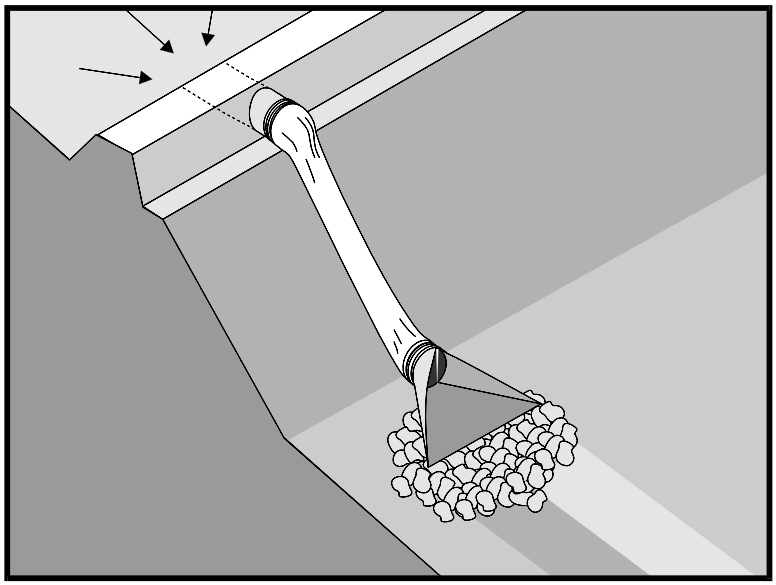
Slope Drains and Subsurface Drains

SC-11



Source: Caltrans Construction Site Best Management Practices Manual, 2003.

Description

Pipes which prevent erosion along slopes by intercepting and conveying runoff or groundwater from the top of the slope to a stabilized discharge point located at the bottom of the slope. Slope drains are primarily used to convey runoff down cut or fill slopes. Subsurface drains are primarily used to remove water from the soil in sloped areas.

Applications

- Use of slope drains applicable to the following:
  - Drainage of concentrated runoff from within swales or behind dikes located at the top of slopes and
  - Drainage of surface runoff to prevent erosion along the slope.
- Emergency spillways for sediment basins.
- Use of subsurface drains applicable to areas where water must be removed from the soil to lower the groundwater table or to prevent excessive soil saturation.

Installation and Implementation Requirements

- Design of slope drains shall consider the following:
  - Consult with a hydro-geologist or qualified engineer regarding design flows;
  - Limit drainage area discharging to slope drain to 5 acres;
  - Direct surface runoff into slope drain using interceptor dikes at the top of slope. Refer to SC-6 (Earth Dike) and SC-7 (Temporary Drains and Swales) in this manual for more information;
  - Pipe slope drains exceeding 12 inches in diameter require a standard flared end section or headwall constructed at the inlet and outlet;

Installation and Implementation Requirements (Continued)

