

CE 3372 WATER SYSTEMS DESIGN

LESSON 9: EPA-NET INTRODUCTION

INTRODUCTION TO EPANET

- Introduction to EPANET
 - Install on PC
 - Install on Mac (Experimental; Unsupported)
 - EPANET in a Box
- Background on the program
 - Interface tour
- Example problems on EPANET

SYSTEM COMPONENTS



Water source (Main Supply)

- Lake
- River
- Aquifer



Transmission Lines

- Convey water from source — treatment facility
- facility — network



Treatment Facility

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



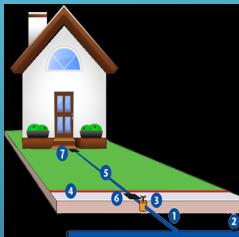
Pumping Facilities

- Provide energy to move water



Intermediate Storage Facilities

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



Distribution Lines

- Convey water from storage — service areas
- Loop(ed) 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 appurtenances



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.

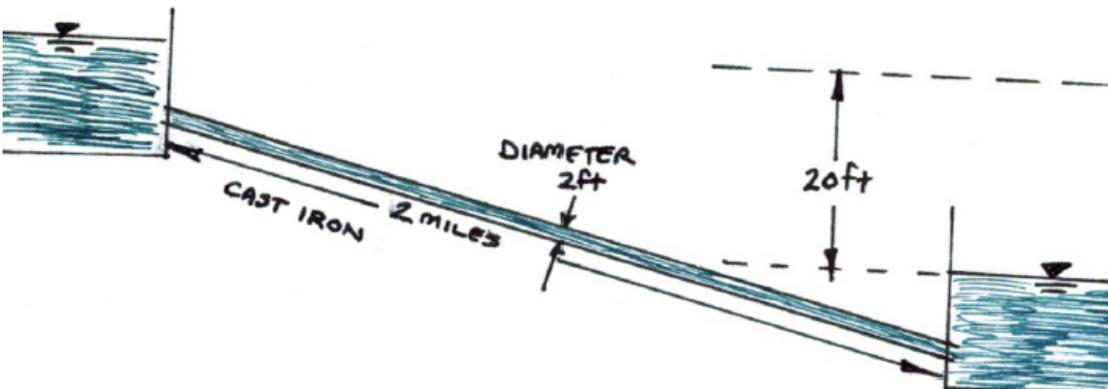
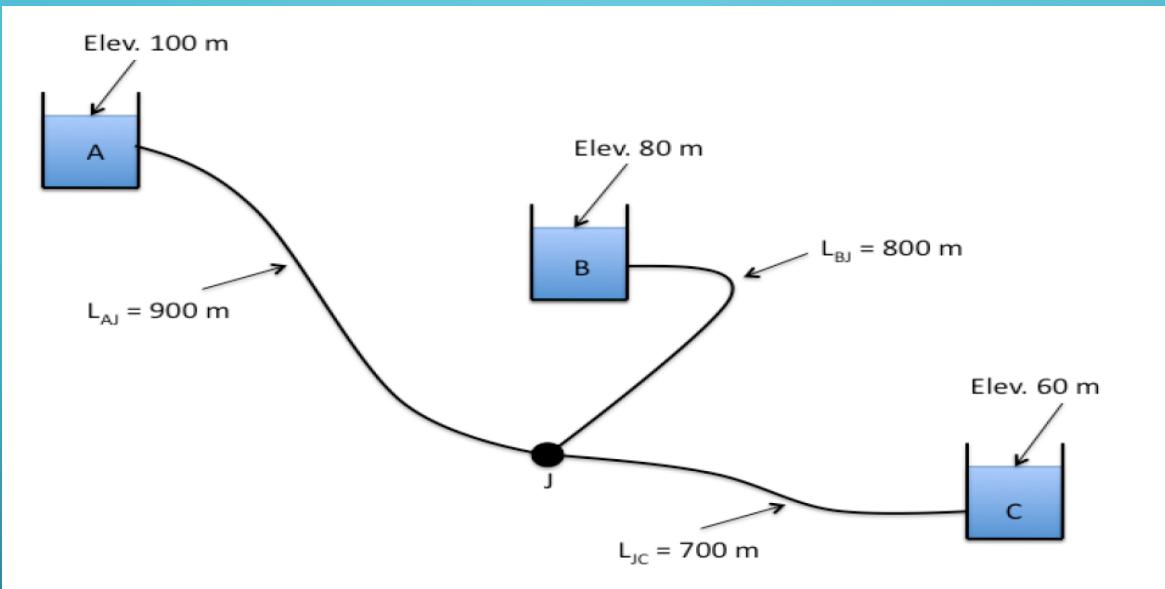


Figure 1: Two reservoirs connected by a cast iron pipe

EXAMPLE 2

- Example 2 – Three reservoir (branched)



Reservoirs A, B, and C are connected as shown³ 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.