NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE GENERAL SPECIFICATIONS

IRRIGATION WATER CONVEYANCE
Nonreinforced Concrete Ditch and Canal Lining

(Feet)
CODE 428A

1. Scope

Work shall consist of constructing an earthen ditch and the installation of concrete lining and appurtenances.

2. Location

The planned location of the irrigation ditch and canal lining shall be as shown on furnished drawings or as staked in the field.

3. Public and Private Utilities

Utilities are defined to be overhead and underground power or communication lines, and pipelines. All utilities discovered to be in the work area will be identified on drawings or sketches. However, the absence of indicators on the drawings or sketches does not assure the nonexistence of utilities in the work area. The contractor is alerted to conduct his/her own search and discovery for utilities in order to avoid potential damages. The owner/operator shall complete TX-ENG-80, UTILITIES INVENTORY prior to layout or any ground disturbance and return it to an NRCS representative.

4. Installation

Foundation preparation. The foundation area for all ditch embankments and/or ditch pads shall be cleared of all trees, weeds, sod, loose rock or other materials not suitable for the subgrade. All trees with root systems that are a hazard to the ditch or canal lining shall be removed.

Placement of earthfill. The moisture content and methods of placing and compacting the material shall insure that a firm, stable embankment results. The fill material shall be placed in horizontal lifts of such thickness that proper compaction and prescribed densities are obtained.

Embankment materials shall be free of brush, roots, sod, large rocks, frozen soil, or other material not suitable for making compacted fills.

Excavation. Ditches and canals shall be excavated to the neat lines of the specified cross section and finished with a smooth, firm surface. Overexcavated areas shall be backfilled with moist soil compacted to the density of the surrounding material. No abrupt deviations from design grade or horizontal alignments shall be permitted.

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

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over all exposed surfaces according to the manufacturer's directions.

Contraction and construction joints. Contraction joints, at least ¼ 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 then 10 ft. Construction joints shall be the butt type formed square with the lining 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.

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.

5. 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 2,000 lb/in.^{2} 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 shown in the preceding paragraphs. Ready-mix concrete shall be discharged from the truck mixer within 1½ 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. Approved Class F pozzolans with LDI factor less than 3 percent may be used to replace not more than 15 percent of the cement by absolute volume. The R factor for class F pozzolan will be determined by the formula $R=(CaO-5)/Fe_2O_3$. This requirement applies to fly ashes used in blended or interground cement or fly ash used as a substitute for cement at the time of batching. Refer to the table on page 2 of Conservation Practice Standard 428A for R factor values. The cement content shall not be less than 4.5 bags/yd^3 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 Concrete 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.

In addition to materials requirements indicated above, the concrete mix shall comply with one of the following:

1. *When using aggregates conforming to ASTM Designation C-33, use at least 5 sacks of cement per cubic yard of mix. When using less than 5 sacks of cement per cubic yard of mix, the concrete mix must be supported by test reports that show that the mix consistently produces concrete with a 28-day compressive strength of 2,000 pounds per square inch or greater.*

2. *When using pit-run aggregates, use at least 6 sacks of cement per cubic yard of mix. When using less than 6 sacks of cement per cubic yard of mix, the concrete mix must be supported by test reports that show that the mix consistently produces concrete with a 28-day compressive strength of 2,000 pounds per square inch or greater.*

Concrete being used for lining shall be subject to sampling and testing for compliance with the 28-day compressive strength prescribed in this specification. When the test results of three specimens show an average 28-day

compressive strength of less than 2,000 pounds per square inch, the job shall not be accepted as meeting this specification.

6. Certificate

The installing contractor shall furnish the Natural Resources Conservation Service the following for each job:

1. A certificate stating the type or cement used; if pozzolan is used, the brand name and amount; the type of aggregates used (concrete aggregates - ASTM designation C-33 or pit run aggregates); the amount of cement per cubic yard used; and that the concrete was mixed, placed, and cured in accordance with this specification.

Or

2. A certificate which states:

a. The mix used contained at least 4.5 sacks of the appropriate type of cement per cubic yard of mix and produces concrete with a 28-day compressive strength or 2,000 pounds per square inch or greater.

b. The certification is based on current compression test reports from a recognized testing laboratory showing that test cylinders made from concrete having the same mix and aggregate consistently attain the specified minimum 28-day compressive strength.

c. The name and location of testing laboratory and source of aggregate.

d. The concrete was mixed, placed, and cured in accordance with this specification.

Prior to accepting the latter type of certificate, the responsible technician will satisfy himself that the test reports on which the certification is based are current and representative of the mix used on the job.

7. Measurement

The amount of concrete lining completed as specified will be determined by measuring the length in feet.

8. Construction Details