CHAPTER 4
STANDARD WASH FACILITY

Section I. VEHICLE PREPARATION AREA

4-1. General

CVWFs have two types of paved staging areas, each with different functions. These are designated as the preparation and vehicle assembly areas. Staging involves alignment of vehicles for orderly movement through the CVWF; in addition, vehicles are sorted according to type and washing requirements. Vehicles waiting and being prepared for washing are aligned for direct entry into the designated wash stations. The preparation area provides troops with a location to remove trash from vehicle interiors, plug drain holes, open bilge pump discharge lines, remove camouflage, check tiedowns, and use restroom facilities (when provided) prior to washing the vehicles.

4-2. Sizing

The area and configuration requirements of the staging areas at CVWFs depend on the queuing arrangement, amount of assembly needed, and the number and types of vehicles washed.

a. *Preparation area.* The preparation area should allow at least one vehicle to *be* staged behind each wash station. Additional vehicles using the CVWF during a major washing effort are queued in a linear fashion along the CVWF entrance road and/or trails leading to the facility. The paved preparation area should be sized to accommodate a minimum of 1000 square feet (92.9 square meters) of paved area per lane. This figure includes the vehicle area and a minimum of 10 feet (3.0 meters) of pedestrian clearance in all directions between vehicles. Since vehicles are aligned in rows according to wash station lanes, the layout of the preparation area can be established based on the gross width of the facility, including vehicle wash lanes, sidewalks, and bypass lanes. The staging area configuration will vary, depending on whether the wash station is linear, skewed, or parallel.

b. *Vehicle assembly area.* This area can be sized to accommodate a company of vehicles which is assembled as a group prior to exiting the CVWF for the cantonment area. If vehicles are allowed to proceed to the cantonment area individually, the vehicle assembly area requirements can be reduced or eliminated. The layout of this area is based on the gross width dimension of the wash station divided into the required area; however, the area should be designed such that no vehicles in the wash stations are slowed because of a backup of units in the assembly area.

4-3. Staging area cleanup

Hydrants should be provided adjacent to the vehicle preparation areas to aid in cleanup of the pavement after a washing effort. Design flow rate for these hydrants should be 25 gallons per minute (gpm) (95 liters per minute). The location of hydrants must be such as to allow hose streams to move soil from all portions of the paved area toward trench drains.

4-4. Drainage

The vehicle preparation areas are sloped to drain from the edge of the pavement toward the trench drains. Trench drains may be required in the assembly areas to facilitate drainage and cleanup. Flushers are included in the trench drains to move the dirt and debris to the collection system. Vehicle preparation areas are generally not curbed; however, curbs may be used at the entrance for traffic control, at locations where vehicles might back off the pavement, or where water would otherwise run off the pavement edge and cause undermining of slab. Curbs used at tracked facilities should be designed to resist damage from tracked vehicles.

Section II. WASH STATION

4-5. Function

The wash station is the central feature of the CVWF which permits manual washing of both tracked and wheeled vehicles. The stations consist of concrete islands with towers placed on either side of the lanes. The vehicles enter the lane and stop for washing. Water hoses are hung from towers so that they do not clutter the area of vehicle movement. The stations should be designed such that two persons can use the hoses from two adjacent towers to wash a single vehicle. This design saves time by allowing both sides of a vehicle or piece of equipment to be washed at once. No solvents or detergents are used to wash vehicles at the facility.

4-6. Configuration

The islands should be spaced in a single, straight line (as in fig 2-1) or skewed (fig 4-1) so that traffic lanes are parallel. This design will ensure smooth traffic flow with a minimum of turning, because vehicles move in only one direction. Vehicles waiting to be washed can queue behind those being washed. Since the vehicles always move forward, there is no hazard due to reverse travel. The islands should have a center-to-center spacing of approximately 25 feet (7.6 meters) (fig 4- 2) to allow the widest vehicle to pass easily between the islands. However, the lane width should allow only one vehicle at a time to pass through the station. If the installation will wash very long

vehicles, semitrailers, or units in tow which could not be cleaned easily at a standard island, double-tower stations may be desirable. At a double-tower station, a tower is placed at each end of the island. A longer island may have to be constructed to accommodate the arms of the two towers. The hose located on each arm is intended to service one-quarter of the oversized vehicle, unlike the hoses on a single-tower island which are designed to service one-half of the vehicle. Figure 4-3 shows the layout of a double-tower station.

