Sanitary Sewer Sizing Calculations Example

Development Information:

Number of Housing Units = 500
Critical Pipe Slope = 0.50%

Set Design Information:

4 residents per household
100 gallons per capita per day (gpcpd)
Peaking factor of 4.0

Assuming a pipe size of 8”:

The area of an 8” sanitary sewer is:

$$A = \pi \frac{D^2}{4} = 3.14159 \frac{\left(\frac{8}{12}\right)^2}{4} = 0.34 ft^2$$

The hydraulic radius is:

Rh = D/4 = (8”/12”)/4 = 0.167 feet

The required capacity is as follows:

500 houses * 4 residents per household * 100 gpcpd * 4.0 peaking factor
=800,000 gallons per day
=1.24 cfs

Using Manning’s Equation for an 8” sewer yields:

$$Q = \frac{1.49}{n} ARh^{2/3} S^{1/2} = \left(\frac{1.49}{0.013}\right)(0.34)\left(0.167^{0.667}\right)\left(\sqrt{0.005}\right) = 0.835 cfs$$

<u>The generated wastewater flow is greater than the capacity of an 8” pipe. Therefore a larger pipe will be needed.</u>

Trying a 12” pipe:

The area of a 12” sanitary sewer is:

$$A = \pi \frac{D^2}{4} = 3.14159 \frac{\left(\frac{12}{12}\right)^2}{4} = 0.78 ft^2$$

The hydraulic radius is:

Rh = D/4 = (12”/12”)/4 = 0.333 feet

Using Manning's Equation for an 8" sewer yields:

$$Q = \frac{1.49}{n} ARh^{2/3} S^{1/2} = \left(\frac{1.49}{0.013}\right)(0.78)\left(0.333^{0.667}\right)\left(\sqrt{0.005}\right) = 2.08\text{cfs}$$

Therefore a 12" pipe shall be used.