlled by cutting them down and immediately spraying or painting the stump with a concentrated herbicide registered for such use.

Where all other options have been exhausted, aerial application of herbicides to control brush over large areas can be considered. This procedure usually requires applying for a 24C Special Local Heed Permit from the California Department of Food and Agriculture. The product manufacturer and all other regulatory agencies must concur before this type of application can be approved. Spray drift from an aerial operation must present no hazard to humans, fish, wildlife, water, or adjacent property.

Federal law (the Endangered Species Act) prohibits the taking of threatened and endangered species without permission of the Endangered Species Office (ESO) of the U.S. Fish and Wildlife Service. Contact the Corps of Engineers, the Fish and Wildlife Service, or the Department of Fish and Game to determine what is endangered.

SECTION 4

PROJECT MAINTENANCE OPERATIONS

Basic maintenance programs related to federal flood control project facilities are required by the Corps of Engineers. Inspected by the

Department of Water Resources, enforced by The Reclamation Board, and carried out by local agencies and the Department of Water Resources.

Host maintenance practices in use today have been modified over the years to meet the increased emphasis on preserving ecological and environmental values. Although maintenance costs have risen, the integrity of the flood control system has been preserved and the environment improved.

The maintenance programs most profoundly affected by environmental considerations include channel clearing rodent control, and vegetation management on or next to project levees, berms, and overflow areas being developed for project mitigation under The Reclamation Board's jurisdiction. Maintenance activity in revegetation and other mitigation areas require special care. This section contains guidelines for specific maintenance operations. Further directions appear in the Board's Guide for Vegetation on Project Levees.

Crown Roadways

4.10

Keeping levee crown roadways, ramps, and State-maintained access roads serviceable are the objective of the crown roadway program. Essentially, the work involves grading and graveling unpaved road surfaces.

A road maintainer (grader) with a 12-foot moldboard is best suited to smooth the road surface, to minimize ponded water, and to recover gravel displaced by traffic. On crown roadways where heavy traffic has compacted the surface so much that grading causes excessive wear of the blade, scarifying may first be required to loosen the surface. Scarifying the roadway before replenishing the road rock also enhances the bonding of old and new surfacing materials. Road surfaces should be crowned (gradually sloped from centerline to shoulder) to ensure proper drainage.

Dust created by levee crown maintenance and repair work can be a nuisance to nearby residents. It can also damage certain crops growing nearby. Workers should use care during these operations. Some crown roadways require more frequent maintenance than others, principally because of the heavier traffic load they carry. All levee roads, however, should be graded at least twice a year. In the fall after the first rains, and in late spring, before the levees begin drying out and getting dusty, are opportune times for this operation.

Grading of crown roadways is usually a one-person job. While the work is being done; the equipment can be parked overnight in a convenient nearby location, provided the site is secure and the property owner grants permission to use it. If such an arrangement is not possible, the equipment should be returned to home base or the maintenance yard. The operator of the equipment is required to take

4.10

(Cont.)

reasonable security precautions when not in attendance at the unit, The operator is provided a pickup truck to travel to and from the job site and to haul lubrication and service equipment. A portable two-way radio with a range of at least 25 miles should be provided for emergencies.

Operators of road grading equipment are required to wear hard hats. Safety glasses, masks, and gloves are optional but recommended.

Vegetation Management on Crown Roadways. Uncontrolled growth of weeds and grasses on crown roadways may become a maintenance problem. Dense vegetation prevents the grader from operating effectively. Nonselective residual herbicides are generally used to control weeds on crown roadways. Roadways should be sprayed only after grading is completed. (See Sec. 3.32 for information on controlling weed growth on crown roadways.) 4.11

Appropriate permits must be obtained before crown roadways are sprayed (see Sec. 2.16).

Fire guarding. Structures or other facilities occupying parts of a flood control project must be protected from fire, both accidental and controlled. Removing flammable debris and wild growth from the immediate area is an important fire prevention procedure. Structures must be guarded before or during the early stage of vegetative growth. (See Secs. 3.32 and 3.33 for additional information on the use of herbicides for fire guarding,) 4.12

Levee Slopes and Rights of Way 4.20

Levee slopes should be free from nonessential structures, encroachments, or vegetative growth that could interfere with or prevent inspection or hamper flood fighting activities.

Vegetation Management on Levee Slopes. All earthen levees must have some sort of erosion protection and yet permit inspection and flood fighting. Sod-forming grasses and ground covers provide the desired protection without interfering with these activities. In some circumstances, The Reclamation Board also permits certain trees and shrubs to grow on levee slopes. (For specific requirements regarding permissible vegetation, consult the Board's Guide for Vegetation on Project Levees.) Broadleaf weeds growing among desirable grasses can be effectively controlled by selective herbicides (see Sec. 3.31). 4.21

All levee slopes need thorough periodic inspection for soil erosion; animal burrows; weed infestation; diseased, weak, or damaged trees; and other undesirable growth. Frequency of inspection depends on the nature and location of each levee. Regular mowing or burning enhances inspection. Special care should be taken to protect mitigation areas from mowing and burning. (See Sec. 3 for vegetation management on levee slopes.) 4.21 (Cont.)

Levee slopes are vulnerable to burrowing rodents » primarily ground squirrels. (See Sec. 5 for control of rodents.)

Dragging. Dragging of levee slopes is a multipurpose operation that helps ensure the integrity of a levee system. It is generally done by pulling a heavy dragging implement, such as a discarded track from a track laying tractor, with a heavy-duty track-laying engine. The drag is rigged with cable controls so the operator can regulate its angle and reach.

4.22

Dragging repairs minor surface erosion or irregularities, preventing more serious erosion. However, disturbing the soil stimulates the growth of weedy plants. OWR personnel schedule broadleaf selective spraying with a pre-emergent herbicide for the fall, following dragging operations (see Sec.3.31).

Hard hats, safety glasses, ear plugs, and a breathing mask are required protective gear for this operation.

Care is needed to avoid removing trees and shrubs that do not interfere with levee inspection. In areas containing elderberry shrubs, coordination with the Endangered Species Office, U.S. Fish and Wildlife Service, is required.

Channel Clearing

4.30

A channel is the entire area of a waterway from the top of one bank to the top of the opposite bank. The general category includes drainage canals, ditches, and sediment settling basins.

River channels and floodways are rated and designed to carry specific anticipated peak flows. Accumulated silt and wild growth, if not controlled, can lower flow capacities and impede flows, causing water to rise above intended levels. Such obstructions may also divert flows, eroding banks or levees.

The Corps of Engineers is responsible for periodically dredging navigable channels to remove silt and snags and for removing aged trees deemed to be potential hazards to navigation.

Local agencies and the Department of Water Resources are responsible for clearing channels of excess debris, brush, and other harmful vegetation. One method is to uproot and pile the vegetation with a medium or large bulldozer with a brush rake attachment. A dragline may be better under certain conditions. Piled vegetation must be removed from the floodway before flood season. Where permitted, burning is the most convenient disposal method. (The Department of Fish and Game and The Reclamation Board are the principal permitting agencies.)

An alternative method and one that is generally more acceptable, is selective cutting with hand tools, including chain saws. Woody growth of selected species less than 8 inches in diameter can be disposed of with a chipper or "brush hog." Spreading and disposal of chips is regulated by the Department of Fish and Game. Personnel of the California Conservation Corps are often available to conduct selective clearing work at low cost. DWR's Flood Project Analysis Section can assist in project design. Permits for channel clearing

4.30

(Cont.)

operations are discussed In Sec. 2.14.