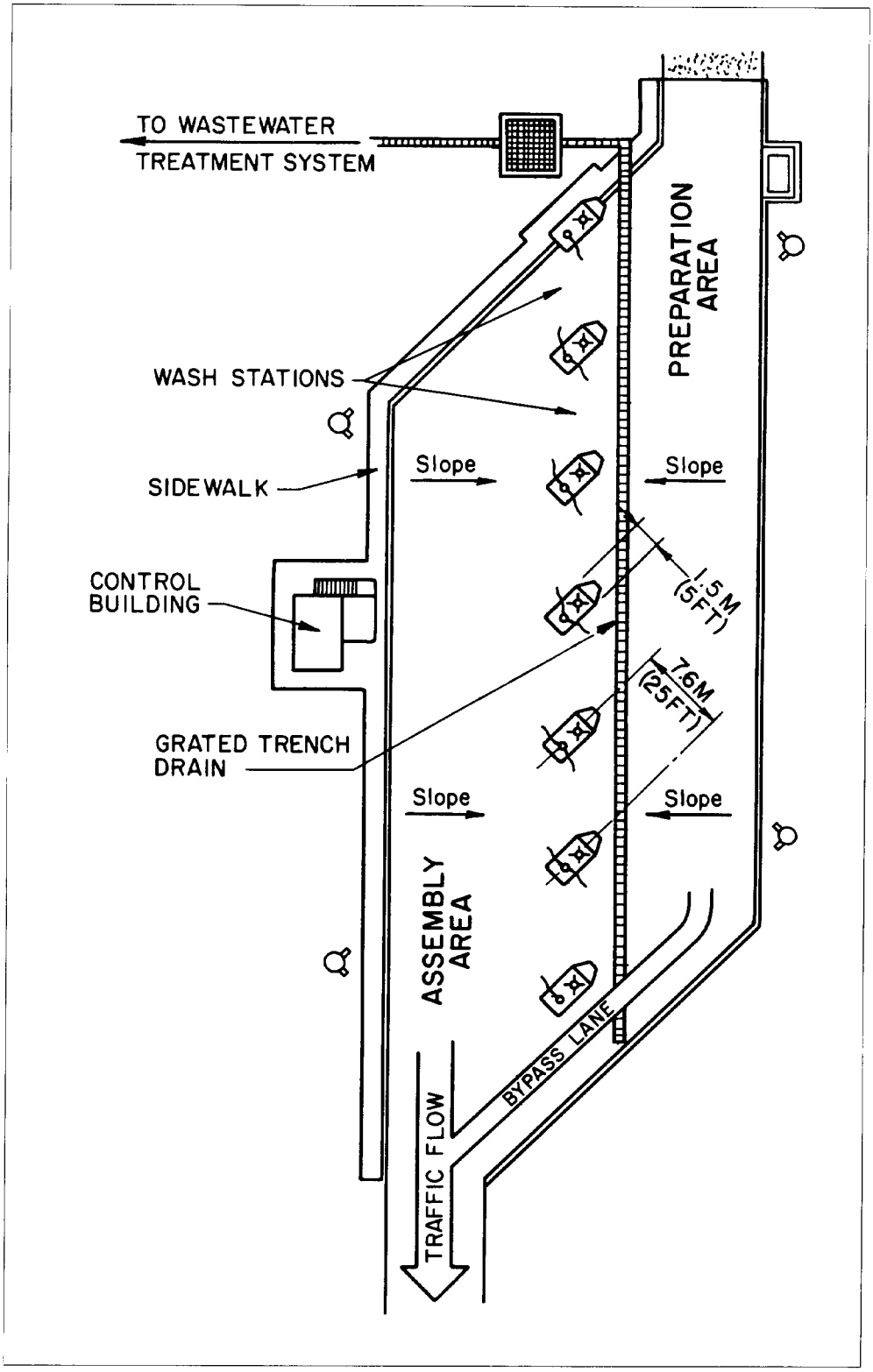

Figure 4–1. Skewed wash station arrangement.

4-7. Island design

Each island should be approximately 5 feet wide (1.5 meters). Figure 4-4 shows the island in cross section. The top of the island should have a crest to prevent water from pending on the island. The surface of the island should have a broom finish to help provide traction to troops when the area becomes wet. At all wash facilities, concrete barriers should be placed on the entrance ends of each island as shown on (fig 4-5). These barriers will protect the tower and the person working at that station against damage or injury by the vehicles.

4-8. Tower design

The tower should be constructed of standard pipe, tapered-metal signal pole or its equal. The tower supports the flexible wash hose and lighting (if needed). Towers installed on interior wash lanes can support two wash hoses fastened horizontally above the island with swivel-type joints. The exact height of pole and length of the hoses will be site-specific, depending on the orientation of the island and the size of the vehicles to be serviced. Towers installed on outer wash islands only need one

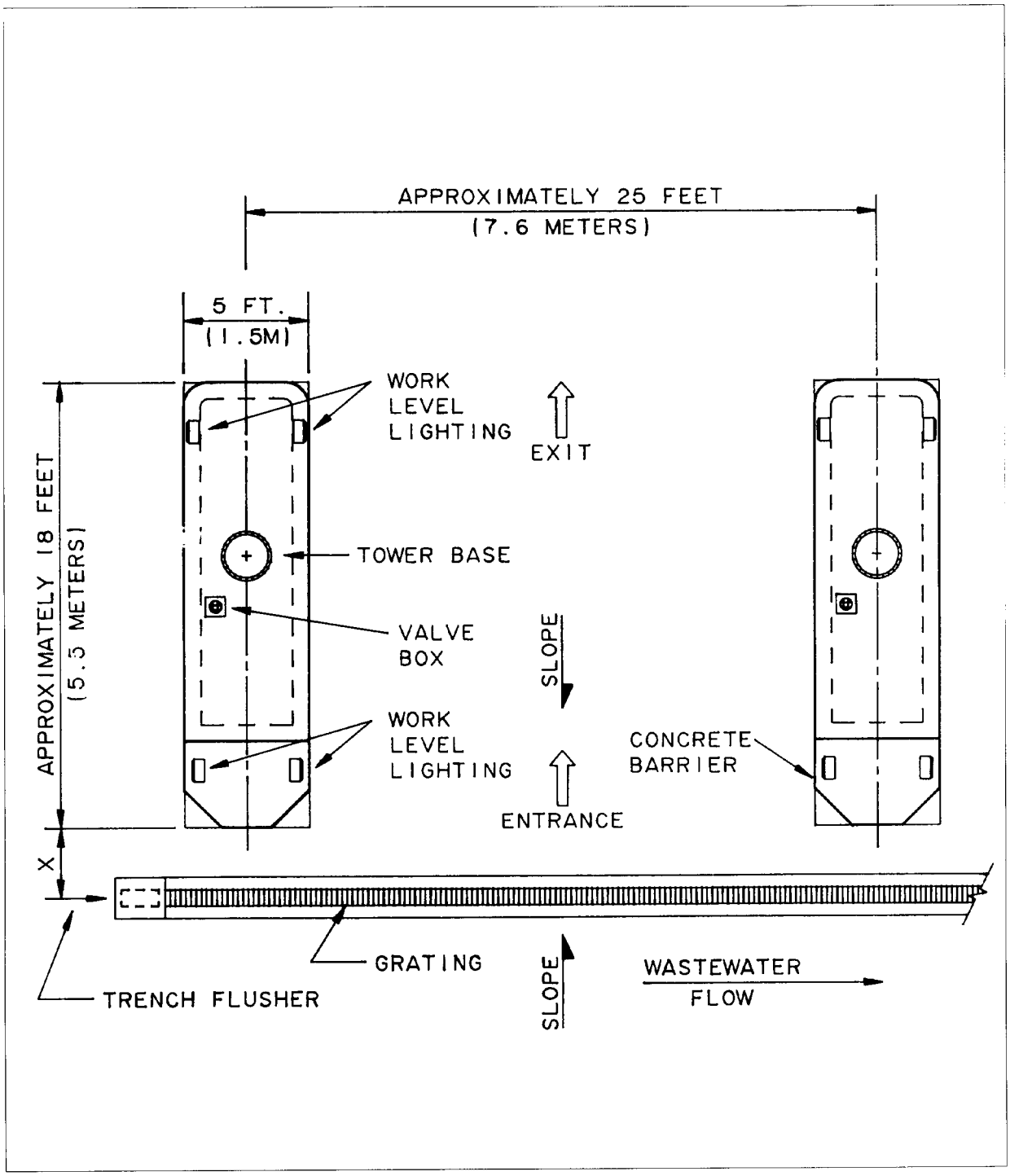

Figure 4–2. Wash island plan showing spacing.

