

Section One: Reading Comprehension

Types of Aqueducts

Various types of conduit can be used for transporting water. The final selection rests on such factors as topography, head availability, construction practices, economic considerations, and water quality. In addition, the transported water must be safeguarded against pollution by inferior water sources. This is a special problem when open channels or conduits operating at low pressure are used.

Open Channels

Open channels are designed to convey water under conditions of atmospheric pressure. By this definition, the hydraulic gradient and free-water surface are coincident. If the channel is supported on or above the ground, it is classified as a flume. Open channels may be covered or open and may take on a variety of shapes.

The choice of an open channel as the means of conveyance will usually be predicted on suitable topographic conditions which permit gravity flow with minimal excavation or fill. If the channel is unlined, the perviousness of the soil must be considered relative to seepage losses. Other considerations of importance are the potential pollution hazard and evaporative losses.

Many modern open channels are lined with concrete, bituminous materials, butyl rubber, vinyl, synthetic fabrics, or other products to reduce the resistance to flow, minimize seepage, and lower maintenance costs. Flumes are usually constructed of concrete, steel, or timber.

Pipelines

Pipelines are usually built where topographic conditions preclude the use of canals. Pipelines may be laid above or below ground or may be partly buried. Most modern pressure conduits are built of concrete, steel, cast iron, or asbestos cement.

Pipelines used in important transportation systems may require gate valves, check valves, air-release valves, drains, surge control equipment, expansion joints, insulation joints, manholes, and pumping stations. These appurtenances are provided to ensure safe and efficient operation, provide for easy inspection, and facilitate maintenance. Check valves are normally located on the upstream side of pumping equipment and at the beginning of each rise in the pipeline to prevent backflow. Gate valves are often spaced about 1200 ft apart so that the intervening section of line can be drained for inspection or repair, and on either side of a check valve to permit its removal for inspection or repair. Air-release valves are needed at the high points in the line to release trapped gases and to vent the line to prevent vacuum formation. Drains are located at low points to permit removal of sediment and allow the conduit to be emptied. Surge tanks or quick-opening valves provide relief from problems of hydraulic surge.

Tunnels

Where it is not practical or economical to lay a pipeline on the surface or provide an open trench for underground installation, a tunnel is selected. Tunnels are well suited to mountain or river crossings. They may be operated under pressure or act as open channels.

Clark, Viessman & Hammer (1977). Water Supply and Pollution Control. IEP. Publishers, p. 142.

Part I. Comprehension Exercises

A. Put "T" for true and "F" for false statements. Justify your answers.

- 1. Open channels must be made of concrete.
- 2. Check valves prevent backflow of water in a pipeline.
- 3. Air-release valves should be installed at the crest of a pipeline.
- 4. Tunnels are used only in mountainous areas.
- 5. Water evaporation in open channels is negligible.

B. Choose a, b, c, or d which best completes each item.

- 1. According to the passage a (an) is required for draining the pipeline section to be repaired.
 - a. check valve
 - b. gate valve
 - c. ball valve
 - d. air-release valve
- 2. From a hydraulics standpoint, flow of water in a tunnel could be similar to that of a (an)
 - a. dike
 - b. open channel
 - c. dam
 - d. orifice
- 3. A flume is an elevated
 - a. water tank
 - b. pipeline
 - c. channel
 - d. storage reservoir
- 4. In addition to general losses in an open channel, water is also important.
 - a. evaporation
 - b. seepage
 - c. turbulence
 - d. infection
- 5. Water flows in an open channel by
 - a. pumps
 - b. gravity
 - c. pressure
 - d. suction