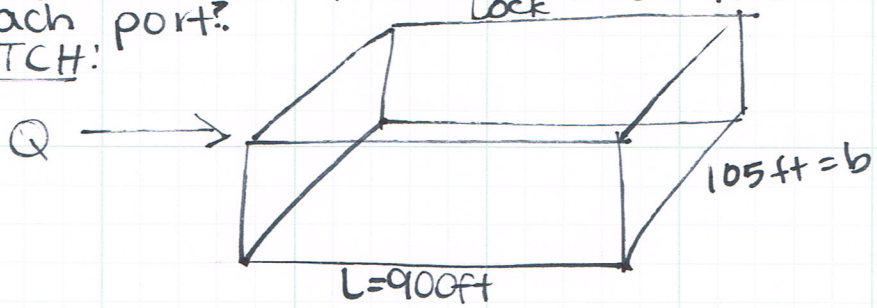
5.23) Water enters the lock of a ship canal through 180 ports, each port having a 2ft by 2ft cross section. The lock is 900ft long and 105 ft wide. The lock is designed so that the water surface in it will rise at a maximum rate of 6ft/min. For this condition, what will be the mean velocity in each port?

SKETCH:



KNOWN

180 ports
$A_p = 2ft \times 2ft = 4ft^2$
$A_{rise} = 105ft \times 900ft = 94{,}500ft^2$
$V_{rise} = 6ft/min$

UNKNOWN:

mean velocity, $\bar{V}$

GOVERNING EQNS

$$\Sigma V_p A_p = V_{rise} \times A_{rise}$$

SOLUTION:

$$180 \times V_p \times (A_p) = V_{rise} * A_{rise}$$

$$180 * V_p * 4ft^2 = \frac{6\,ft}{min} * \frac{1\,min}{60\,sec} * 94500ft^2$$

$$\boxed{V_p = 13.12 ft/s}$$