hose, since only one vehicle will be served by the island. Figure 4-6 shows the tower in cross section.

a. Height. At least 15 feet (4.6 meters) clearance is needed between the pavement and the hose pivot point. If a vehicle taller than this height will be washed at the facility, a higher clearance can be used at one or more wash stations, as required.

b. Hose pivots. The hose pivots support the hose and should be properly sized steel beams which support the hose and allow horizontal rotation of the hose. Cushioned stops should be installed on the towers to limit the movement of the pivot to 180 degrees in the horizontal plane. A tie rod or other form of brace should be used to stabilize the pivot in the vertical direction. A system should be included to secure the hose after use. This system shall allow for draining of all water out of the hose and keep it from being run over by the vehicles.

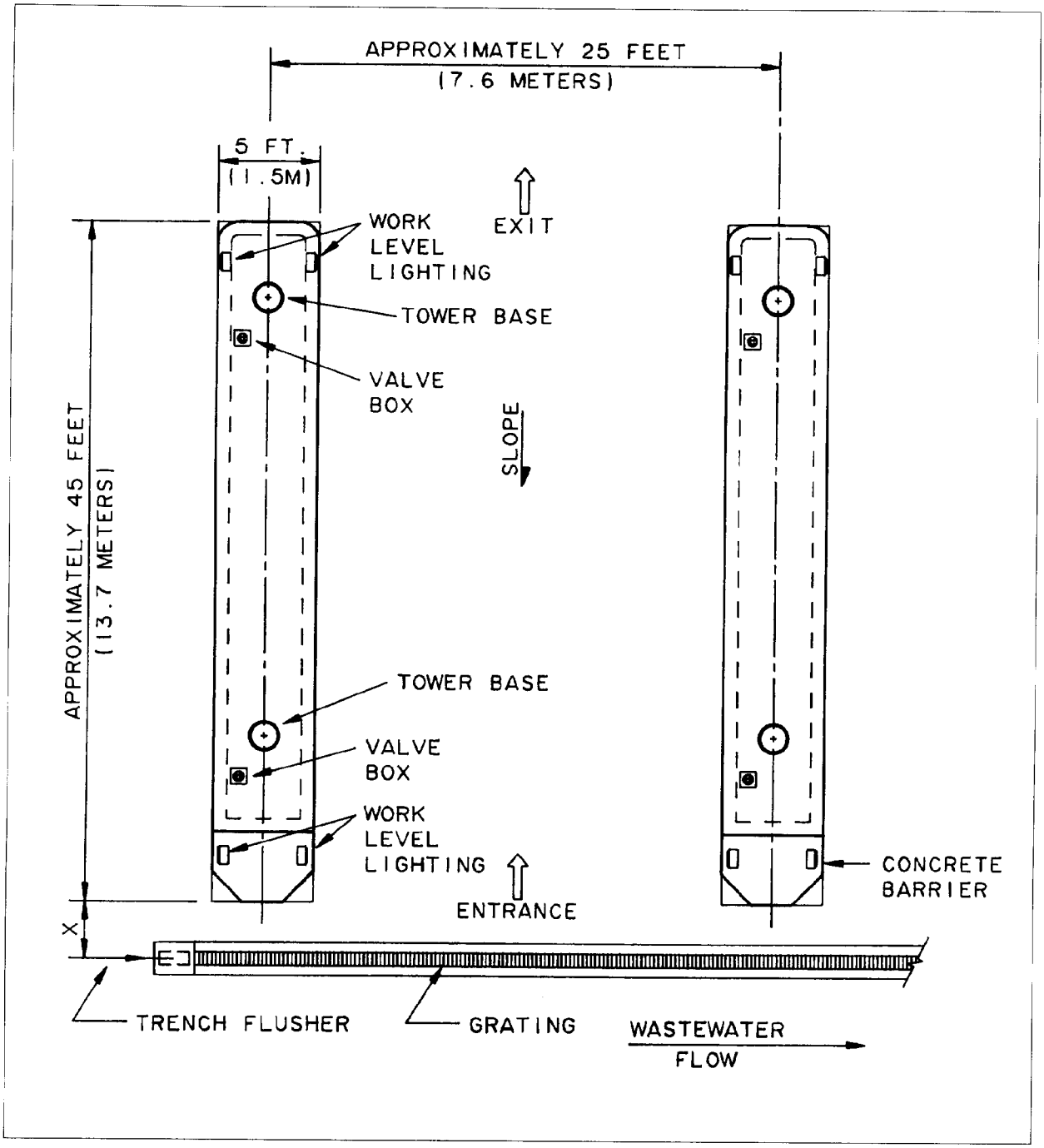

Figure 4–3. Double-tower island.

c. Water pressure and flow rates. The recommended de-- sign pressure is 75 pounds per square inch (psi) (5.2 atmospheres). The water pressure is measured at the nozzle. The recommended design flow rate is 25 gallons per minute (95 liters per minute). Pressures and flow rates are given here to facilitate pump selection. Control should be provided to limit maximum pressures at the nozzle to 90 psi. Valving must be installed to allow each island to be isolated from the water supply. Manually operated valves are required to allow troops to control flow from each hose on the island.

d. Hoses. The hoses to be specified at the vehicle wash stations are made of reinforced rubber. The reinforcement should be an all-textile braid made of resilient synthetic yams; this material is covered with thick rubber. The hoses must be flexible for ease of handling and rated for a minimum working pressure of 300 psi (20.4 atmospheres). Hoses must be durable, suitable for use in water, and resistant to abrasion, oil, and sunlight. Orifice diameter of the nozzle should be 5/16 inch in order to provide chosen flow at 75 psi (5.2 atmospheres) pressure at the nozzle inlet. Each hose must be long enough at each location to reach the side, front, and back sections of the vehicles being washed.

e. Nozzles. The nozzles must be durable to withstand frequent punishment and heavy use. The inner diameter of the hose connection at the tower will be determined by the required pressure and flow rate. The hoses should be designed with rubber nozzles built in by the manufacturer.