Unless soil and plant roots are also removed, mechanical control provides only a short-term solution to brush problems. Removal of above-ground plant material stimulates regrowth and suckering in most brush species often resulting In a heavier stand than originally existed.

Where permitted, translocating herbicides can kill above-ground and below-ground plant parts, eliminating or greatly reducing regrowth. Spraying brush in channels without suitable access usually requires a tractor and a trailer-mounted storage tank with a high-pressure pump. Where channels are narrow or where there is improved access, it may be possible to use traditional spray equipment fitted with a long hose. Where all other options are regarded as ineffective, the aerial application of herbicides can be considered. Except as specified on the pesticide container label, special care must be taken to prevent drift or contamination of waterways <see Sec. 3. 4).

Safety practices and gear requirements for channel clearing are the same as those for heavy equipment operation and the handling, use, and disposal of toxic materials. Hard hats, safety glasses, and ear plugs are required for operating chain saws, tractors, and chippers. Consult the pesticide label and also see Sec. 2.22 for recommendations and requirements on the use of specific protective clothing to be worn while handling pesticides.

Drainage Facilities

4.40

Drainage ditches, canals, and settling basins are essential parts of flood control operations and must be periodically inspected and maintained. The flow capacity of drainage facilities can be impaired by undesirable vegetation and built-up silt deposits, primarily from bank sluffing. These facilities can function effectively and safely only when silt and excess growth are periodically removed with a dragline or other suitable equipment. Aquatic herbicides can be used to help control undesirable vegetation. (See Sec. 3.33! also, consult the county agricultural commissioner's office for recommended materials.) Heavily eroded banks should also be resloped and/or revetted with rock, when needed.

Overhead power lines and underground lines carrying communications, natural gas, oil, or water can endanger channel clearing operations. Most of these hazards can be identified by markers or warning signs. Specific information about location and depth of service lines can be obtained by calling Underground Service Alert (1-800-642-2444).

Control Gates and Culverts. Concrete passageways or corrugated metal pipes of varying diameters equipped with manual or automatic flood control gates are situated at appropriate sites in the flood control project. If these facilities malfunctioned, particularly during high-water conditions, flooding could occur in some inhabited or farmed areas. Therefore, normal maintenance of these structures includes keeping the intake and discharge areas free of constricting debris, silt, and wild growth, and Inspecting and testing the performance of the control mechanisms. Slide or flap gates must

4.41

be inspected and tested in the early fall before high water occurs.

Minor Structures

4.50

This category includes mile markers, gates, barricades, and miscellaneous signs. (See Figures 1 - 7, following Sec. 4.67.)

Mile Markers. Mile markers are signs installed on the levee shoulder at half-mile intervals to identify unit designations and levee miles. The markers are seven-foot metal posts with anchors and plates. The posts are driven or set in concrete to a depth of three feet, and the plates are welded to the tops with their faces perpendicular to the levee centerline so they are visible to traffic in either direction. Reflectors fastened to the plates make the markers easy to find when visibility is poor.

4.51

Maintenance of levee mile markers consists mainly of replacing reflectors and damaged plates and keeping signs clean and readable. Vegetative growth that hides the signs from view should be kept clear, either mechanically or with herbicides (see Sec. 3.33).

Gate, Barricades, and Signs. Gates, barricades, and miscellaneous signs are installed to prohibit or discourage unauthorized traffic from using flood control project facilities. Trespassing and vandalism have increased markedly in recent years because of the rise in popularity of recreational vehicles and expansion of housing and Industrial developments.

4.52

Gates on the crown roadway and barricades that extend down levee slopes and across berms are usually effective protection against unlawful entry by motor vehicles. An underlying property owner who needs even greater security may apply to The Reclamation Board for a permit.

Maintenance of gates) barricades, and signs consists mostly of keeping them in good appearance and working properly, including their locking systems. Periodic washing, painting, straightening, and replacement of reflectors is general maintenance requirements. Visibility must be maintained by eliminating tall vegetation, either mechanically or with herbicides (see Sec. 3.33). Accurate records of the date, time, and type of maintenance performed must be kept to protect the maintaining agency in the event of litigation. (See Figure 7, "Minor Structure Maintenance Report," following Sec. 4.67.)

An acetylene torch or arc welder may be used to Install and repair gates, barricades, and signs, but because of the fire danger, precautions must be taken. A torch or welder should never be used near dry vegetation or when unusually hot or windy conditions exist. At all times, their use should be backed up with a minimum of firefighting equipment: shovels, rakes, appropriate extinguishers) and a supply of water with means of delivering it to a blaze.

4.52
(Cont.)

State and local standards for positioning of Signs, the distances

before the signs are legal. Because regulations and codes vary from area to area, it is best to contact the city or county public works department having jurisdiction. DWR uses signs referring to the State Vehicle Code, Sec. 2116.

Mitigation Measures. Where mitigation and enhancement measures are provided to protect fish and wildlife, endangered species, or other environmental values, care should be taken to avoid harm to these features and to maintain them and any special markings, protective features, etc., as they were installed. These measures are becoming more widely known and installed in connection with federal and state projects as a result of permits from the Corps of Engineers. (See Figures 1 - 7 following Sec. 4.67.) 4.53

Major Structures 4.60

A number of flood control facilities are essential parts of the Sacramento and San Joaquin Rivers flood control projects. These include fixed weirs; control weirs; pumping plants; and diversion, drop, and outfall structures.

Fixed Weirs. A fixed weir designed for flood control functions as a section of a levee. Its crest is at a selected elevation, usually original ground level. The purpose of such a fixed weir is to relieve pressure on a levee system by allowing excess flood water to escape into bypasses or designated drainage basins when river stages begin rising to threatening levels. Fixed weirs allow no discharge to occur until the water level exceeds the weir crest. Fixed weirs are usually built of reinforced concrete, but they may also be built of stone, quarry rock, cobbles, or other suitable material. 4.61

Maintenance of fixed weirs usually requires periodic removal of such obstructions as undesirable vegetation, debris, and silt deposits on the water ward side and clearance of debris from the stilling basin or spillway to permit uniform flow into the escape route. A weir should also be regularly inspected for evidence of spalling or cracking and for exposed reinforcement bars in abutments or wing walls.

Undesirable vegetation should also be removed from the downstream revetment. Where handrails or walkways are present, they should be regularly inspected to ensure that they are safe and meet safety regulations. Where a county or State highway or a railroad is an Integral part of the flood control structure, the maintenance responsibilities are defined in a separate agreement with the agency concerned.

Control Weirs. Control weirs serve essentially the same purpose as fixed weirs. That is, they permit excess water to escape into a bypass system when high river stages occur. Control weirs, however, are designed to release additional flows through a series of control gates to reduce the stress on levee systems, when needed. 4.62

Proper operation of control weirs is considered vital to the safety of residential, industrial, and agricultural property near and downstream from the facility. Operational guidelines are dictated by the the Corps of Engineers and must be rigidly adhered to.

Removal or leveling of silt deposits, debris, and undesirable vegetation between the river and the structure are essential maintenance activities. The spillway should also be freed of obstructions and the concrete bulkhead and superstructures kept in good repair. Diagrams and maintenance procedures for the control mechanism and a record of maintenance performed should be filed and made readily available for inspection at the headquarters of the operating and maintaining agency. Erosion in the discharge area of the control structure can be expected to occur as gates are opened for flood control. Turbulence created by the volume and velocity of water rushing through the aperture may have a scouring effect.

Whenever the gates of the Sacramento Weir are opened, the event must be documented. The gates are opened and closed under the direction of the Flood Center.

