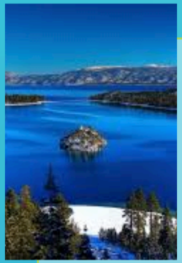
CE 3372 WATER SYSTEMS DESIGN

LESSON 9: EPA-NET INTRODUCTION

INTRODUCTION TO EPANET

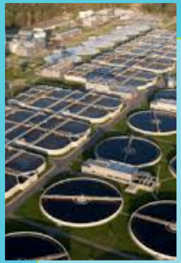
- Introduction to EPANET
  - Install on PC
  - Install on Mac (Experimental; Unsupported)
- Background on the program
  - Interface tour
- Example problem (from ES4) on EPANET

SYSTEM COMPONENTS



Water source (Main Supply)

- Lake
- River
- Aquifer



Treatment Facility

- Treats and disinfects water
- Meet water quality standards
- Potable water

Transmission Lines

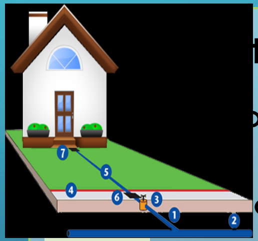
- Convey water from
  source – treatment facility
  facility – network

Pumping Facilities

- Provide energy to move water

Intermediate Storage Facilities

- Stabilize line pressures
- Reserve for peak demand periods
- Provide storage for fire flow req.



tribution Lines

- onvey water from
  storage – service areas
- oped(grid) and Branched Layouts

Appurtenances

- Fire Hydrants. Valves, auxiliary pumps, fittings

NETWORK REPRESENTATION

- **Distribution network** - Consists of items designed to convey potable water at adequate pressures and discharges
  - Tanks
  - Pumps
  - Pipes
  - Valves
  - Fittings
  - Meters
  - Other appurtenences

EPANET

- Computer program that simulates flow in closed conduit (pressurized) systems
  - Nodes
  - Links (pipes, pumps, valves)
  - Reservoirs (reservoir, tanks)
  - Demand schedule (extended period simulation)

GETTING THE PROGRAM

- Download and install EPA-NET
  - PC Users – Google EPANET or Use the class website
  - MAC Users – Use the class website

GETTING THE DOCUMENTATION

- Download and PRINT the user manual
  - EPANET website, or class website.
    - Topology constructed in a GUI
    - Lengths, diameters, friction terms entered for each component (pipe, valve)
    - Demand entered for each node (+ outflow, - inflow)

ABOUT THE PROGRAM

- Topology (Network Layout) is constructed in a GUI
- Nodes
  - Demand entered for each node (+ outflow, - inflow)
  - Elevation for each node (to calculate pressure)
- Links
  - Lengths, diameters, friction terms entered for each component.
  - Pipes, Pumps, Valves are all “link” components
- Reservoir/Tank
  - All models need a reservoir or tank (like the ground in an electric circuit)

STUFF YOU HAVE TO CHOOSE

- Head Loss Models
  - Darcy-Weisbach
  - Hazen-Williams
  - Chezy-Mannings
- Flow units (CFS, GPM, CMS and such)
  - Select SI or US Customary
    - – Preferably before building a model
  - The program does not convert unit SYSTEMS

MODELING PROTOCOL

- Sketch a layout on paper
  - Identify pipe diameters; length; roughness values
  - Identify node elevations; demands
  - Supply reservoir (or tank); identify reservoir pool elevation
  - Identify pumps; pump curve in problem units
- Start EPANET, and build the model

EXAMPLE 1

- Example 1 – Flow between two reservoirs

Figure 1 shows two reservoirs connected by a 2 mile long, 2 foot diameter, cast iron pipe. The elevation difference between the two reservoir surfaces is 20 feet. Determine the discharge rate of the reservoir elevations remain unchanged.