4-9. Protection against freezing

In regions where freezing conditions may occur, the water supply piping, valves and fittings at the wash stations must be self-draining and designed for protection from damage due to freezing.

4-10. Water supply piping

Valves which will be frequently operated on the supply piping to the wash stations must be accessible through valve pits, valve boxes, or manholes. Isolation valves within the system can be directly buried.

4-11. Paved area drainage

a. Surface drainage. All water used for washing vehicles and cleaning the CVWF as well as all precipitation falling on or flowing through the paved area shall be collected through a drainage system that flows to the primary treatment basin. This volume may be captured as makeup water if necessary. The assembly area located after the wash area and the preparation area shall be paved and sloped toward a grated trench drain. Concrete curbing should be installed at all pavement/ soil interfaces when the designer deems necessary to contain and direct the runoff to the treatment system. In areas where water is not expected to occur and vehicular control is not required, such as the preparation area, the designer may choose to limit or not use curbing. Other surface water shall be drained away from the facility unless it is to be captured for use as makeup water.

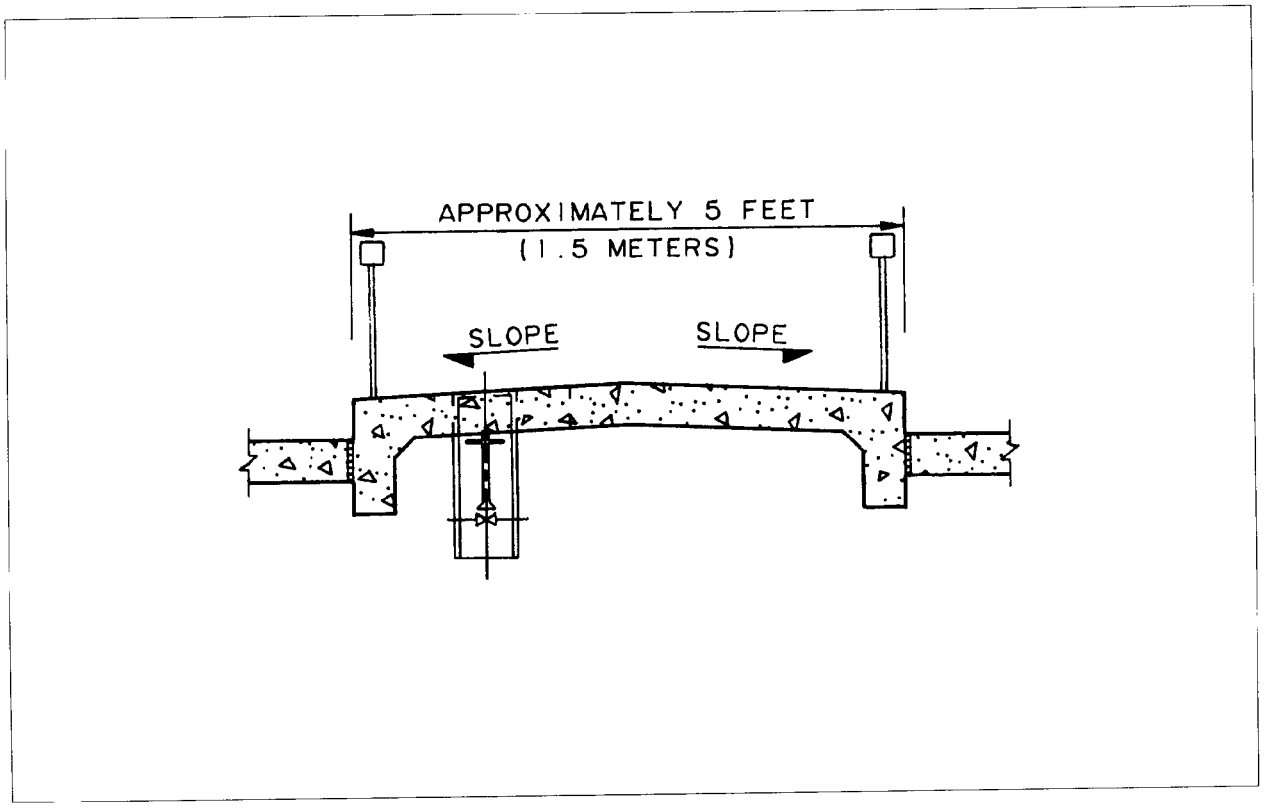

Figure 4–4. Cross section of an island.

b. Trench drains. Open-grated trench drains are provided to move soil-laden wastewater from the paved staging and wash station areas to the wastewater collection system. Figure 4-7 shows a typical trench drain in cross section. The trench should have a circular (U-shaped) bottom with a smooth surface for good open channel hydraulics and abrasion resistance. Grating should be galvanized steel or cast iron and able to support the vehicle loads to be imposed. Grate openings should be at least 1 inch (2.54 centimeters) wide to allow gravel to pass through. Grating sections should be of a weight and attachment design that allow easy removal for maintenance of flow in the trench drain system.

(1) *Trench drain layout.* Trench drains are usually oriented transverse or diagonally across the direction of vehicular traffic. A trench drain system is required the length of each row of wash stations at the entrance end (see figs 2-1, 4-1, 4-2 and 4-3). The location of additional trench drains in the staging areas will depend on the following:

(a) The amount and distance that soil-laden material must be moved during wash area cleanup operations.

(b) The location of staging area hose hydrants and their effective area of coverage.

(2) *Trench drain flushing system.* The trench flushing system consists of a supply line with motor-operated valve and nozzle injection points along the trench drain. An adequate slope must be maintained in the trench which will move the dirt and debris to the collection system. Flow velocities of at least S fps (1.5 meters per second) are required. Trench slopes shall be at least 2 percent. Bottom grades at bends, junctions, slope changes, and section changes in the trench drains should be designed for energy losses. The flushing nozzles are located in the trench just above the normal flow surface and point downward and downstream. Flushing is accomplished intermittently during vehicle washing periods and during cleanup operations at the wash station trenches, and only during cleanup in other staging area trenches. Flush system control by the facility operator is critical and is independent of other pumping supply systems. Flushers are operated only when necessary in order to conserve water and power. A well designed flushing system utilizes water drawn from the equalization basin as discussed in chapter 6.

c. Wastewater collection system.

