Darcy Friction Factor for Pipe Flow

Reynolds Number

Friction Factor \( f = \frac{\Delta \rho / \rho}{\frac{L}{2} \sqrt{\frac{g}{D}}} = 4 \tau_w / \sqrt{\frac{g}{D}} \)

Smooth honed steel 0.00065
Drawn tubing: glass, brass, lead, plastic 0.0015
Asphalted cast iron 0.12
Galvanized steel 0.15
Wood stave 0.18-0.91
Cast iron 0.25
Concrete 0.3-3
Heavy brush coat: asphalts, enamels, tars 0.45-0.6
General tuberculation 1-3 mm 0.6-1.9
Riveted steel 0.8-9
Severe tuberculation and incrustation 2.5-6.5

Indicative Roughness Values

Laminar Zone

Transition Zone

Critical Zone

Complete Turbulence Zone

Reynolds Number \( Re = \frac{\nu V D}{\mu} = \frac{V D}{\nu} \)

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