SECTION 685.1 GENERAL.

There are two methods of delivering irrigation from the water source to the field. Open channel or ditch flow can be used where pressure isn't necessary. Pipelines are used where there is a need to develop pressure and/or conserve water that would be lost to seepage, evaporation, or weeds.

SECTION 685.2 OPEN CHANNEL FLOW.

Section 685.21 Open Channel Flow Design.

Open channel flow is used in conjunction with furrow irrigation, level borders, graded borders, corrugations, and wild flooding. Criteria for the design of open ditches can be found in Practice Standard 320 - Irrigation Canal or Lateral 388 - Irrigation Field Ditch, and 428 - Concrete Ditch and Canal Lining. Further design considerations can be found in the E.F.M. page 15-12 through 15-14.

Page 6-75 through 6-80 in the E.F.M. describes and shows standard plans of structures which are placed in a ditch to control the velocity of the water or make distribution of the water. In addition to these drawings, Appendix 2 of the E.F.M. has some standard drawings of water control structures.

Section 685.22 Irrigation Ditch Lining Design Example.

Design the most economical section for a lined ditch for the following: Q = 25 c.f.s.

S (slope) = .2%

Surface finish to be such that Manning's coefficient of roughness will be .014. (concrete)

Using 685-1, follow down the column under Slope = .002. The first section that will handle 25 c.f.s. is a ditch with a bottom width (b) of 1.0 ft., when the flow depth (d) is 2.0 ft. Such a ditch with a freeboard of 0.5 ft. will carry 26.6 c.f.s.

Continuing down the Slope = .002 column in the table, it is seen that a ditch with a bottom width of 1.5 ft. and a depth of 1.8 ft. will also carry the required Q. This ditch, with a required freeboard of 0.4 ft., will carry 26.2 c.f.s.

By comparing the concrete quantity required for each of the above sections, it will be found that the ditch with a bottom width of 1.5 ft. required slightly less concrete.

Velocity Check

The resulting velocity, using the 1.5 ft. bottom ditch, will be "Q" in c.f.s. divided by the "Flow Area" in sq. ft. (see Column 3 in 685-1). Thus 26.2 divided by 5.94 = 4.4 ft. per sec. This velocity is satisfactory as it is less than 8 ft/sec.

$$V = \frac{Q}{A} = \frac{26.2}{5.94} = 4.4\ ft/\sec$$

Choice of Section

Assuming that construction equipment is available for both ditch sections, the latter section (b = 1.5') is more desirable and would be used.

Correction for Rough Concrete Finish

If it is known that the resulting concrete finish will be less smooth and will have a roughness coefficient of .016 then, design for a Q of 25 x 1.14 (see under "Notes") which is 28.5 c.f.s. Using this revised Q, select the most desirable section in the same manner as above.