(1) *General.* Wastewater and stormwater collected on the paved areas and moved to the trench drains are

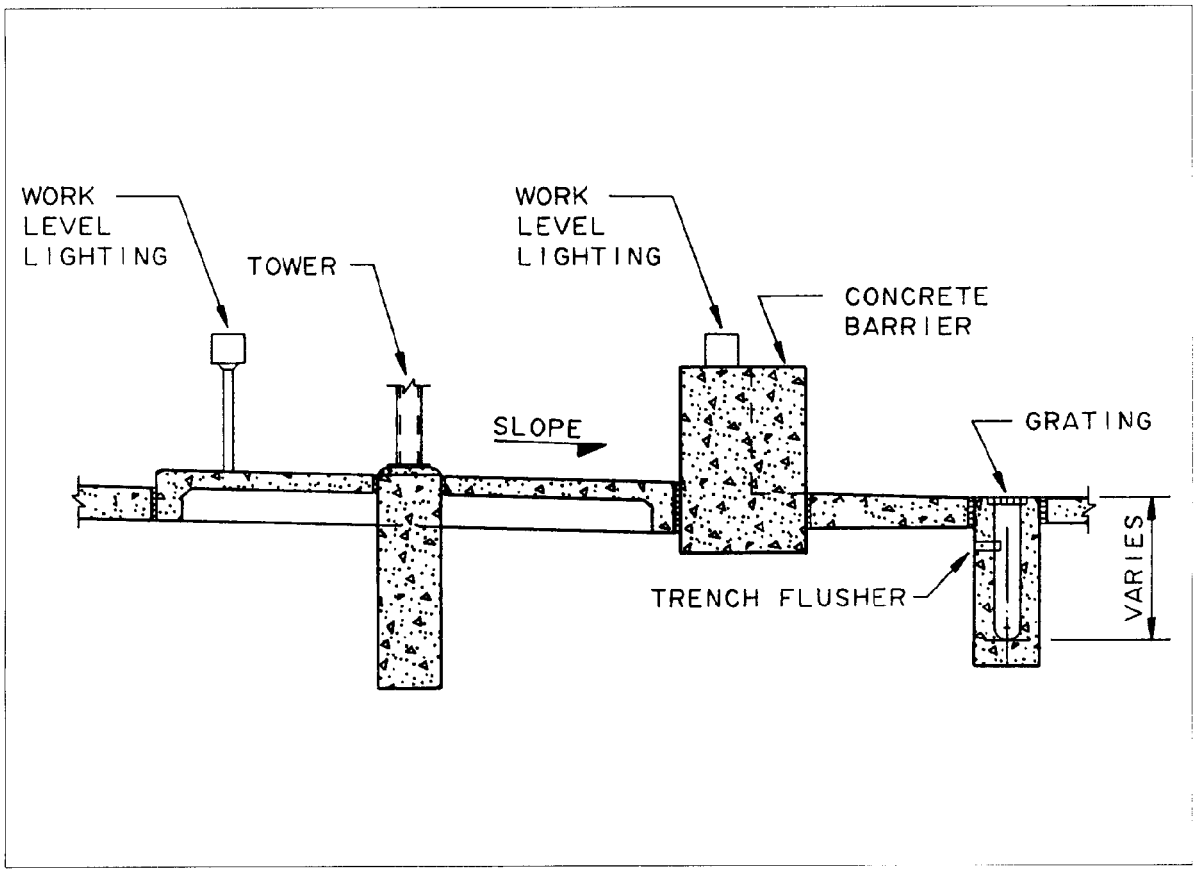

Figure 4–5. Longitudinal section of an island.

tied to an open trench or underground piping network, or combination thereof, and conveyed by gravity to the sediment basin for primary treatment. If site conditions and grades permit, the collection system for stormwater to the sediment basin should be an open channel for easy cleaning of the open trench. Lines and channels should be as straight as possible. Minimizing the number of changes in direction will avoid mud and debris accumulation. Manholes should be provided for pipe systems at pipe intersections, changes in direction, and changes in slope, and at no greater than 400-foot (121.9-meter) intervals on straight runs. Gravity collection systems without flushers that empty into the sediment basin are designed to maintain a minimum velocity of 5 fps (1.5 meters per second). A minimum of 2 percent slope shall be required on all gravity wastewater lines.

(2) *Materials.* Open channels are cast concrete rectangular, trapezoidal, or semicircular cross sections. Semicircular channels limit areas where dirt and