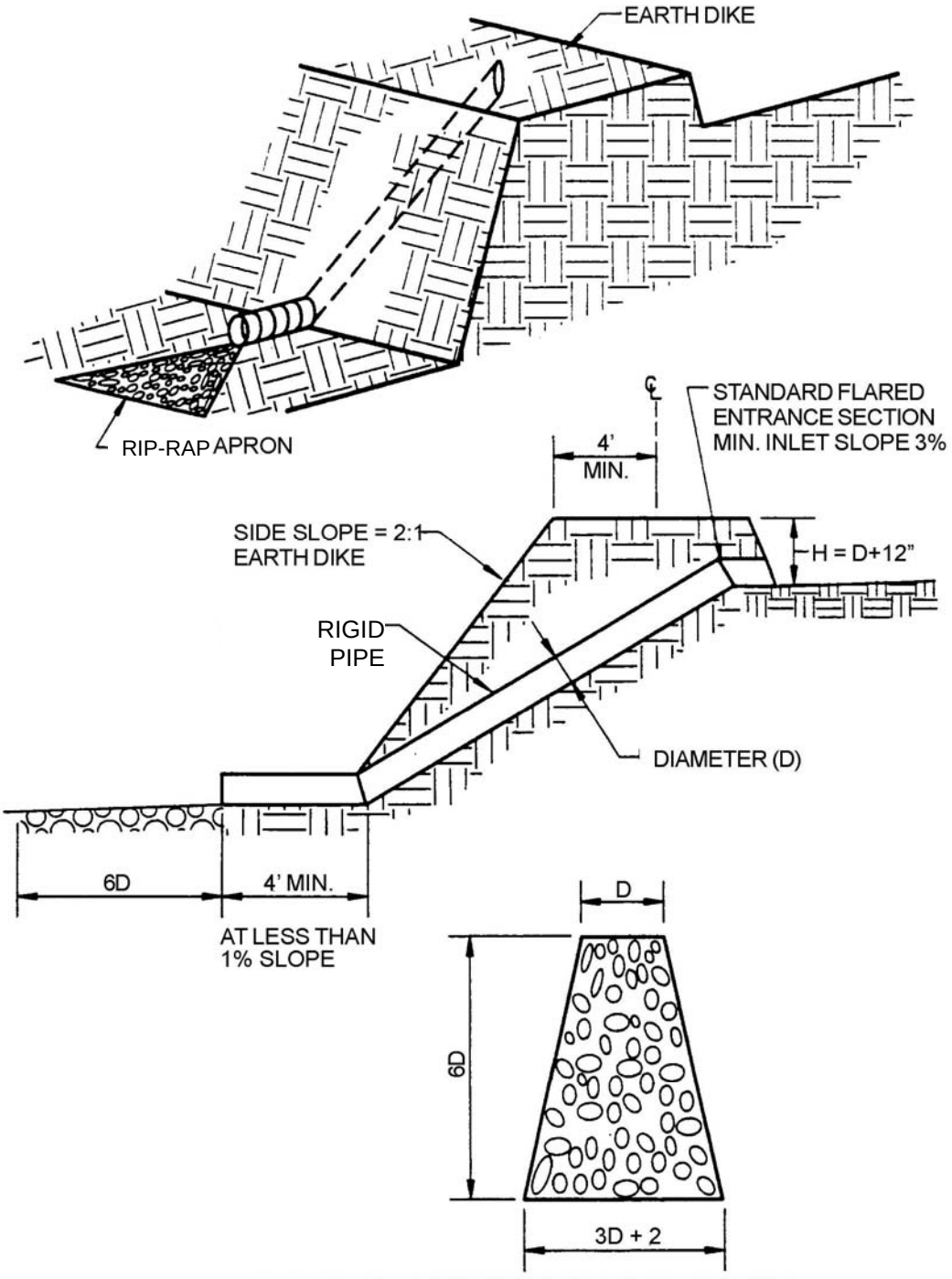
- o Install lining such as vegetation or geotextile filter fabric to protect area around inlet;
- o Install rip-rap or other energy dissipation device at outlets;
- o Compact soil under and around inlet, outlet, and along the pipe;
- o Slope drains may be installed above ground or buried beneath the slope surface;
- o Above ground installation shall utilize pipe anchors to secure pipe to ground;
- o Align slope drain perpendicular to contours of slope;
- o Generally limit maximum slope to 2:1 (H:V). For slopes exceeding 2:1 (H:V), velocity dissipation is required at the pipe outlet; and
- o Direct sediment-laden stormwater to a sediment trap or sediment basin.

Limitations

- Drainage area discharging to slope drains shall not exceed 5 acres. For larger areas, use multiple pipes, paved chute, or rock lined channel.
- Clogged slope drains direct runoff around pipe which may result in erosion along the slope.
- High flow velocities at the pipe outlet require implementation of velocity dissipation devices to prevent downstream erosion.
- Severe flooding and erosion may result from failure of slope drains.