Diversion Structures. Fixed controllable diversion structures divert water from the main channel for flood control, irrigation, or other needs. Accumulated silt, gravel, and debris on the upstream side can restrict flows and interfere with the effectiveness of the structure. 4.63

Maintenance involves removing all obstructive materials, including undesirable trees and wild growth, from the upstream and downstream sides of the structure. The condition of the concrete should be periodically noted and appropriate repairs made. The control gate mechanism should be regularly tested and adjusted to ensure proper operation. Special attention must be given to discharge pipes where obstructions could be present but are not readily visible.

Pumping Plants, A pump or a series of pumps with a wide range of capacities is used to draw excess water from drainage systems and discharge it into the main channel. Steel trash racks are installed to protect the pumps by preventing materials large enough to damage them from entering the intake sump. At some stations, a log boom supplements the function of trash racks. 4.64

All trash, including built-up sand and gravel, must be removed from the area of the log boom, the trash rack, and the gravity discharge pipe or channel before the high-water season begins. Just as important, when the pumps are active, debris captured by intercepting structures must be removed, either by hand tools or mechanical means, before the accumulated materials can clog the system.

Wing walls, bulkheads, splash aprons, and the superstructure are made of reinforced concrete that is subject to cracking and spalling and exposure of the reinforcement bars. Repairs should be made as early as possible. 4.64 (Cont.)

A maintenance guide and inspection check list is located inside each control structure. The superintendent should acquaint himself and all authorized maintenance personnel with the operation) housekeeping, and maintenance procedures for the facility.

Outfall Structures. Outfall structures are multipurpose features 4.65

that are usually situated in a drainage canal or channel near its confluence with a main river. A series of mechanized discharge pipes or slide gates are incorporated into a reinforced concrete barrier that, when closed, prevents flood water in the river from backing up into the drain system.

The gates can also be operated to maintain desirable levels in the drainage system to meet irrigation needs or to release excess flood water into a bypass system.

Trash gates and/or log booms are positioned on the upstream side of the control gates to prevent debris from fouling their operation. When debris begins to collect in the area, it must be removed immediately. At some facilities, a debris boom is installed for this purpose. Revetment on both sides of the structure should be kept clear of undesirable vegetation and an unobstructed passageway maintained.

The concrete superstructure should be inspected regularly and cracks and spalls patched. The metal works are also subject to some battering, and breaks or distortion can be expected to occur. Such conditions can be corrected by straightening or welding the damaged area. The electrical or hydraulic system should be inspected and tested frequently by a qualified employee.

Bridges and Roads. The superintendent's responsibilities for county or State bridges and roads that cross a federal flood control waterway include inspection, reporting, and maintenance. When a condition is noted that would affect the safety of the structure or the functioning of the flood control works, it should be reported as a matter of courtesy to the agency responsible for it. 4.66

Drop Structures. The purpose of a drop structure is to stabilize a channel by holding flow velocities below the point of scouring. 4.67

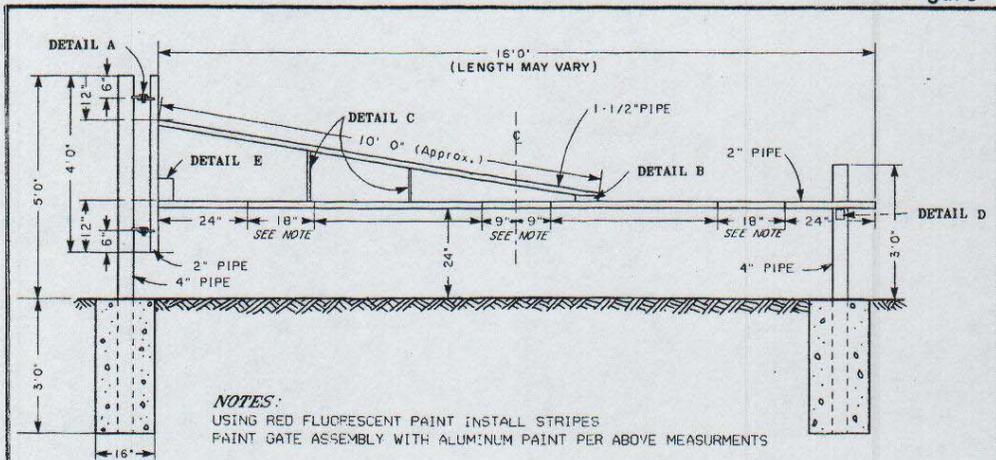
Drop structures are built of reinforced concrete, with wing walls, a crest or headwall, a spillway apron-slab, and end Sills. Revetted slopes on the upstream and downstream ends are essential parts of the facility. Drop structures with headwalls that extend above the invert of the channel have drain ports to prevent ponding of water on the upstream side of the structure. The ports must be kept free of material that would restrict flows.

General maintenance of a drop structure requires removal of any accumulated trash and debris from the intake area of the facility. Silt and gravel deposits in and about the stilling basin should also be removed after each high-water event. Undesirable growth impairs the chief function of the revetted area. It must be eliminated, either mechanically or by the use of herbicides. 4.67 (Cont.)

The reinforced concrete work should be periodically checked for cracks, spalling, and rebar exposure, and repairs should be made at an early opportunity.

Some drop structures are equipped with a wooden gate or a cable-supported barricade designed to prevent livestock and other animals from falling into the drop basin. These protective devices should be kept in good repair.

Figure 1



MATERIAL LIST		
ITEM	UNIT	QUANTITY
CONCRETE	C.F.	8
4" STEEL PIPE	L.F.	14
2" STEEL PIPE	L.F.	20
1-1/2" STEEL PIPE	L.F.	10
GATE HINGES	EA.	2
POST HINGES	EA.	1
WEB PLATES	EA.	2
GATE REST	EA.	1
SGN HOLDER	SET	1
MILE MARKER	EA.	2

MATERIAL LIST		
ITEM	UNIT	QUANTITY
0/7 HARDENED CHAIN	L.F.	20
3/4"x2" MACH. BOLT	EA.	2
3/4" NUTS	EA.	2
ROAD CLOSED SIGN	EA.	1
MACH. SCREWS	EA.	4
AMBER REFLECTOR	EA.	2
ALUMINUM PAINT	GAL.	1
3" BRUSHES	EA.	2
FLUORESCENT PAINT	QT.	1
MASKING TAPE	ROLL	1