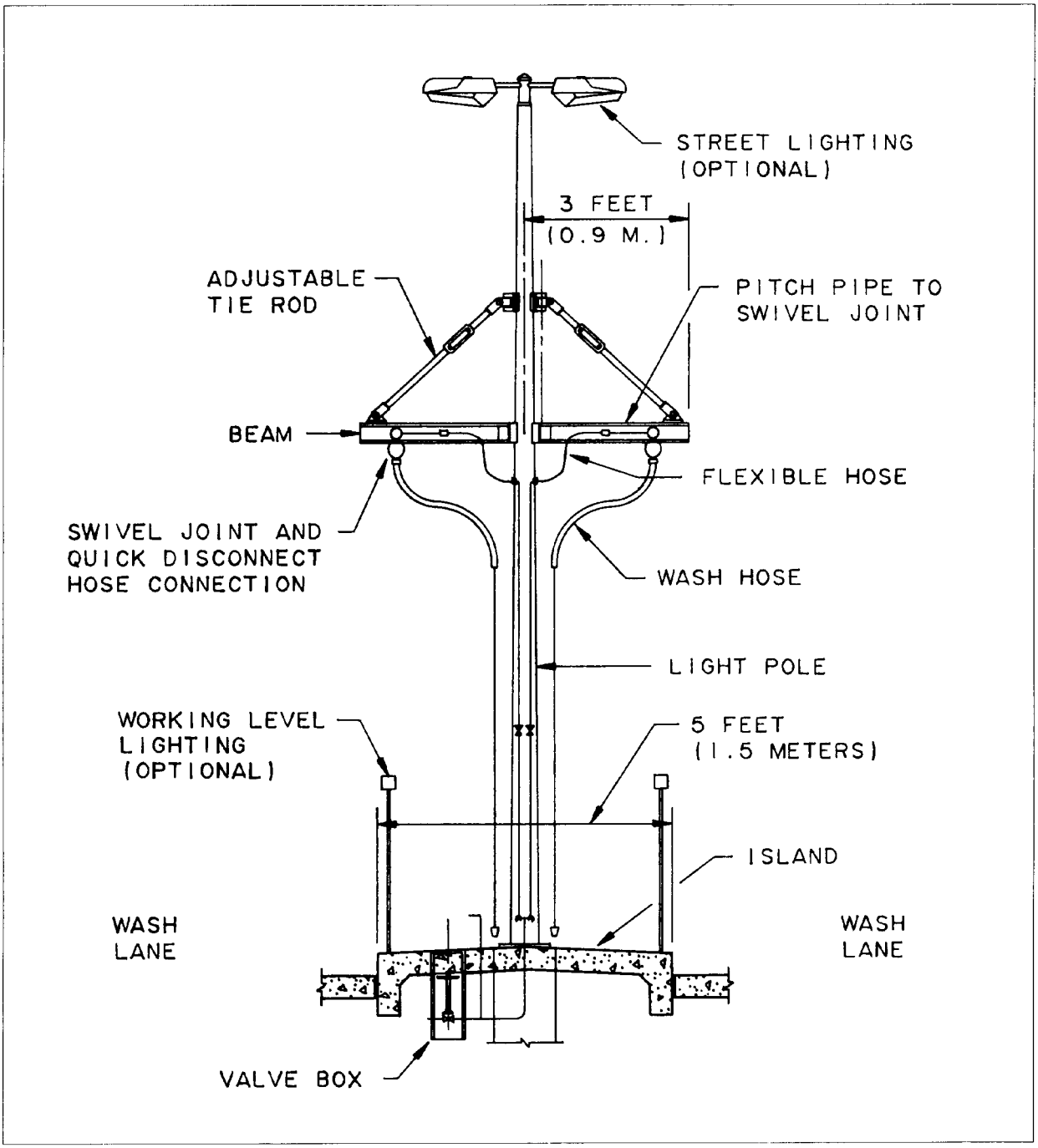

Figure 4–6. Tower detail in cross section.

debris can accumulate. Gravity pipe systems usually are reinforced concrete, steel, or ductile iron pressure piping. Plastic pipe may be used, as local practices and experience permit, except under pavements.

4-12. Pavement

All ground surfaces within the CVWF that will support vehicle movement must be covered with a hard surface and curbing for water and vehicle control. Pavement is required to keep the clean vehicles from driving and parking on surfaces where they would become soiled. It also ensures that vehicles do not track dirt from unpaved areas into places reserved for clean vehicles. Concrete is recommended in areas of tracked vehicle movement, including pavements over which both tracked and wheeled vehicles will maneuver. Asphalt paving will suffice in most areas where only wheeled vehicles will operate or in areas of straight tracked vehicle movement. The paving and base should be designed to meet the needs of the vehicles that will use the facility. Concrete should be used around critical drainage structures, such as at wash stations. Roads and trails leading to motor pool areas from the wash facility shall be paved to prevent clean vehicles from be-coming soiled again. Roller-compacted concrete should be considered for all paving areas except at critical drainage structures, where form-worked concrete should be used.

4-13. Interior wash equipment (optional)

Low-flow, interior wash equipment should be provided at the islands, at user request, for washing truck beds, cab floors, jeep interiors, and other such areas. This equipment is used for washing personnel compartments only and is not intended for cleaning engines. Engine cleaning is prohibited at these locations. The outlet should provide a water pressure of 40 psi (2.8 atmospheres) and a flow rate of 5 (19 liters per minute). A 3/4 inch heavy duty utility hose is attached to the outlet. A sign shall be posted warning personnel not to wash engine compartments.

