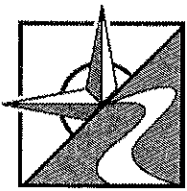


Phase 1 Fire Flow Calculations



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PROJECT NO. 7602 PINE TREE PHASE 1

SHEET NO. 1 OF

CALCULATED BY RIB

CHECKED BY

SCALE

DATE 5/25/21

ESTIMATED FIRE FLOW AT HYDRANT LOCATED ON PINE TREE ROAD APPROXIMATELY 740 FEET FROM SALISBURY STREET

FLOW TESTS PERFORMED 11/9/18 BY LOGSWELL SPRINKLER

HYDRANT A - CORNER OF SALISBURY STREET AND PINE TREE ROAD

PRESSURE LOSS AT PROPOSED HYDRANT DUE TO ELEVATION CHANGE

$$\begin{array}{rcl} \text{EX. HYDRANT ELEVATION} & = & 772 \\ \text{PROP. HYDRANT ELEV} & = & 801.5 \\ \hline \text{ELEVATION CHANGE} & = & 29.5 \text{ feet} \end{array}$$

$$\text{CHANGE IN PSI} = 0.434 \text{ psi / foot}$$

$$\begin{array}{l} 29.5 \text{ feet} \times 0.434 \text{ psi / ft} \\ = 12.8 \text{ psi loss} \end{array}$$

USING DARCY-WEBBACH EQN

$$h_f = \frac{f L V^2}{2 D g}$$

$$h_f = \text{pressure loss ft}$$

$$f = \text{friction coefficient}$$

$$L = \text{length of pipe ft}$$

$$V = \text{velocity in pipe ft/s}$$

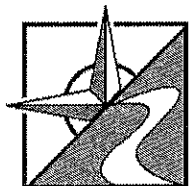
$$D = \text{diameter of pipe ft}$$

$$g = \text{gravity ft/sec}^2$$

VELOCITY FROM MEASURED FLOW = 964 gpm

$$964 \text{ gpm} \times 0.0022 \text{ cfs/gpm} = 2.12$$

$$V = \frac{Q}{A} = \frac{2.12 \text{ cfs}}{\pi (0.33)^2} = 6.08 \text{ ft/s}$$



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PROJECT NO. 7602 PINETREE PHASE 1
SHEET NO. 2 OF
CALCULATED BY PSB
CHECKED BY
SCALE
DATE 5/25/21

REYNOLDS NUMBER (Re)

$$Re = \frac{V d}{K_v}$$

$$V = \text{velocity} = 6.08 \text{ ft/s}$$

$$d = \text{diameter of pipe} = 0.667 \text{ ft}$$

$$K_v = \text{kinetic viscosity} = 1.21 (\text{ft}^2/\text{s}) \times 10^{-5}$$

$$Re = \frac{6.08 (0.667)}{1.21 \times 10^{-5}} = 3.35 \times 10^5$$

$$\text{Relative Roughness} = \frac{\epsilon}{D}$$

$$\epsilon = \text{pipe friction factor} \\ 0.004 \text{ for DICE}$$

$$D = \text{pipe diameter (ft)}$$

$$= \frac{0.004}{0.667} = 0.006$$

friction coeff. from Moody's Diagram using Re and Rel. Rough.

$$= 0.032$$

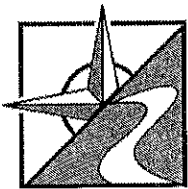
∴

$$h_f = \frac{(0.32) (740 \text{ ft}) (6.08 \text{ ft/s})^2}{2 (0.667 \text{ ft}) (32.2 \text{ ft/s}^2)} = 20.4 \text{ ft}$$

$$\text{Conversion Head (ft) to psi} = 2.31' = 1 \text{ psi}$$

$$20.4 \div 2.31 = 8.8 \text{ psi loss}$$

$$\text{TOTAL psi loss from elevation change and pipe friction} \\ = 12.8 \text{ psi} + 8.8 \text{ psi} = 21.6 \text{ psi}$$



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PROJECT NO. 7602 PINE TREE PHASE 1
SHEET NO. 3 OF
CALCULATED BY RJB
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CALCULATED FLOW AT PROPOSED HYDRANT

RESIDUAL PRESSURE MEASURED = 69 psi

$$69 \text{ psi} - 21.6 \text{ psi (loss)} = 47.4 \text{ psi @ PROP. HYDRANT}$$

$$Q = 964 \left(\frac{105 - 20}{105 - 47.4} \right)^{0.54} = 1189 \text{ gpm @ 20 psi res. pressure}$$

CONCLUSION:

REQUIRED MAXIMUM FIREFLOW = 1080 gpm from
previous coordination with sprinkler coils

THE PROJECTED ESTIMATED FIREFLOW CAPACITY

$$= 1189 \text{ gpm @ 20 psi}$$

THEREFORE, ADEQUATE FIREFLOW CAPACITY IS ESTIMATED
TO EXIST.