STANDARD PIPE GATE
MANUFACTURED AND INSTALLED

NO SCALE

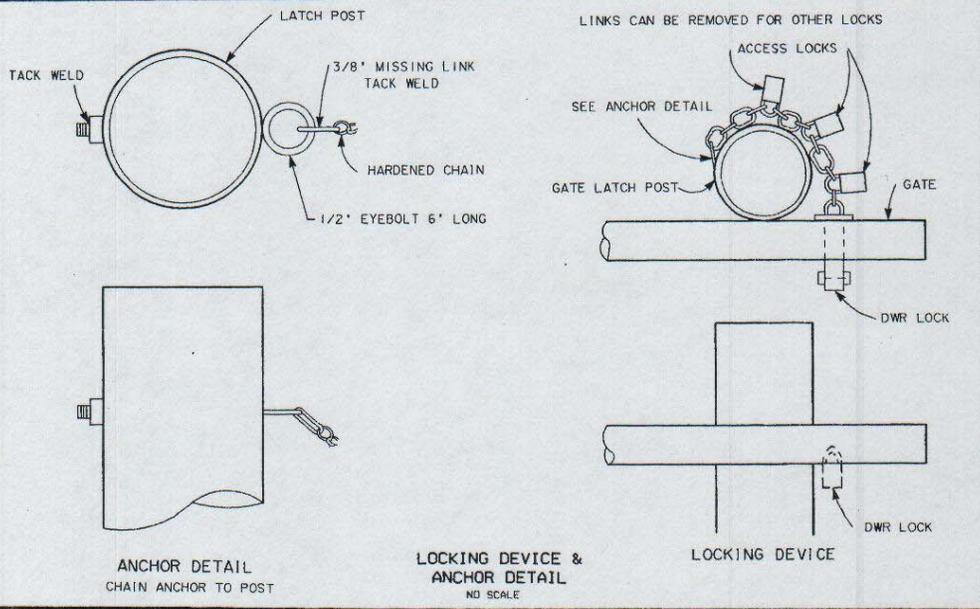
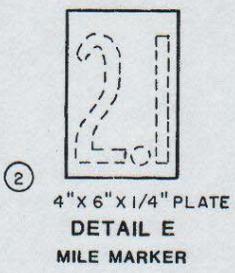
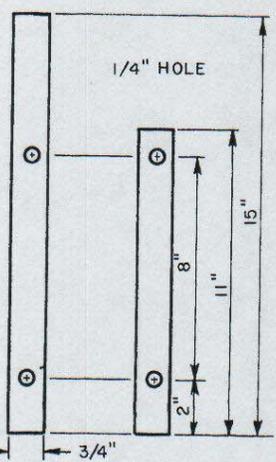
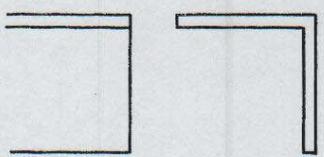
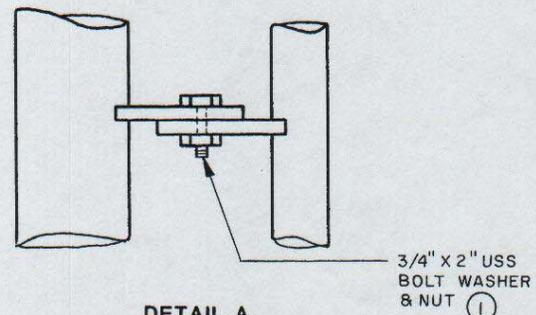
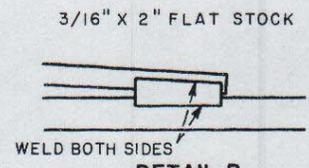
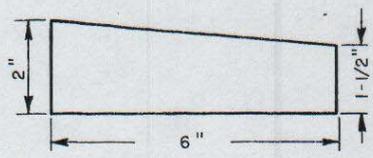
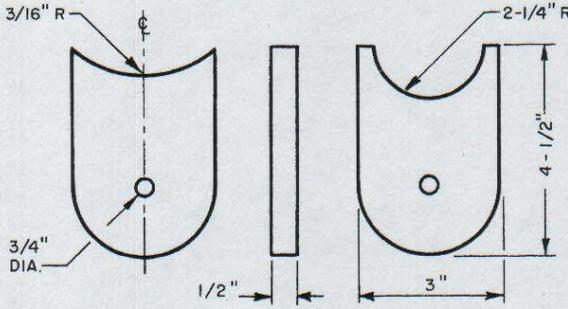
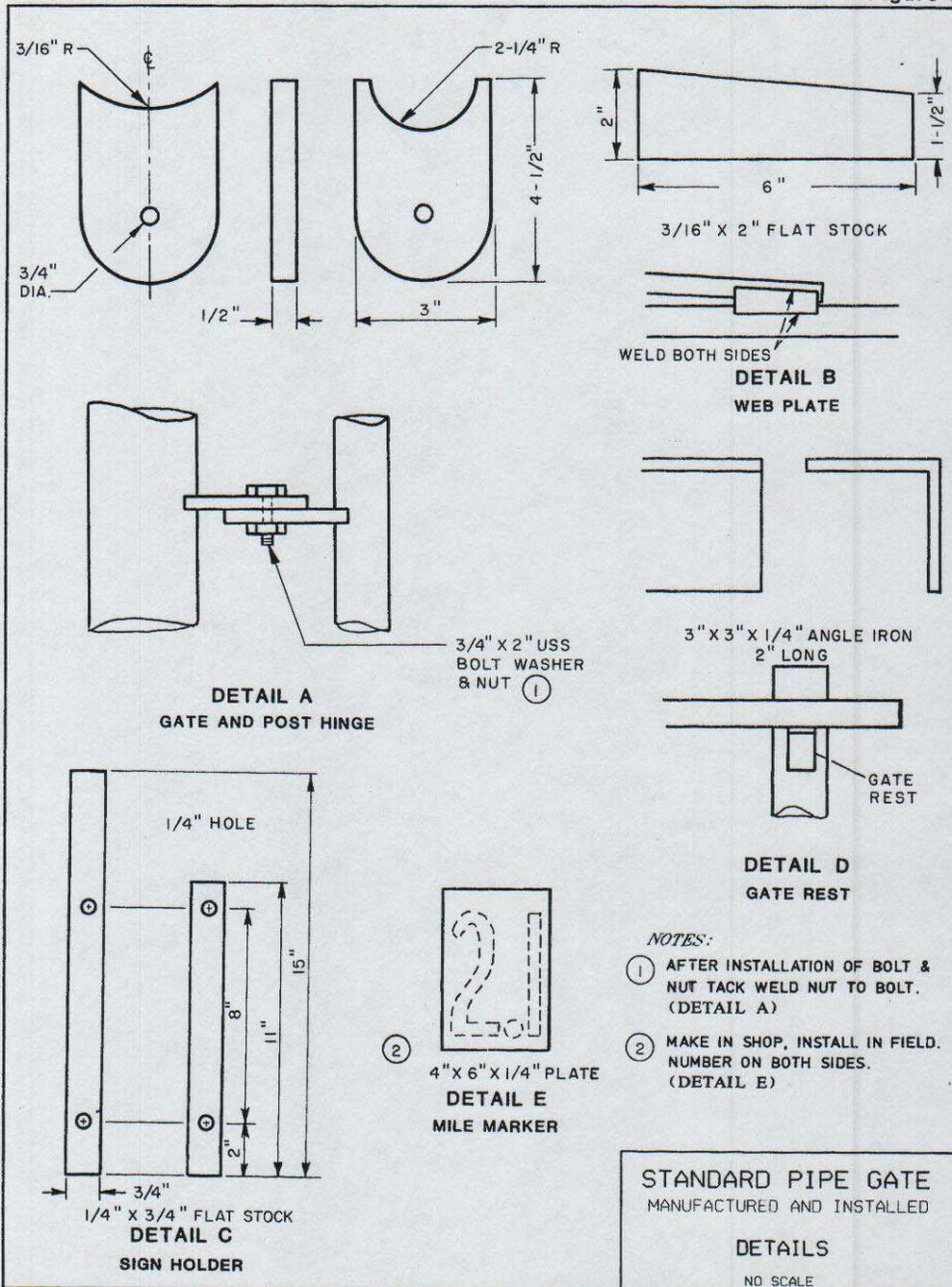


Figure 2



NOTES:

- ① AFTER INSTALLATION OF BOLT & NUT TACK WELD NUT TO BOLT. (DETAIL A)
- ② MAKE IN SHOP, INSTALL IN FIELD. NUMBER ON BOTH SIDES. (DETAIL E)

