

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

IRRIGATION WATER CONVEYANCE

(Ft.)

CODE 428-A-S

**NONREINFORCED CONCRETE
DITCH AND CANAL LINING
SPECIFICATIONS**

INSTALLATION

Clearing and Grubbing

All trees, brush, shrubs and other material not suitable for the subgrade shall be cleared from the foundation area of ditch embankments and ditch pads. All stumps, buried logs, roots of 1 inch in diameter or larger and other objectionable material shall be removed to a depth of 2 feet below the finished ditch or canal flowline.

Disposal of Refuse

All refuse materials shall be burned or buried outside the ditch or canal area or piled outside the area for disposal by the land user.

Filling and Shaping

Embankment materials shall be free from rocks, brush, stones over 6 inches in diameter and from any other objectionable material. Frozen materials will not be placed in the fill nor will fill be placed on a frozen foundation. The moisture content of the fill material shall be sufficient to obtain class "C" compaction. All fills shall be placed in layers not to exceed 8 inches in depth, and each layer compacted with the wheels of the construction machinery or other compacting equipment.

Excavation

Ditches and canals shall be excavated to the neat lines of the specified cross-section and finished with a smooth, firm surface. Over-excavated

areas shall be backfilled with moist soil compacted to the density of the surrounding material.

Concrete placement and curing

All surfaces on which concrete linings are to be placed shall be moist when the concrete is poured. Slip forms and screeding equipment shall be operated so as to place the concrete uniformly across the perimeter of the ditch or canal, with a minimum thickness not less than that specified. Concrete shall not be placed on mud, excessively dry soil, uncompacted fill, ice, or frozen subgrade.

Concrete linings shall be constructed to at least the thickness shown on the plans or as specified for the job or both. Finished lining grades shall not vary above or below the design channel grade by more than the deviation assumed in computing the freeboard requirements and as specified for the job. Concrete linings shall have a smooth and uniform finish and shall be free of honeycomb.

Concrete shall be cured for not less than 5 days by (1) impounding water over the exposed surface, (2) covering with burlap or a similar material that is kept continuously moist, or (3) spraying a concrete sealing compound evenly over all exposed surfaces according to the manufacturer's directions.

Contraction and construction joints

Contraction joints, at least 0.25 in. wide, shall be cut transversely in the concrete to a depth of about one-third the thickness of the lining at a uniform spacing not greater than 8 ft. Expansion joints with suitable 0.5 inch or thicker material will be installed as needed, but normally not more than 100 feet of lining. Construction joints shall be the butt type, formed square with the lining

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resource Conservation Service.

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surface and at right angles to the ditch or canal. Contraction and construction joints shall be tooled so that the edges will have a smooth finish.

Construction operations

Construction operations shall be done in such a manner that erosion and air and water pollution are minimized and held within legal limits. The completed job shall be workmanlike and shall present a good appearance.

Concrete should not be installed during freezing period of the year, but if conditions warrant, concrete shall be protected from freezing for at least 3 days after placement.

The use of accelerators or antifreeze compounds shall not be allowed.

Concrete damaged by freezing shall be considered defective work and must be removed and replaced according to these specifications.

MATERIALS

Concrete

Concrete used in ditch and canal linings shall be proportioned so that it is plastic enough for thorough consolidation and stiff enough to stay in place on the side slopes. A dense, durable product shall be required. The concrete mix shall be one that can be certified as suitable to produce a 28-day compressive strength of 3,000 lb/in. or greater.

Ready mix may be used if the concrete is mixed and delivered according to ASTM Designation C-94, and the cement content and maximum size aggregate conform to the requirements. Ready-mix concrete shall be discharged from the truck mixer within 1.5 hours after water is mixed with the cement and aggregates, or the cement with the aggregates. If the air temperature exceeds 90 degrees F, the discharge time shall be reduced to 45 minutes.

Cement

The cement used shall be Portland cement, Types I, IP(MS), II, or V as specified for the job. Refer to the table of this standard for R factor values if they are needed for sulfate resistant

concrete. The cement content shall not be less than 5.0 bags/yd of concrete.

Water

Water used in mixing shall be clean and free from harmful amounts of sediments, salts, or organic impurities.

Aggregates

Aggregates shall conform to ASTM Designation C-33,

Standard Specification for Construction Aggregates, except that Pit-run aggregates may be used if they are well graded, clean, and durable. Maximum size shall not exceed one-half the specified lining thickness.

Computations

The measurement of concrete will be made on the basis of the volume within the neat lines of the lining as indicated on the plans or as otherwise specified.