

3.0 OPEN CHANNEL FLOW

3.1 GENERAL

This section summarizes the practical considerations, technical principles, and criteria necessary for proper design of open channels. The analysis of open channel flow also aids in determining other flow-related concerns, such as, culvert tailwater depths, time of concentration calculations (travel times), and flood elevations.

In a major drainage system, open channels offer significant advantages over closed conduits in regard to cost, flow capacity, flood storage, recreation, and aesthetics. However, open channels require considerable right-of-way and maintenance. Careful consideration must be given in the design process to insure that disadvantages are minimized and the benefits maximized. When a design approach not covered in this manual is to be used, it should be reviewed and discussed with the Fort Bend County Drainage District Engineer prior to commencing significant portions of the design effort.

3.2 OPEN CHANNEL HYDRAULICS - AN OVERVIEW

Flow conditions in an open channel are characterized as steady or unsteady, uniform or varied, subcritical or supercritical.

3.2.1 Steady or Unsteady Flow

Steady flow occurs when the velocity of successive fluid particles at a particular location is the same for successive periods of time. Thus, the velocity is constant with respect to time ($\frac{dv}{dt}=0$) although it may vary at different locations in the channel. This statement implies that the flow rate Q must also be constant with respect to time. For unsteady flow, the velocity at a particular point is not