CE 474/574 - Unit Operations in Environmental Engineering

Design Assignment 3.
Designing a Clarifier for the Drain, OR Public Water Supply

The town of Drain now wants the next stage of the design: a clarifier system. Mr. Monella liked your previous work but he feels you need to start building some redundancy into the system to allow for future growth of the town, and also to allow parts of the system to be shut down during the night shift or, for maintenance or repairs while continuing to operate. So for all future aspects of the design, use **double** the average expected flow for the current population (i.e., twice your previous design flow) and design **two parallel clarifiers**. (Note that each clarifier will be built for the original design flow you used. And together they will satisfy double the present daily flow.)

Mr. Monella wants to compare circular and rectangular clarifiers, so you may choose to design *either* a circular *or* rectangular clarifier. Do *only* *one* type of clarifier, *not* both types.)

Here are some design guidelines.

- Use the suggested ranges in Table 11.6 of the text for rectangular and circular clarifiers. Since this is a very small plant that is subject to easy disturbance, use the *most conservative* value of overflow rate. The resulting clarifier will not be all that large, anyway.
- Recommended detention times for clarifiers following flocculation are a minimum of 2-4 hr. Find the minimum acceptable depth (table 11.6) that falls within this range.
- The length of a rectangular clarifier should be four times the width of the clarifier.
- Be sure to include information about the length of the overflow weir, and include in your drawings a depiction of how you will accommodate the required weir length.
- Do *not* worry here about the depth of the launders. In practice you can get the right size launders for your flow by consulting a technical sales representative for a manufacture of pre-made launder channels.

[Cont'd]

Lab Sedimentation Tests:

A set of settling column tests has been completed for raw water that has been coagulated and flocculated according to the design principles you established in your last assignment.

	Percentage Removal		
time (min)	0.8 m depth	1.6 m depth	2.4 m depth
30	24	19	17
60	40	34	31
90	55	44	42
120	63	55	50
180	77	65	60
240	81	73	68

In a cover memo to Mr. Monella report the following:

1. State all the dimensions of your clarifiers. Include a scale drawing of the system.
2. State all design criteria used: Overflow rate, detention time, weir overflow rate.
3. State the calculated removal efficiency of the clarifiers at the design depth and detention time.