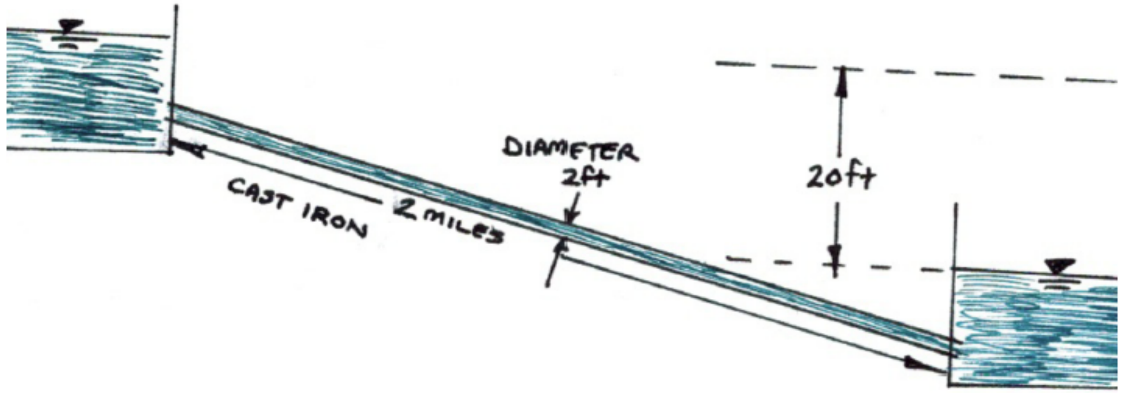
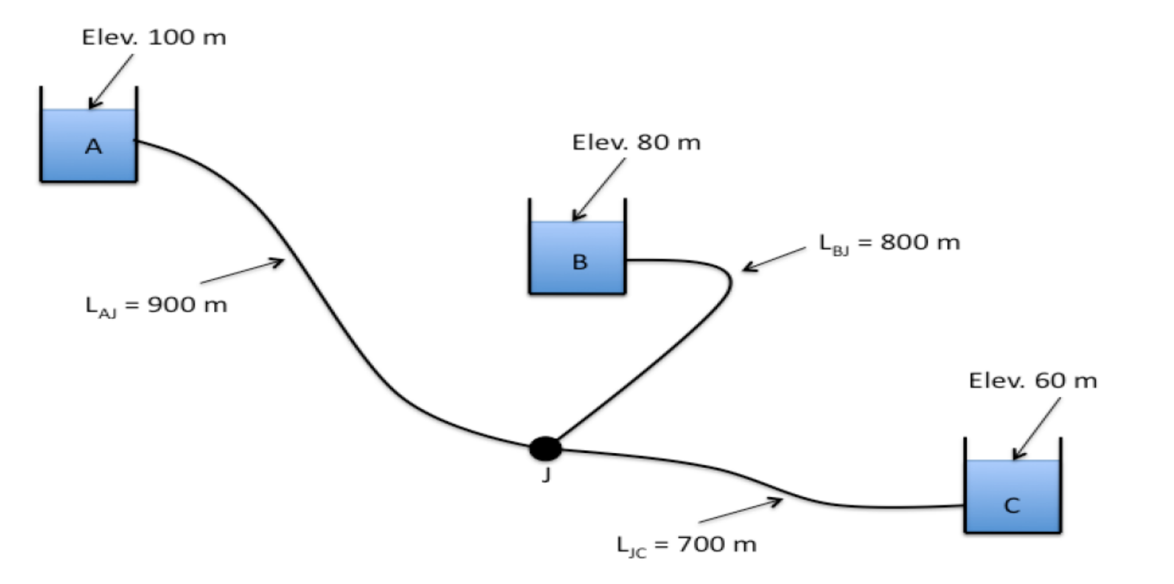


Figure 1: Two reservoirs connected by a cast iron pipe

EXAMPLE 2

- Example 2 – Three reservoir (branched)



Reservoirs A, B, and C are connected as shown[3] in Figure 11. The water elevations in reservoirs A, B, and C are 100 m, 80 m, and 60 m. The three pipes connecting the reservoirs meet at junction J, with pipe AJ being 900 m long, BJ being 800 m long, and CJ being 700 m long. The diameters of all the pipes are 850 mm. If all the pipes are ductile iron, and the water temperature is 293°K, find the direction and magnitude of flow in each pipe.

NEXT TIME

- Additional Network models in EPANET