University of Colorado Denver
Department of Civil Engineering
CVEN-4426/5426 Pipe Network and Sewer Design

Assignments and Answers
dcm 4/13/2021

Except as noted, problem numbers refer to Shammas and Wang (2011).
Problem numbers in parentheses are required for CVEN-5426 and optional for CVEN-4426.

Week	Topic	Assignment
1	Civil engineering design process.	Handout—writing, software, CATME
2	Introduction to water systems.	Handout—safety, demand, fire flow
3	Water software (EPANET).	Handout—EPANET
4	Tanks and pumps.	8.6, 8.7, 8.8, 8.9, 8.15, (8.20)
5	Water hydraulics.	5.3, 5.8, (5.9)
6	Water system design I.	6.7 Section E-E, 6.19, (EPANET)
7	Water system design II.	Handout—safety, equivalence
8	Introduction to wastewater systems.	Handout—safety, treatment, references
9	Review. Midterm exam.	Handout—EGL and HGL
10	Wastewater software (SWMM)	Handout—profiles, Auraria
11	Wastewater hydraulics.	13.1, 13.24, 13.27, (13.3)
12	Wastewater system design I.	14.3
13	Wastewater system design II.	14.9
14	Wastewater system appurtenances.	Handout—CATME, values

Answers to Problems
These partial answers will help determine whether you are on track. Some have been rounded.

Week 1
Results will vary.

Week 2
1. Results will vary.
2. (a) 1.0 gpm (b) 6.3%
3. (a) 1500 gpm (b) 2800 gpm
4. Results will vary with updates to the Web of Science.

Week 3
1. Results will vary
2. (a) pipe AB, Q = 0.67 MGD, head loss H = 87 ft
   (b) pipe AB, Q = 0.28 MGD, head loss H = 18 ft
3. Results will vary.

Week 4

8.6 500 gal/min

8.7 77 ft

8.8 8.2 hp

8.9 For Darcy-Weisbach (n = 2), 2100 gpm. For Hazen-Williams (n = 1.85), 2300 gpm.

8.15 *Hint:* To avoid confusion from typo, use SI units [m^3/hr] (a) ~~V~~ = 400 m^3; (b) ~~V~~ = 130 m^3

8.20 (a) 300 m^3; (b) 220 m^3

Week 5

5.3 (a) H_A = 99 m; (b) Q_C = 1.9 L/s

5.8 (a) Q_{BC} = 70 L/s, (b) P_D = 468 kPa, (c) z_{max} = 602 m, (d) D_{AB} = 480 mm

5.9 (a) Q_B = 200 L/s, (b) Q_B = 90 L/s.

Week 6

6.7 Section E-E: deficiency 1.6 MGD, so add/remove pipes, while keeping S ≈ 2‰

6.19 (a) ΣH = +0.30 ft, (b) P_C = 28 psi, (c) P_C = 17 psi

Week 7

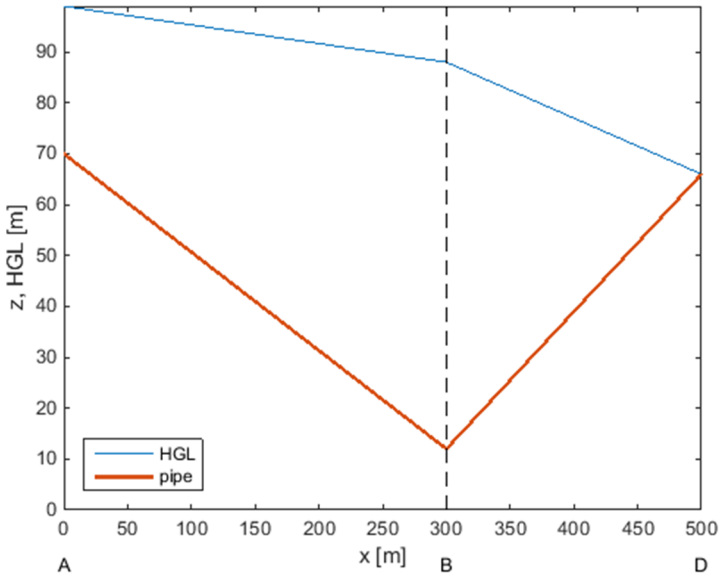
1. Answers will vary
2. (Problem 6.4) D = 350 mm
3. *Hint:* What assumptions are embedded in the series and parallel recipes?