STANDARD PIPE GATE
MANUFACTURED AND INSTALLED
DETAILS
NO SCALE

Figure 3

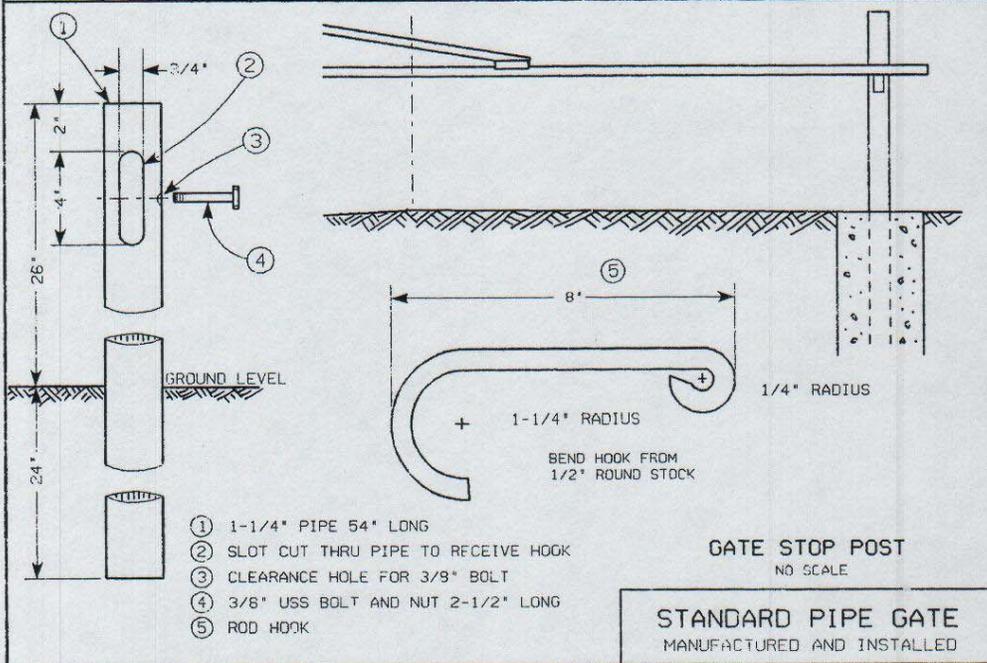
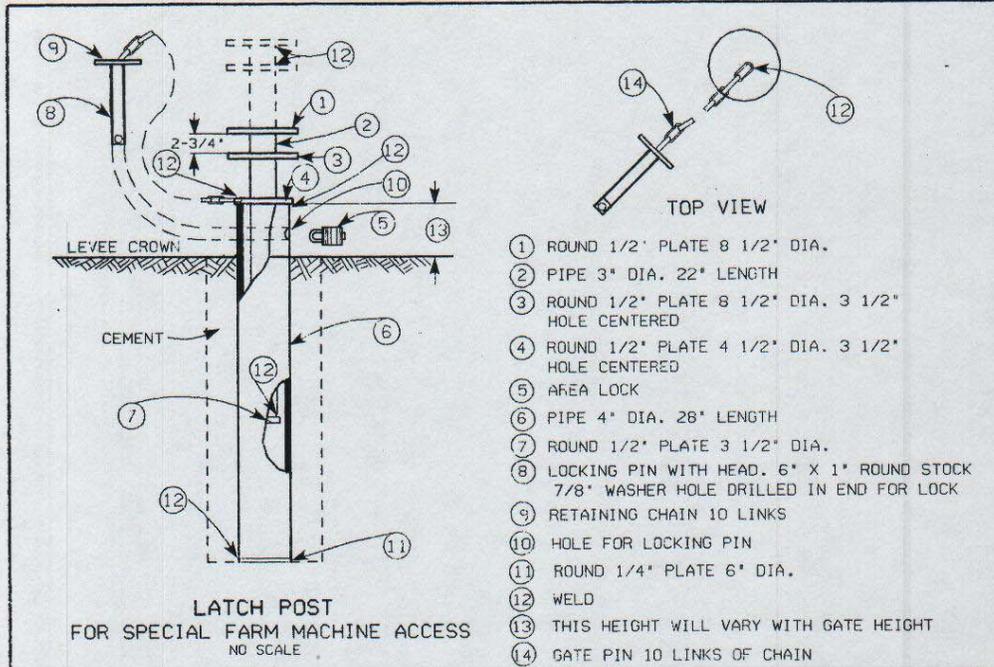