Inspections and Maintenance

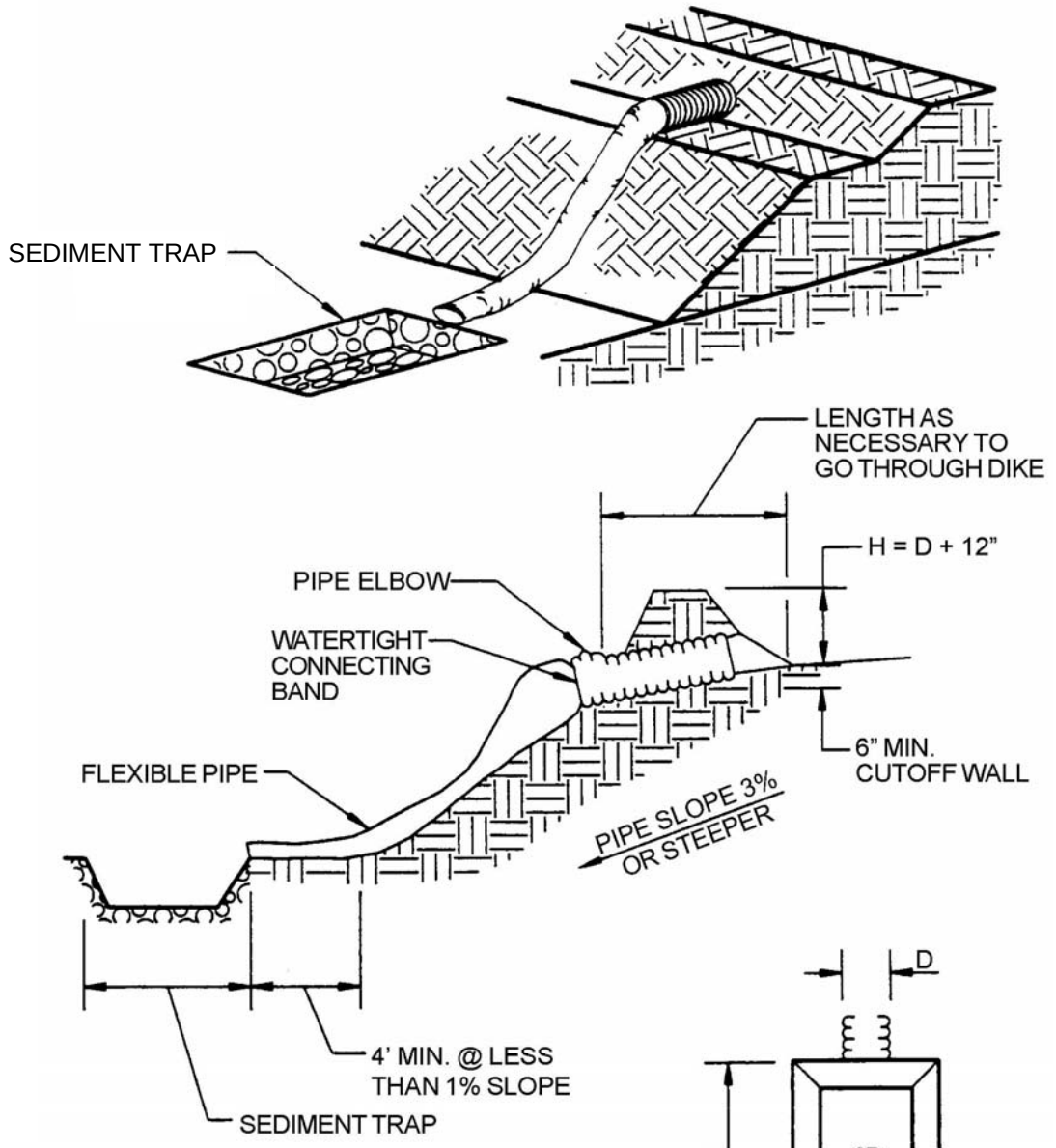
- Inspect weekly during dry periods as well as within 24 hours of any rainfall of 0.5 inch or greater which occurs in a 24-hour period and daily during periods of prolonged rainfall for erosion at outlet and downstream scour. Repair damage and install energy dissipation devices as necessary.
- Inspect slope drains for debris and sediment accumulation. Remove sediment and debris from entrances, outlets, and within drains.
- Inspect pipe anchors to ensure pipe remains anchored to slope.
- Verify ponding does not occur in areas such as active traffic lanes and material storage areas.



PIPE SLOPE DRAIN (RIGID)

NTS

Source: CCH Best Management Practices Manual for Construction Sites in Honolulu, 1999.



NOTE:

RIP-RAP SHOULD CONSIST OF 6" DIA. STONE PLACED AS SHOWN. DEPTH OF APRON SHOULD EQUAL THE PIPE DIA. AND RIP-RAP SHALL BE A MINIMUM OF 12" IN THICKNESS

PIPE SLOPE DRAIN (FLEXIBLE)

NTS

Source: CCH Best Management Practices Manual for Construction Sites in Honolulu, 1999.