Week 8

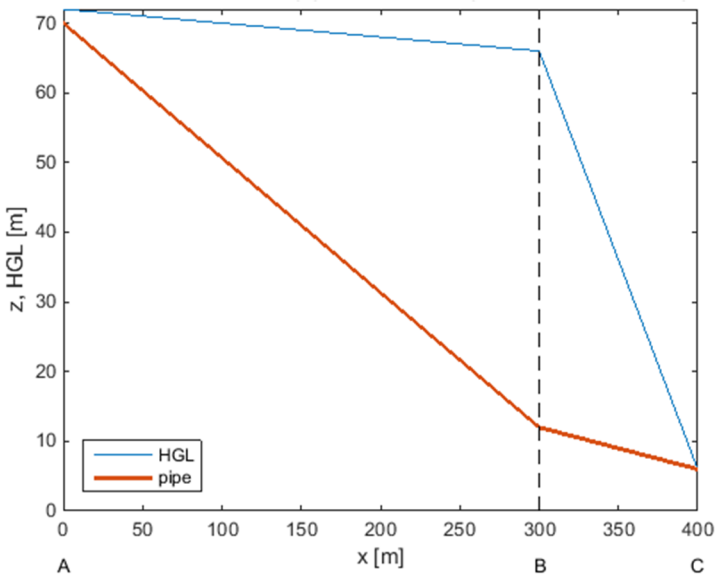
Answers will vary.

Week 9

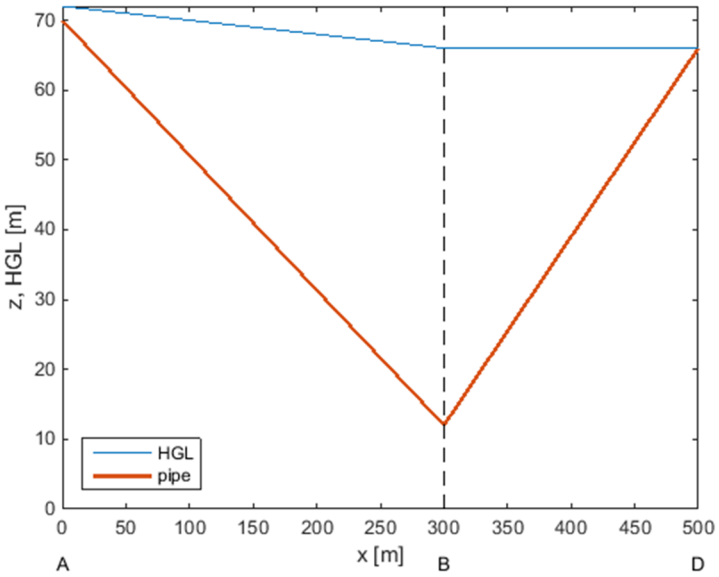
(a) Profile A-B-C given in problem statement.
Profile A-B-D as follows:



(b) Profile A-B-C as follows:



Profile A-B-D as follows:



Week 10

1. (a) right, (b) left, (c) right.
2. Design exercise—results will vary.
3. (a) V = 16 ft/s, (b) V = 5.8 ft/s, (c) right.

Week 11

13.1 (a) Q = 1.2 cfs (b) S = 9‰

13.24 *hint*, assume conduit flowing full after adding trunk flow and neighborhoods A and B
(a) 1,200 dwellings in neighborhood B (b) various combinations of (D, S, V) are possible

13.27 d_s = 5.4 in

13.3 $V = \frac{1.49}{n}\left(\frac{W}{4}\right)^{2/3} S^{1/2}$

Week 12

14.3 (a) $V_{min,B}$ = 0.90 m/s (b) Δz_{invert} = 28 cm (c) D_{small} = 600 mm

Week 13

1. Pump operating point Q = 8,300,000 gpd and H = 170 ft.
2. Answers will vary.

Week 14

1. CATME team participation report—answers will vary.
2. Values statement—answers will vary.