Figure 4

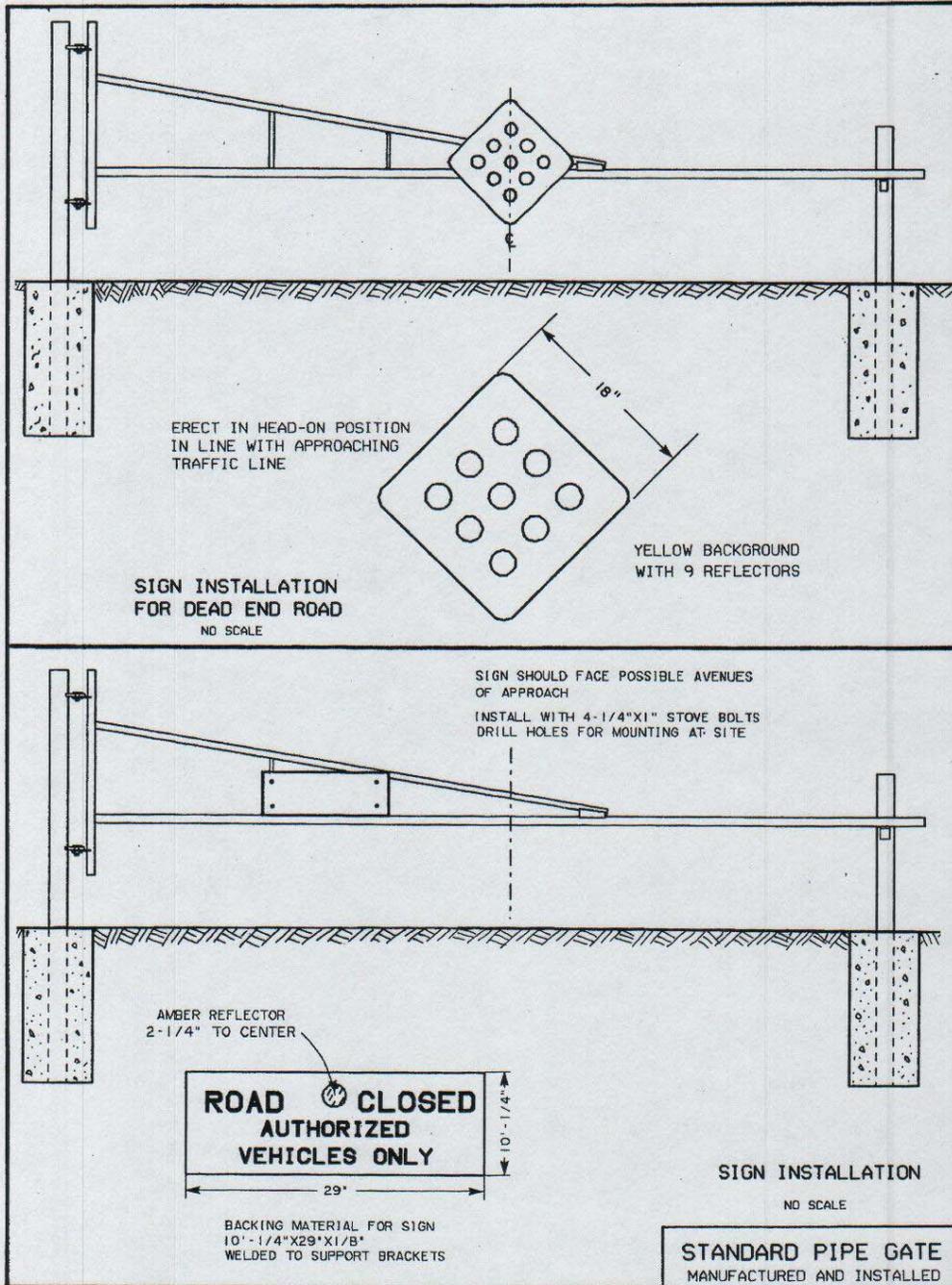


Figure 5

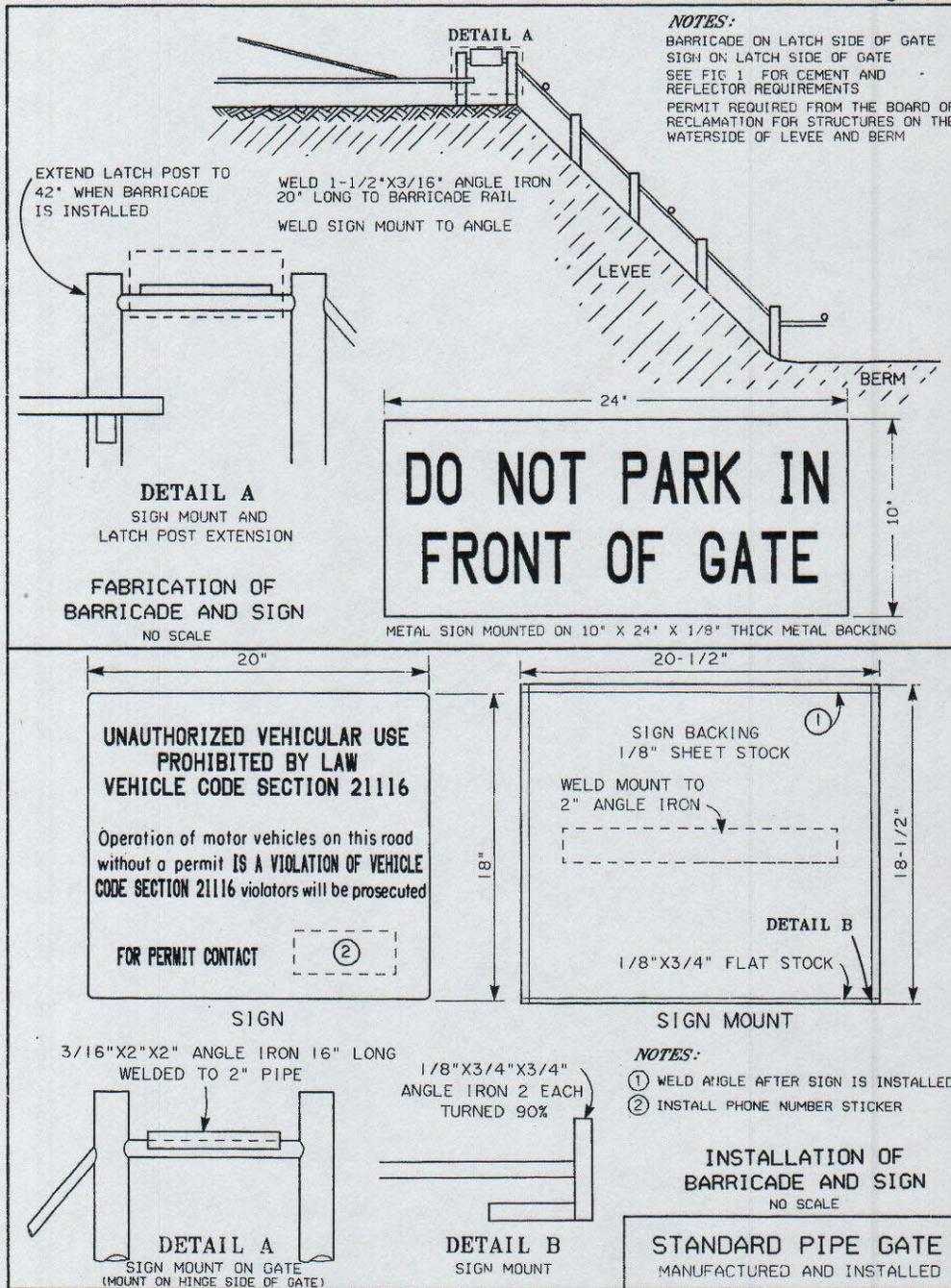


Figure 6

NO TRESPASSING
UNAUTHORIZED TRESPASSING
IS A VIOLATION OF PENAL
CODE SECTION 602(o)
VIOLATORS WILL BE CITED

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

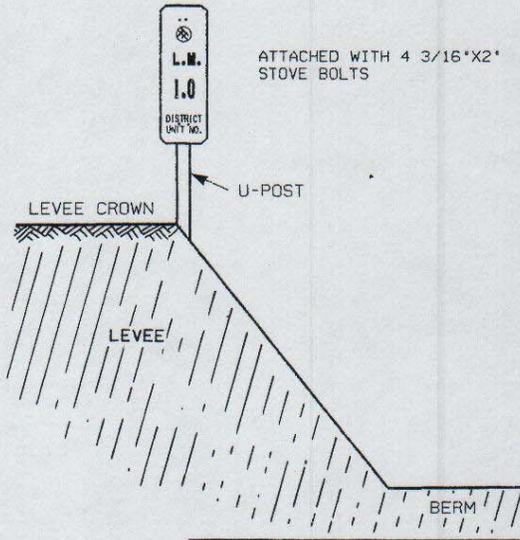
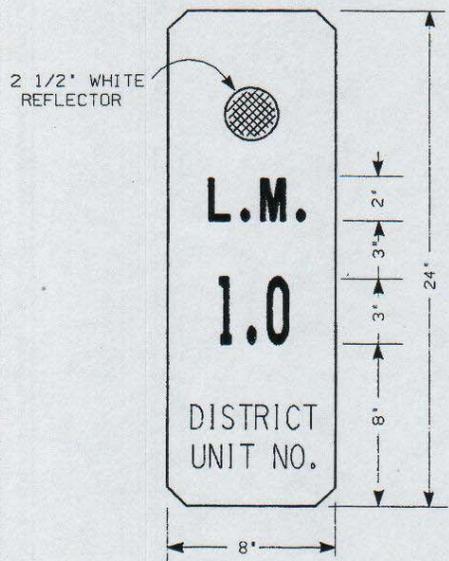
SACRAMENTO BY-PASS
PROPERTY OF
STATE RECLAMATION BOARD

**TRESPASSING
OR
LOITERING**

IS FORBIDDEN BY LAW
PENAL CODE SECTION 555
FOR INFORMATION CALL

STANDARD PIPE GATE
MANUFACTURED AND INSTALLED

SIGNS IN USE
NO SCALE



SIGNS TO BE INSTALLED AT 0.5 AND
1.0 MILES WATERWARD LEVEE SHOULDER

STANDARD
LEVEE MILE MARKER
NO SCALE

SECTION 5

RODENT CONTROL

Ground squirrels and other burrowing rodents can threaten the structural integrity of levees and other flood control structures. When these animals remove material by burrowing, they reduce the structure's ability to contain flows.

Ground Squirrel Control

5.10

The presence of ground squirrels or their burrows on a levee crown, slope, or toe always warrants control measures. Because of their high reproductive potential and extensive burrow systems, ground squirrels present a serious hazard to levees and, to a lesser extent, to other project facilities. Their burrowing loosens the soil, increasing the risk of erosion and sloughing. Also, a burrow can act like a pipe to carry floodwater into and through levee sections.