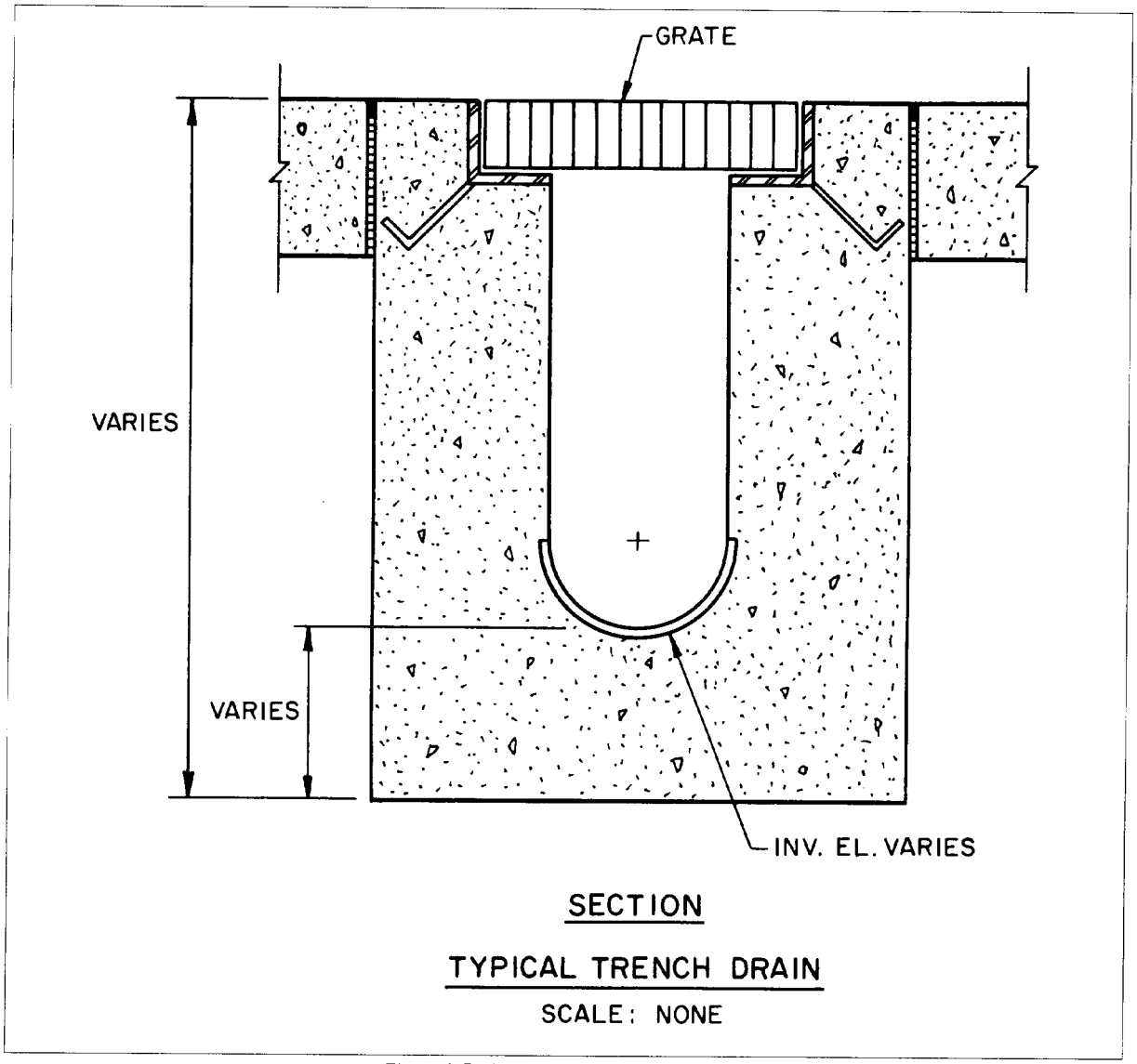

Figure 4–7. Cross section of a trench drain.

Section III. SUPPORT FACILITIES

4-14. Lighting

Adequate overhead and working-level lighting must be provided at CVWFs where users will be washing vehicles at night. Overhead tower structures provide lighting for the staging areas. Towers may be high- or low-mast, but must be located so as to provide total wash area coverage without interfering with traffic. Wash station towers may have lighting fixtures for this area as shown on figure 44. Lighting levels of at least 3 foot-candles measured at ground level should be provided in the wash areas and at least one foot-candle at all points on the CVWF hardstand. Working-level, high-intensity, horizontal mounted flood lighting is provided at each wash station to reduce shadows on vehicle sides and to aid in inspection of vehicles after washing. At least 5 foot-candles should be provided in the wash area, measured at the extreme end of a vehicle. The two types of lighting should not be additive in computing lighting intensity levels since one is a vertical projection and the other is a horizontal projection. No lighting is provided at CVWFs where only daytime use is planned. However, security lighting is always provided at entrance/exit doors of each building and other locations as required. A selected portion of the tower fixtures may be used as security lighting.

4-15. Physical security

Physical security consists of locks on building doors. The CVWF usually is not fenced unless the user requests it for safety and protection against vandalism. Fencing of the basin areas is recommended.

4-16. Signage

Signs must be posted warning personnel not to drink the wash water and directing them where potable water is available. Traffic flow signs as well as pavement markings should be provided to ensure safe, effective use of the facility.

4-17. Solid waste collection

Commercial dumpsters should be located strategic points along the edge of the preparation area for disposal of solid waste. Dedicated concrete pads adjacent to the pavement are preferred to avoid damage to dumpsters and moving vehicles. Extra dumpsters may be required at the wash stations.

4-18. Operation and controls

Equipment operating, maintenance, and repair manuals should be specified to be provided by the contractor at completion of the construction contract.

a. Operator. The requirement for an operator will depend on the size and complexity of the CVWF. The operator is responsible for shutting off the equipment in times of emergency and at the end of the washing operation. This person controls the pumps and valves, oversees cleanup, reports any maintenance problems, and assures safe operations. At facilities which have recycled water systems, the operator will also be responsible for monitoring the treatment process.

b. Control building. A building shall be provided to house controls for the wash facility in one central location. A master control panel shall be installed to permit the operator to shut off all washing operations at one point. This design allows the operator to shut down the facility quickly and efficiently if required. The building shall provide protection for the operator during inclement weather. Insulation, heating, ventilation, and air-conditioning may have to be provided for the control building at some installations. Latrines and potable water for the troops can also be included in the control building. A telephone should be installed in this building to allow the operator to report O&M problems and emergencies. Figure 4-8 shows a recommended layout, for the control building.

(1) *Location and design.* The control building must be located such that the operator can easily see washing operations at all wash stations. The entire treatment system also should be visible from the control building. Latrines for troops and operators and a lockable storage space can be included in the building as required. An efficient design places the control panel in a second-story room above the latrine and/or storage rooms (fig 4–9). This allows the operator to have a good view of all washing and treatment operations. The operator should be able to operate the control panel and still have a clear view of the operations. Depending on the orientation of the facility and the control building, tinted glass or sunscreens may have to be installed to reduce glare which may inhibit the operator's view of the wash facility or control panel. Area and control-room lighting must not interfere with the operator's visibility during nighttime operations.

(2) *Size*. The control building must be sized to house wash facility controls, building electrical and mechanical equipment, storage, and latrines for the wash facility in one location.

(3) *Protection.* If the control building is to be located adjacent to vehicle movement, protective barriers must be installed at its comers. Other protective barriers such as guard rails may also be required.

