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**Open**

**CIVIL PE PRACTICE EXAM:**

**WATER RESOURCES DEPTH**

**VERSION A**

**PE PREPARED**



**F. Pressure conduit (e.g., single pipe, force mains, Hazen-Williams, Darcy-Weisbach, major and minor losses)**

**CERM 17-12**

**CERM 17-8**

**CERM 17-7**

**Hazen-Williams**

Friction headloss

$$h_f, ft = \frac{3.022 L_{ft} v_{ft}^{1.85}}{C^{1.85} D_{ft}^{1.17}}$$

$$Q = 1.318 C A R_h^{0.63} S^{0.54}$$

C = roughness coefficient

\*Alternate equation available in  $Q_{gpm}$

**Darcy-Weisbach**

Friction headloss

$$h_f, ft = \frac{f L_{ft} v_{ft}^2}{2g D_{ft}}$$

Laminar:  $Re < 2100$

$$f = \frac{64}{Re}$$

Turbulent:  $3000 < Re < 100,000$

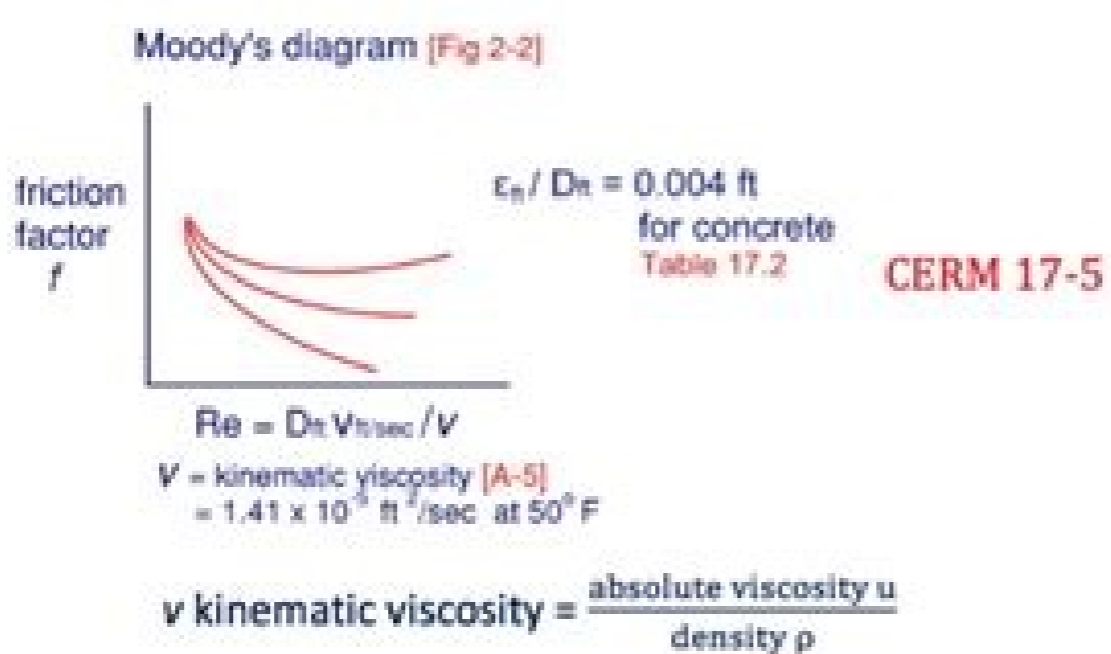
$$f = \frac{0.316}{Re^{0.25}} \text{ or Moody's diagram or A-42}$$

$$\text{Minor headloss: } h_L, ft = \frac{k v_{ft}^2}{2g}$$

k = friction loss coefficient **Table 17.4**

Equivalent length **A-47**

\*Don't forget to add the length of the pipe



**Civil Engineering Water Resources & Environmental PE Exam**

**SAMPLE EXAM**

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