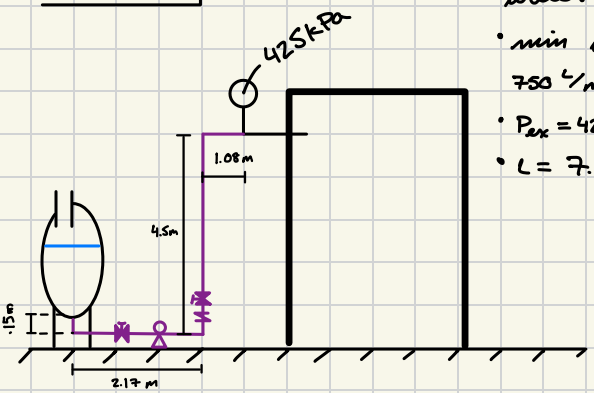
Homework 11

Problem 2



- water @ 80°C
- min flow rate is 750 L/min (198 gpm)
- $P_{ex} = 425$ kPa
- $L = 7.9$ m

I will select schedule 40 steel pipe for this system. For the given:

$.75\ m^3/min = 180\ m/min\ (A) \Rightarrow A = .00417\ m^2$ so 3in schedule 40

so then to get V → $.75\ m^3/min = V(4.768E\text{-}3\ m^2) \Rightarrow V = 157.30\ m/min$ or $2.62\ m/s$

now to calculate pump head using $H_a = H_L + \Delta z + \frac{V_2^2}{2g} + \Delta P$?

- 3 elbows ($K = 30 f_T$)
- 2 gate valve ($K = 8 f_T$)
- 1 check valve ($K = 100 f_T$)

$N_R = \frac{2.62(7.9)}{.365E\text{-}6} \Rightarrow 5.67E7$

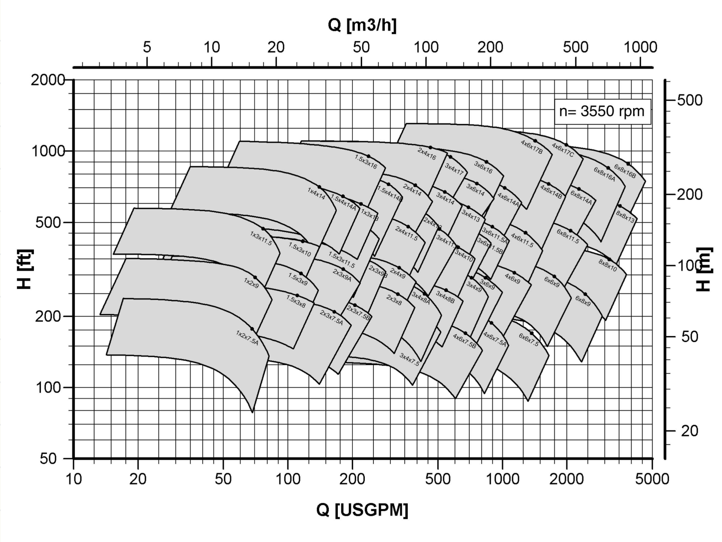
$D/\varepsilon = \frac{.0779}{4.6E\text{-}5} \Rightarrow 1693.48$

Used f to be .01803

then $H_a = 3(30 \cdot .01803) + 2(8 \cdot .01803) + 100(.01803) + (4.5) + \frac{2.62^2}{2(9.81)} + (425 - 101.7)$

$\Rightarrow H_a = 331.86$ m

$Q = 750$ L/min



parameters do not quite match but could not find any more sources (catalogs) so use highest values for selected pump

from table choose 1×4×14

point lands on 14.00in line
↳ impeller diam.