

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

IRRIGATION CANAL OR LATERAL

(feet.)

CODE 320

DEFINITION

A permanent channel constructed to convey irrigation water from the source of supply to one or more irrigated areas.

PURPOSE

To convey irrigation water to one or more irrigated areas.

CONDITIONS WHERE PRACTICE APPLIES

A canal or lateral and related structures are needed as an integral part of an irrigation water conveyance system.

Water supplies and irrigation deliveries for the area served are sufficient to make irrigation practical for the crops to be grown and the irrigation water application methods to be used.

CRITERIA

All planned work shall comply with all federal, State, and local laws and regulations.

Capacity requirements. The capacity of canals or laterals shall be:

- capable of conveying surface runoff that is allowed to enter the channel, and
- sufficient to meet delivery demands of all the irrigation systems served and the amount of water needed to cover the estimated conveyance losses in the canal or lateral, or
- sized to convey the available water supply in water-short areas, where water is not normally available to meet the irrigation demands.

Velocities. Canals and laterals shall be designed at velocities that are nonerosive for the material(s) through which the channel passes. Local information on the velocity limits for specific soils shall be used if available. If such information is not available, the maximum design velocities shall not exceed those shown in Figure 6-2, Chapter 6, TR-

25 "Design of Open Channels" or other equivalent method. For unlined canals and laterals constructed with earthen materials, a Manning's "n" no greater than 0.025 shall be used to check that velocities do not exceed permissible values.

Canals and laterals shall be designed to safely convey the required flows with the maximum probable retardance conditions. For capacity design, the value of "n" shall be selected according to the material in which the canal or lateral is constructed, the alignment, the hydraulic radius, the expected vegetative growth and planned operation and maintenance.

Side slopes. Canals and laterals shall be designed to have stable side slopes. Local information on side slope limits for specific soils and/or geologic materials shall be used if available. If such information is not available, the design side slopes for the banks of canals or laterals shall not be steeper than the following:

| Material | Section | Slope |
|------------------------------------|----------------|--------------|
| Solid Rock | Cut | 1/4:1 |
| Loose Rock | Cut | 3/4:1 |
| Cemented Gravel | Cut | 3/4:1 |
| Heavy Clay ^{1/} | Cut | 1:1 |
| Heavy Clay ^{1/} | Fill | 2:1 |
| Sand or Silt w/Clay Binder | Fill/Cut | 1-1/2:1 |
| Sand or Silt, no Clay | Fill/cut | 3:1 |
| Loam | Fill/cut | 2:1 |
| Peat, muck, and sand ^{2/} | Fill/cut | 1:1 |

^{1/} Heavy clays in CH soils often experience sliding problems caused by the structure of the clays. The recommended side slope for these soils is no steeper than 4:1.

^{2/} Silts and sands that have a high water table in the side slopes will slough due to hydrostatic pressure gradient. The recommended side slope for these saturated conditions is no steeper than 3.5:1.

Freeboard. The required freeboard above the maximum design water level shall be at least one-

third of the design flow depth (0.33d) and shall not be less than 0.5 feet.

Water surface elevations. Water surface elevations shall be designed to provide enough hydraulic head for successful operation of all ditches or other water conveyance structures diverting from the canal or lateral.

Canal or lateral banks. The top width of the canal or lateral banks shall be designed to ensure stability, prevent excessive seepage, and facilitate maintenance. The bank top width shall not be less than 2 feet and shall equal or exceed the flow depth.

Protection from surface waters. Runoff from adjacent areas shall be conveyed over or under the canal wherever practical. If runoff is permitted to enter the canal or lateral, the side slopes shall be protected from erosion, and provisions shall be made for its disposal. Where sediment-laden water is allowed to enter the canal or lateral, the design shall include provisions to transport the sediment through the canal or lateral or measures shall be installed to trap and remove the sediment.

Related structures. Designs for canals or laterals shall provide for adequate turnouts, checks, crossings, and other related structures needed for successful operation of the facility. All structures shall be designed in accordance with the applicable NRCS practice standard. Structures needed for the prevention or control of erosion shall be installed before the canal or lateral is put into operation.

Linings. On sites where soils with moderately rapid to very rapid permeability must be crossed or where erosive water velocities will occur, the canals and laterals shall be lined or piped according to the appropriate NRCS Practice Standard(s) for ditch and canal linings or pipelines.

Maintenance access. Provisions shall be provided, as required, for maintenance operations. If the top of the bank or berm is to be used for a roadway, the width shall be wide enough to allow safe equipment travel and operation.

CONSIDERATIONS

When planning this practice incorporate safety elements.

Consider using buffers or filters to remove sediment from runoff water.

Cultural Resources Considerations

NRCS's objective is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice will have any effect on any cultural resources.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

GM 420, Part 401, the California Environmental Handbook and the California Environmental Assessment Worksheet provide guidance on how the NRCS must account for cultural resources. The Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Endangered Species Considerations

Determine if installation of this practice, along with any others proposed, will have an effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS's objective is to benefit these species and others of concern, or at least not have any adverse effect on a listed species. If the Environmental Evaluation indicates that the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the landowners, NRCS may initiate consultation with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Water Quantity

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.
2. Potential for a change in plant growth and transpiration because of changes in the volume or level of soil water.
3. Effects on downstream flows or aquifers that would affect other water uses or users.
4. Effect on the water table of the field in providing suitable rooting depth for anticipated land uses.

Water Quality

1. Effects on erosion of banks and beds and the movement of sediment, and the soluble and sediment-attached substances carried by runoff.
2. Effects on the movement of dissolved substances to ground water.
3. Short-term and construction-related effects on the quality of downstream water courses.
4. Potential for uncovering or redistributing toxic material.
5. Effects on wetlands or water-related wildlife habitats.
6. Effects on the visual quality of soil, water and plant resources.
7. Effects of water levels on salinity of soils, soil water downstream waters.

PLANS AND SPECIFICATIONS

Plans and specifications for constructing irrigation canals or laterals shall describe the requirements for applying the practice to achieve its intended purposes. Site specifics typically include cross-section details, embankment/bank requirements, channel grades and appurtenant structural details.

OPERATION AND MAINTENANCE

A site-specific operation and maintenance plan shall be provided to, and reviewed with, the landowner(s) before the practice is installed. The plan shall adequately guide the landowner(s) in the routine maintenance and operational needs of the irrigation canal or lateral. The plan shall also

include guidance on periodic inspections and post-storm inspections to detect and minimize damage to the canal or lateral.

The plan shall as a minimum include requirements for the removal of accumulated sediment and debris from the channel, the repair of banks and berms and control of undesired vegetation.

REFERENCES

Natural Resources Conservation Service,
Engineering Field Handbook, NEH Part 650.14,
Chapter 14, Water Management (Drainage), April
2001,
<http://www.info.usda.gov/CED/ftp/CED/EFH-Ch14.pdf>