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| NAME |  |
| Student ID |  |

*Known:* Water flows horizontally through a 1 inch inner diameter pipe over a length of 30 feet. Water has the following properties: υ=1.21×10-5  ft2/s and ρ=1.94 slug/ft3. The equivalent roughness of the pipe, ε=0.0001ft.

*Find:* Part 1: Determine the friction factor and the pressure drop if the average velocity is 0.2 ft/second.

Part 2: Determine the friction factor and the pressure drop if the average velocity is 1 ft/second.

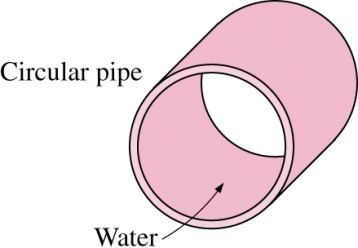
*Assumptions:* 1) The flow is fully developed. 2) No change in elevation. 3) There are no bends or contractions.

Equations:

*Re = VD/υ*

*flam=64/Re*

*hL= f*



D = 1 in

*l* = 30 ft

*Solution:*

*Part 1:*

*Re = VD/ υ = (0.2 ft/s) (1/12 ft) / (0.0000121 ft2/s) = 1,377*

* *Laminar flow*

*flam = 64/Re = 64 / 1,377 = 0.0464*

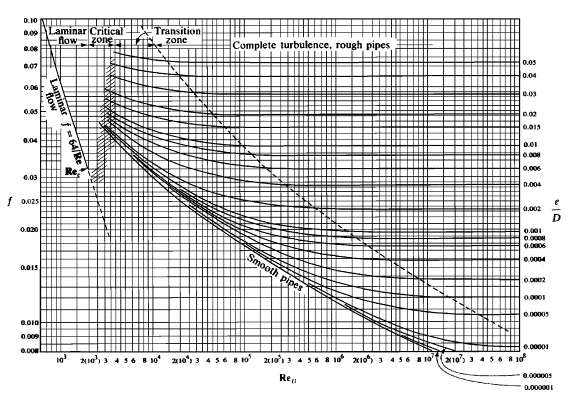
*f == = 0.649 = 0.0045*

*Part 2:*

*Re = VD/ υ = (1 ft/s) (1/12 ft) / (0.0000121 ft2/s) = 6887*

* *Turbulent flow*
* *Go to Moody diagram or Colebrook friction factor equation*

ε/D = 0.0001ft / (1/12 ft) = 0.0012



*fturb ~ 0.035*

*f == = 12.2 = 0.0850*