Ground squirrel densities tend to be higher where an attractive food source such as walnuts or ether seed crops are present.

Rodent Control Techniques

5.20

Areas with high-density ground squirrel populations may require reducing or removing vegetation so that burrow damage can be assessed and control work more easily achieved.

Various rodent control techniques are available. Use of these at the proper time of the year will increase their effectiveness and minimize certain problems, such as bait shyness, poor control, and non target kills.

Timing is critical to the success of any rodent control program. Control efforts should be aimed at achieving at least a 90 percent mortality. Any less than that level is likely to result in a rapid regrowth of the population.

Rodenticides used carelessly are hazardous to people, livestock, and non target wildlife. Many rodenticides are restricted use materials that require the applicator to (1) have a permit from the county agricultural commissioner's office; (2) notify the commissioner's office 24 hours in advance of the planned work (by phoning in a Notice of Intent); and (3) either be a certified "qualified applicator" or be able to demonstrate to the commissioner's office possession of a satisfactory level or knowledge of the product to be used.

Fumigation. Fumigants are toxic gases or materials that, when placed in the burrow, generate a toxic gas. A number of fumigants are available for control of ground squirrels, including carbon monoxide, gas cartridges (smoke bombs), methyl bromide, and aluminum phosphide (Phostoxin).

5.31

The most effective times of the year for fumigation are the breeding season, which occurs from February through May, and the fall, after the first rains and before the coldest weather begins. The soil should not be too dry. Soil that is excessively dry is likely to have cracks and other openings that will allow the gas to escape. The squirrels must be active (not hibernating or estivating) and must be in the burrows at the time of fumigation.

5.21

(Cont.)

The general procedure for application is to place the fumigant in the burrow. When aluminum phosphide is being used, it is followed with crumpled sheets of newspaper. The burrow is then sealed with earth. All active burrows should be treated, and all burrows, both active and inactive, should be sealed with earth. Effectiveness for all forms of fumigants can be improved by treating the burrows again in 48 hours.

Bait Stations. Bait stations are effective in eliminating any rodents that remain after fumigation or the use of acute toxicants. Because of the volume of material that bait stations require, this technique should be used exclusively for small, local ground squirrel colonies.

5.22

Bait stations are used only with anticoagulant baits. These may be formulated as loose grain, paraffin bait blocks, or pellets. The functions of the bait station are to protect the bait from moisture and dirt; to confine it to a small area, while giving the target species access to it; and to reduce or eliminate danger to children, pets, and non target animals.

To be effective, anticoagulant baits must be placed repeatedly. Bait stations must be serviced regularly and kept full of fresh bait. They should be anchored to the ground or some solid structure to reduce spillage and vandalism. They should also be posted with warning notices that displays the name of the toxicant, the concentration being used, and the name and telephone number of the maintaining agency.

Bait stations should not be used in urban areas because of the danger to children and pets and the likelihood of vandalism.

Bait Broadcasting. Bait broadcasting is the technique used to apply acute toxicants, such as zinc phosphide, strychnine, and 1080. Under certain circumstances, anticoagulant baits may also be broadcast. Ground squirrels are excellent foragers. They readily detect and pick up bait that is broadcast at the rate of three to five kernels per square foot. Non target animals are far less likely to find the bait. Bait that is distributed more densely or placed in piles may not be taken by squirrels and, because it may be more noticeable, is extremely hazardous to other wildlife, livestock, and humans.

5.23

Bait may be broadcast by hand around each active burrow (spot halting) or, in high-density areas, may be broadcast in a swath by a mechanical spreader.

Acute toxicants are lethal. Only a single feeding is needed to

5.23

achieve the desired results. If they are applied repeatedly, bait shyness or poor bait acceptance can result, thereby lowering the mortality rate.

(Cont.)

When anticoagulant bait is used, the bait must be broadcast regularly (daily or on alternate days) to ensure that the supply will last for several days.

Trapping. Small Infestations of ground squirrels or squirrels occupying areas in which it is impractical or unsafe to use fumigants or toxicants may best be controlled with traps. Both live and kill traps may be used.

5.24

Traps should be placed at the burrow entrance, on runways, or in other locations the squirrels frequent. Initially, traps should be placed unset to allow the squirrels to become accustomed to them. After a few days, the traps can be set and baited with grain, nuts, or other foods that attract these animals. Kill traps should be anchored to prevent them from being carried off by predators.

Other Problem Species

5.30

Occasionally other species such as pocket gophers, rats, beaver, or muskrats may present a flood control hazard. The problems they cause tend to be somewhat specialized, and the techniques for combating them cannot be addressed in a general discussion such as this. If any of these or other animals are suspected of causing damage, the local agricultural commissioner's office should be contacted for assistance.

EMERGENCY OPERATIONS

Superintendents of State and local agencies responsible for maintenance of federal flood control project facilities are also responsible for flood emergency preparedness. This includes training personnel in flood fighting methods and stocking flood fighting supplies.

Flood Fight Materials & Equipment Recommended for Patrol Vehicles 6.10

Powerful electric lanterns and extra batteries.
Round-point shovels (to drain ponded water on the crown roadway).
Axes or chain saws (for trees and branches that have fallen across the roadway).
A tow chain (to drag debris from the roadway or assist mired flood tight vehicles).
Highway flares (to warn of dangerous road conditions).
A set of battery jumper cables.
Tire chains.
Visquine sheeting.
Sand bags.

(See also "Flood Fight Check List" In Sec. 6.26.)

High "Water Patrolling 6.20

The Corps of Engineers requires that federal flood control project levees are patrolled when river stages exceed warning levels. To comply with the Corps' requirements, the superintendent must prepare a comprehensive patrol schedule with increasing frequency of patrolling as flood waters rise and a plan that provides for a quick emergency response.

Early detection and evaluation of a developing trouble spot is the key to protecting lives and property during high-water periods. Levee patrols are the first line of defense against levee failure at such times. Patrols must be able to deliver a high standard of performance, even when working long hours in hostile weather and under difficult conditions.

The Mobile Patrol Unit 6.21

A mobile patrol unit usually consists of a journey worker or a supervisor, assisted by an apprentice or temporary employee. One person in each unit is assigned sole responsibility for locating and reporting discrepancies in the patrol area. The two-person crew is ideal if enough workers are available. A second person means an extra pair of eyes, as well as an extra margin of safety in often dangerous situations.

A mobile patrol uses a pickup truck rigged with a lighting system 6.21

powerful enough to illuminate levee slopes during darkness. Each unit should be equipped with an installed or portable two-way radio. Because a patrol's primary responsibility is surveillance it does not normally interrupt this function, except to evaluate and mark trouble spots.

(Cont.)

Emergencies can develop suddenly, however, that may require the patrol's immediate response. For that reason, it is recommended that patrol vehicles also carry basic emergency flood fighting equipment and materials listed in Sec. 6.10.

Selecting a Sector Boss

6.22

It is a good policy, before the flood season starts, to appoint a qualified employee as sector boss of a specific sector for each 12-hour shift. The sector boss' prime responsibility is overseeing patrol operations. He also inspects reported trouble spots and recommends corrective actions, as needed. To carry out his duties effectively, the sector boss must be fully aware of all conditions in his sector, including the history of high-water problems.

Patrol Scheduling

6.23

To comply with requirements of the Corps of Engineers for high-water patrolling, the superintendent must prepare a comprehensive patrol schedule and a plan providing for quick emergency response. The schedule should allow for increasingly frequent levee surveillance from warning stage through danger stage.

