# FLUIDS LABORATORY

College of Engineering

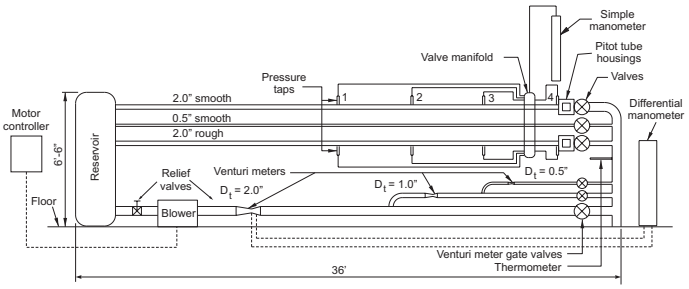
# Measurement of Velocity Profile and Head Loss/Friction Factor in Pipe Flow

*Purpose*

To measure flow rate, friction factor, and velocity profile in pipe flows with smooth and rough walls and specified turbulent-flow Reynolds number (*Re*) and compare the results with benchmark data , including uncertainty analysis for the friction factor and velocity profile.

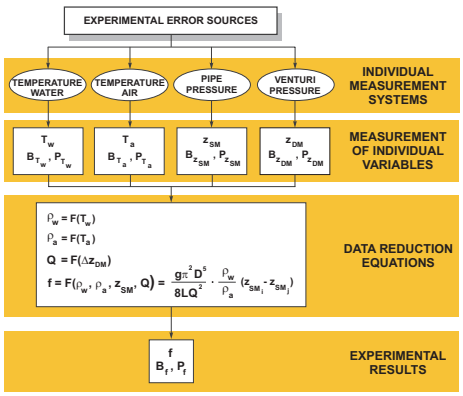
*Test Design*

Air is blown into a large reservoir located at the upstream end of the pipe system. Pressure built up in the reservoir forces air to flow downstream through any of the three straight experimental pipes. At the downstream end of the system, the air is directed downward and back through any of the three other pipes fitted with venturi meters.

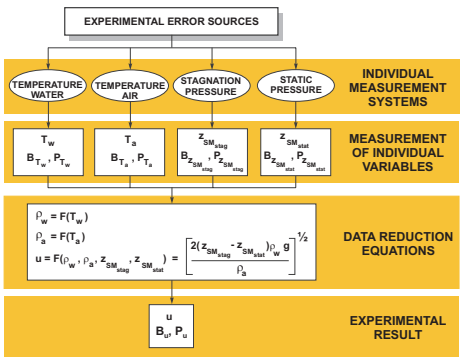



Air-flow pipe system

*Measurement Systems*




Block diagram of the experimental determination of the friction factor

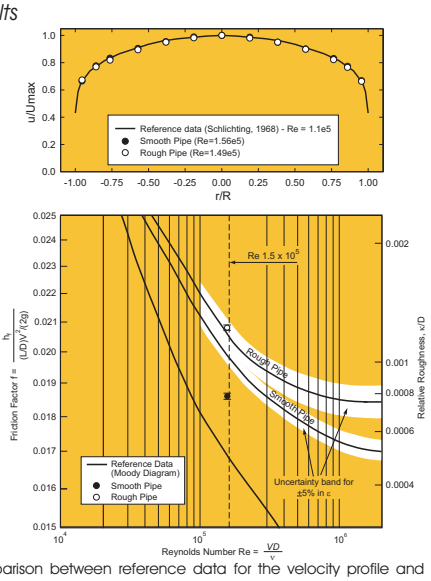



Block diagram of the velocity measurement

*Data Analysis*

- Obtain and plot the velocity profile and compare with benchmark data
- Determine the friction factor using the pressure measurements and the Darcy-Weisbach equation and compare with benchmark data
- Estimate experimental uncertainties

*Results*




Comparison between reference data for the velocity profile and friction factor and the experimental results