

CE 326 Principles of Environmental Engineering  
Rapid Sand Filter Design  
Summer Session

A new water treatment plant is planned for a community of 40,000 people along the Des Moines River. The new plant will consist of rapid mix for coagulation, flocculation, and sedimentation basins, followed by rapid sand filters. The water quality for the plant will be similar to the Des Moines River water sample tested in the lab during the past two weeks. Use the following as a basis of for the rapid sand filters:

design population	40,000
average demand	100 gallons per capita per day
maximum day demand	2.4 times average
cold water temperature	10°C
avg. floc particle size	50 $\mu$
sand	
specific gravity	2.65
effective size, mm	0.47
uniformity coefficient	1.4
shape factor	0.84
bed porosity	0.42

Prepare a design for the rapid sand filter, including the clean bed headloss and expanded media calculation. Follow the example in the text, recognizing in this case, you are already given the media size analysis. Provide a short report providing a summary of the design, any assumptions that were made, and sample calculations. Include a plan sketch showing a layout of the filters and the total filtration surface area required. Also, include a section sketch of the filter showing where the bottom of the washwater troughs should be placed to keep from losing media during backwashing.