Patrol schedules should be posted conspicuously at the superintendent's headquarters and a copy sent to the Flood Operations Center in Sacramento.

As a basis for an effective schedule, the superintendent should divide and subdivide his area of responsibility into zones, sectors, and walking patrol stations. The zone concept applies when more than one geographic area is involved.

Quick-Response Plan. Normally, there is ample lead time to meet the Corps of Engineers' patrol requirements when the Joint Federal-State River Forecast Center issues a flood warning bulletin. However, it is sometimes difficult to muster an emergency response crew when a crisis occurs during off hours or on a long holiday weekend. This problem can be partially solved by:

6.231

1. Frequently updating the list of telephone numbers of flood fight personnel.
2. Providing for standby vehicles, equipment, and materials that are ready for immediate use.
3. Requiring key personnel to notify their headquarters office where they can be reached in the event an emergency develops while they are out of their usual areas,

Mobile Patrols. Before leaving headquarters to patrol, a unit is given updated forecasts for tide, weather, and river stages? current and proposed changes in reservoir releases; and the radio call number and location of other units in the area.

6.241

Units should be limited to a levee reach that allows them to check both waterside and landside thoroughly at intervals of no more than one hour. As more patrols are added, inspections should be no more than one half hour apart at normal patrol speed.

The terminal point of each mobile patrol district should be clearly marked, preferably by metal posts and plates. When the point has been set, space for vehicle turn-around should be provided.

Walking Patrols. When water levels rise to near flood stage or reach flood stage, patrolling on foot may become necessary, particularly in areas with a history of high-water problems. As a rule, the current or forecast river stage dictates the extent of patrol coverage. However, wind speed and direction frequently have a profound effect on levee stability and the superintendent must take these factors into consideration.

6.242

Each patrol is given a specific area of responsibility and given empty sandbags, stakes, and shovels. The patrols report trouble spots to a sector boss or mobile patrol unit in the area. Because a foot patrol is assigned to cover a smaller area, it can provide more thorough and more frequent surveillance.

Potential or developing trouble spots will need special attention, particularly during long periods of intense rain.

Walking patrol assignments are identified by placing colored flags or other marker on the levee shoulder. The beat covered by a walking patrol should be changed as conditions change.

Reporting Trouble Spots

6.25

As soon as a potentially hazardous condition is discovered by a patrol unit or is brought to the patrol's attention, the patrol marks the location by driving a 4-foot lath into the levee shoulder near the site. The patrol then reports the location, nature, and extent of the problem. The lead man also classifies the problem as needing immediate action or only surveillance. When warranted, an identification number assigned by the command center is attached to the stake, along with other essential information. The stake should be flagged with fluorescent material so it will be visible to patrols working during darkness.

Before relief patrols go on duty, they should be fully briefed on the current status of staked trouble spots and other problems in their assigned areas.

An ample supply of the following tools, materials, and equipment should be readily available in a convenient location. These supplies should be regularly inventoried and re-stocked.

The Inventory should be adjusted according to length of patrol area, number and type of flood control facilities, and experience during other flood events.

Local agencies might also consider stocking foul weather gear, including extra sets in various sizes.

<u>Items</u>	<u>Quantity</u> (Minimum required)
Visquine plastic sheeting, 10 mil, 100 x 20 feet -----	2 rolls
Or	
Canvas, 100 x 20 feet -----	2 rolls
Sandbags -----	1,000
Twine or baling wire -----	One box
Stakes, 2-foot, 2" x 4", W/V points -----	50
Laths, 4-foot -----	One bundle
Tie buttons or stones -----	50
Flagging, fluorescent -----	6 rolls
Lineman's plies -----	4
Sledge hammers -----	2
Shovels -----	5
Life jackets -----	4
Logbook (to document trouble spots) -----	
Tire chains -----)) Quantities
Jumper cables -----)	
Highway flares -----)) As
Tow chains -----)	
Axes -----)) Needed
Chain saws -----)	
Electric lanterns -----)	
Batteries for lanterns -----)	
Maps -----)	
Lighting system for night patrol	
Two-way oar radio or car telephone	

When a flood disaster is impending, local and State agencies must fully expend their resources to prevent loss of life and property damage. If an emergency exceeds the capabilities of local and State agencies, aid is available from federal agencies.

During a Flood Emergency

6.31

When flood water reaches the danger level or when other serious problems develop, the superintendent may ask for additional aid from the DWR Flood Operations Center in Sacramento to extend patrol coverage or to engage in a flood fight. The Center is staffed on a 24hour basis during flood alerts and responds to requests for personnel, material, and equipment for flood fighting. The Center also provides engineering and consultation services for damage appraisal or evaluation during flooding.

If a flood control structure is in immediate danger of falling and the situation is more than a local agency can handle, the local superintendent should report the situation to the DWR Chief of Flood Operations in Sacramento at 800-952-5530 or 916-4Y5-3553.

If a DWR representative confirms that conditions also exceed the capabilities of the State's forces, the Director of the Department of Water Resources calls on the Corps of Engineers for assistance.

In time of flooding or coastal storms, the Corps of Engineers can also undertake emergency operations to supplement local disaster assistance, flood fighting, and disaster recovery and rehabilitation. State or local agencies cannot be reimbursed for expenses they have incurred.

After the Flood Emergency Has Ended

6.32

The State Natural Disaster Assistance Act (NDAA) provides for financial aid to State and local agencies to replace or repair public property destroyed or damaged by a natural disaster. Such aid, which is provided on a cost-sharing basis, is not available until the Governor has declared a state of emergency exists. Facilities used solely for recreation are excluded from such assistance.

NDAA is administered by the Director of the Office of Emergency Services (OES), who may delegate any power or duty invested in him to another State agency.

A local agency may be eligible for HDAA financial aid after it has met the following conditions:

(1) It has declared a local state of emergency exists and has asked the Director of OES to concur.

(2) It submits a formal application for assistance to the Director of OES.

(3) The application includes a preliminary assessment of costs of repair or replacement.

Delegated State agencies examine the region involved and submit

6.32

reports supporting the request to OES. To qualify for HDAA assistance, the declaration of a local emergency must have been made within 10 days of the occurrence of the emergency (following a declaration of emergency by the Governor.

(Cont.)

All applications must be filed within 30 days of the local emergency declaration with the Office of Emergency Services, 2800 Meadowview Road, Sacramento CA 95832.

Public Law 84-99. This law authorizes the Corps of Engineers, when requested by the Governor or his authorized representative, to assist the State in a flood fight when high-water damage or failure of a federal or nonfederal flood control facility could cause loss of life or property damage. To invoke this law, however, State and local agencies must first expend maximum effort.

6.321

Following emergency operations, the Corps of Engineers, under PL 84-99 (as amended), can give additional help for 10 days.

Conditions governing participation by the Corps of Engineer's for advance measures and emergency operations are outlined in the Corps' handbook, Emergency Operations.

(The form for requesting aid under PL 84-99 follows this section.)

Federal Emergency Management Agency (FEMA). Historically, the American Red Cross, the Salvation Army, church groups, and other nonprofit humanitarian organizations are first at the scene to meet the immediate needs of victims of natural disasters. A wide range of assistance is also available through FEMA before a presidential declaration of disaster. However, FEHA will not participate in post-flood repair of federally constructed flood control projects.

6.322

Following a presidential declaration, public facilities and private property damaged in a disaster are eligible for federal assistance on a conditional and sliding scale basis. This aid is granted to restore properties to predisaster condition. Applications for assistance must be filed with the Office of Emergency Services no more than 30 days following the presidential declaration. (See the OES Disaster Assistance Procedures Manual, 1985.)