USDA
NATURAL RESOURCES
CONSERVATION SERVICE

DELAWARE CONSERVATION
PRACTICE STANDARD

DIVERSION

CODE 362
(Reported by Ft.)

DEFINITION

A channel constructed across the slope generally with a supporting ridge on the lower side.

PURPOSES

This practice may be applied for one or more of the following purposes:

- Break up concentrations of water on long slopes, on undulating land surfaces, and on land that is generally considered too flat or irregular for terracing.
- Divert water away from farmsteads, agricultural waste systems, and other improvements.
- Collect or direct water for water-spreading or water-harvesting systems.
- Increase or decrease the drainage area above ponds.
- Protect terrace systems by diverting water from the top terrace where topography, land use, or land ownership prevents terracing the land above.
- Intercept surface and shallow subsurface flow.
- Reduce runoff damages from upland runoff.
- Reduce erosion and runoff on urban or developing areas and at construction or mining sites.
- Divert water away from active gullies or critically eroding areas.
- Supplement water management on conservation cropping or stripcropping systems.

CONDITIONS WHERE PRACTICE APPLIES

This applies to all cropland and other land uses where surface runoff water control and/or management is needed. It also applies where soils and topography are such that the diversion can be constructed and a suitable outlet is available or can be provided.

CONSIDERATIONS

A diversion in a cultivated field should be aligned and spaced from other structures or practices to permit use of modern farming equipment. The side slope lengths should be sized to fit equipment widths when cropped.

At non-cropland sites, consider planting native vegetation in areas disturbed due to construction.

Consider planting native plant species beneficial to wildlife. Minimize adverse effects to existing wetlands. Diversion of upland water to prevent entry into a wetland may convert a wetland by changing the hydrology. Any construction activities should minimize disturbance to wildlife habitat. Opportunities should be explored to restore and improve wildlife habitat, including habitat for threatened, endangered, and other species of concern.

On landforms where archeological sites are likely to occur, use techniques to maximize identification of such sites prior to planning,

design, and construction.

This practice has the potential to affect National Register listed cultural resources or eligible (significant) cultural resources. These may include archeological, historic, or traditional cultural properties. Care should be taken to avoid adverse impacts to these resources. Follow NRCS state policy for considering cultural resources during planning.

CRITERIA

Criteria Applicable to All Purposes

Capacity. Diversions as temporary measures, with an expected life span of less than 2 years, shall have a minimum capacity for the peak discharge from the 2-year frequency, 24-hour duration storm.

Diversions that protect agricultural land shall have a minimum capacity for the peak discharge from a 10-year frequency, 24-hour duration storm.

Diversions designed to protect areas such as urban areas, buildings, roads, and animal waste management systems shall have a minimum capacity for the peak discharge from a storm frequency consistent with the hazard involved but not less than a 25-year frequency, 24-hour duration storm. Freeboard shall be not less than 0.3 ft.

Design depth is the channel storm flow depth plus freeboard, where required.

Cross-Section. The channel may be parabolic, V-shaped, or trapezoidal. The diversion shall be designed to have stable side slopes.

The ridge shall have a minimum top width of 4 feet at the design depth. The ridge height shall include an adequate settlement factor.

The ridge top width may be 3 feet at the design depth for diversions with less than 10 acres drainage area above cropland, pastureland, or woodland.

The top of the constructed ridge at any point shall not be lower than the design depth plus the specified overfill for settlement.

The design depth at culvert crossings shall be the culvert headwater depth for the design storm plus freeboard.

Grade and Velocity. Channel grades may be uniform or variable. Channel velocity shall not exceed that considered non-erosive for the soil and planned vegetation or lining.

Maximum channel velocities for permanently vegetated channels shall not exceed those recommended in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 7, or Agricultural Research Service (ARS) Agricultural Handbook 667, Stability Design of Grass-Lined Open Channels (Sept. 1987).

When the capacity is determined by the formula $Q = A\ V$ and the V is calculated by using Manning's equation, the highest expected value of "n" shall be used.

Location. The outlet conditions, topography, land use, cultural operations, and soil type shall determine the location of the diversion.

Protection Against Sedimentation. Diversions normally should not be used below high sediment producing areas. When they are, a practice or combination of practices needed to prevent damaging accumulations of sediment in the channel, shall be installed. This may include practices such as erosion control practices, tillage practices, vegetated filter strip, or structural measures. Install practices in conjunction with or before the diversion construction.

If movement of sediment into the channel is a problem, the design shall include extra capacity for sediment or periodic removal as outlined in the operation and maintenance plan.