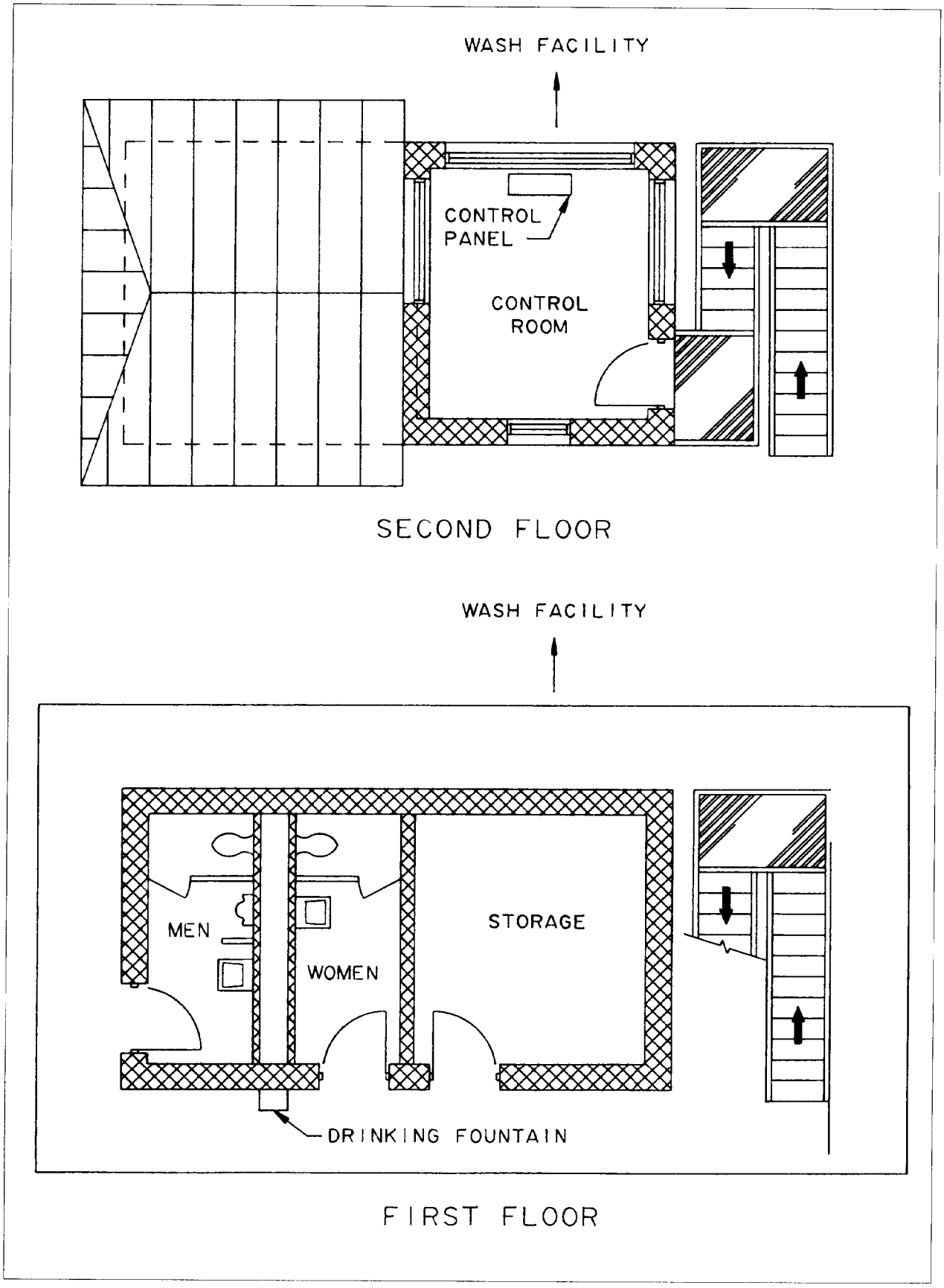

Figure 4–8. Example floor plan for the control building.

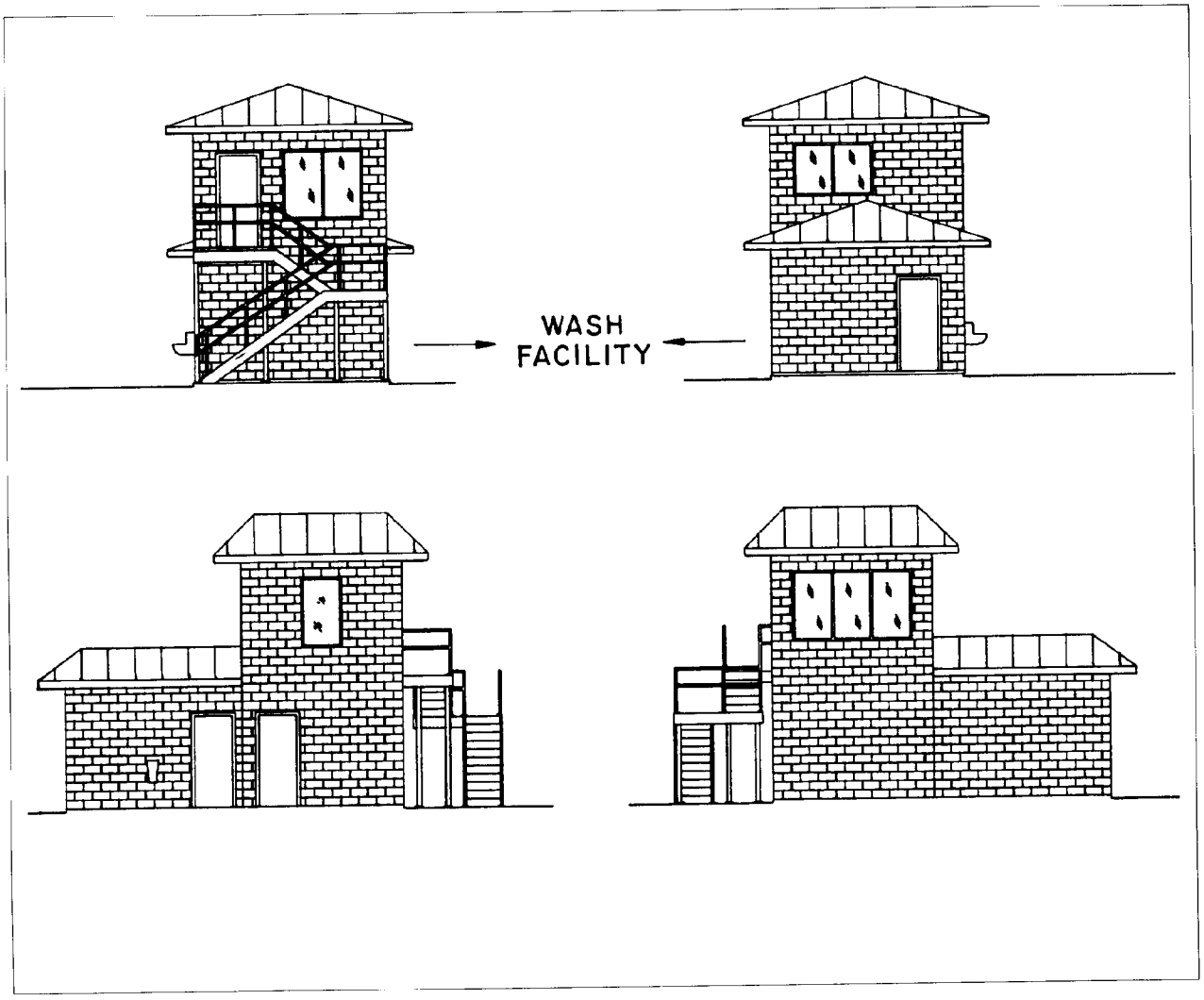

Figure 4–9. Control building exterior.