Outlets. Each diversion must have a safe and stable outlet with adequate capacity. The outlet may be a grassed waterway, a lined waterway, a vegetated or paved area, a grade stabilization structure, an underground outlet, a stable watercourse, a sediment basin, or a combination of these practices. The outlet must convey runoff to a point where outflow will not cause damage. Vegetative outlets shall be installed and established before diversion construction to insure establishment of vegetative cover in the outlet channel.

The release rate of an underground outlet, when combined with storage, shall be such that the design storm runoff will not overtop the diversion ridge.

The design depth of the water surface in the diversion shall not be lower than the design elevation of the water surface in the outlet at their junction when both are operating at design flow.

Vegetation. Disturbed areas that are not to be cultivated shall be seeded as soon as practicable after construction. Planting shall be specified in accordance with practice standard for Critical Area Planting (Code 342) for seeding.

Lining. If the soils or climatic conditions preclude the use of vegetation for erosion protection, non-vegetative linings such as gravel, rock riprap, cellular block, or other approved manufactured lining systems may be used.

PLANS AND SPECIFICATIONS

Plans and specifications for this practice shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail concerning site preparation and establishment to ensure successful management of the practice. Appropriate conservation practice standards shall be used for designing and installing structural and vegetative measures. Documentation shall be in accordance with the section "Supporting Data and Documentation" in this standard.

OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be developed for use by the client. The plan shall include specific instructions for maintaining diversion capacity, storage, ridge height, and outlets.

The minimum requirements to be addressed in the operation and maintenance plan are:

1. Provide periodic inspections, especially immediately following significant storms.

2. Promptly repair or replace damaged components of the diversion as necessary.

3. Maintain diversion capacity, ridge height, and outlet elevations, especially if high sediment yielding areas are in the drainage area above the diversion. Establish necessary clean-out requirements.

4. Each inlet for underground outlets must be kept clean and sediment buildup redistributed so that the inlet is at the lowest point. Inlets damaged by farm machinery must be replaced or repaired immediately.

5. Redistribute sediment as necessary to maintain the capacity of the diversion.

6. Vegetation shall be maintained and trees and brush controlled by hand, chemical, and/or mechanical means.

7. Keep machinery away from steep sloped ridges. Keep equipment operators informed of all potential hazards.

SUPPORTING DATA FOR DOCUMENTATION

Field Data and Survey Notes

Record on survey notepaper, SCS-ENG-28, or other appropriate format. The following is a list of the minimum data needed:

1. Plan view sketch.

2. Profile of the existing ground at the location of the diversion.

3. Cross-sections of the existing ground at the location of the diversion (minimum of one per reach not to exceed 300 feet.)

4. Lengths of each reach and total length.

5. Profile and cross-section of outlet and special precautions if needed.

Design Data

Record on appropriate engineering paper. For guidance on the preparation of engineering plans see Chapter 5 of the Engineering Field Handbook - Part 650. The following is a list of the minimum required design data:

1. Locate the practice on the farm plan map in the case file.

2. Determine soil type and any special restrictions.

3. Determine peak runoff from the contributing drainage area for the required design storm in accordance with Chapter 2, Engineering Field Handbook - Part 650 or by other approved method.

4. Design each reach in accordance with Chapter 9, Engineering Field Handbook - Part 650, or other source.

5. Show job class on the plan. Indicate the location, description, and elevation of the temporary benchmarks used in the design survey. Provide a location map, which indicates the job site.

6. Plan view sketch, profile of diversion and cross-sections of each design reach to be shown on the construction plans.

7. Details of the diversion outlet or other structural components needed.

8. Show on the plans the planting plan. This must meet the criteria, specifications and documentation requirements of the conservation standard for Critical Area Planting (Code 342).

9. Estimated quantities and cost estimate.

Construction Check Data/As-Built Plans

Record on survey notepaper, SCS-ENG-28, or other appropriate format. Survey data will be plotted on the as-built plans in red. The following is a list of minimum data needed for as-built documentation:

1. Documentation of site visits. The documentation shall include the date, who performed the inspection, specifics as to what was inspected, all alternatives discussed and decisions made and by whom.

2. Check notes recorded during or after completion of construction showing grade and cross section of constructed reaches and outlets including length, width, and depth.

3. Measure total length constructed.

4. Statement on seeding and outlet stability.

5. Final quantities and documentation for quantity changes. Material certifications as appropriate.

6. Signature and date on check-notes and plans of someone with the appropriate engineering job approval authority. Include a signed statement that constructed practice meets or exceeds the construction plans and NRCS practice standards.