

ENGR 292 Fluids and Thermodynamics

## Design a Pump and Pipe System Steps 6 & 7

**Supporting Docs**

**Feb.03, 2017**

### Step 6 & 7

- ❑ **Commercially available pipe and tubing**
- ❑ **Specifying piping and tubing for a particular application is the responsibility of the designer (engineer, technologist, etc.) and it has significant impact on**
  - **Cost**
  - **Life,**
  - **Safety**
  - **Performance of the system**

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### Steps 6 & 7

- ❑ **For many applications, codes and standards, and specifications must be followed.**
  - **Industry**
    - **Oil and Gas: High pressure, High Temperature**
    - **Mining:**
  - **Residency: Plumbing**

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### Steps 6 & 7

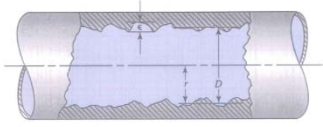
**Pipe Material: Commercial Steel**

<http://www.pipeflow.com/sitemap/pipe-roughness>

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### Steps 6 & 7

#### **Roughness of Pipe**



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### Steps 6 & 7

#### **Pipe Roughness**

Material	Roughness $\epsilon$ (m)	Roughness $\epsilon$ (ft)
Glass	Smooth	Smooth
Plastic	$3.0 \times 10^{-7}$	$1.0 \times 10^{-6}$
Drawn tubing: copper, brass, steel	$1.5 \times 10^{-6}$	$5.0 \times 10^{-6}$
Steel, commercial or welded	$4.6 \times 10^{-5}$	$1.5 \times 10^{-4}$
Galvanized iron	$1.5 \times 10^{-4}$	$5.0 \times 10^{-4}$
Ductile iron—coated	$1.2 \times 10^{-4}$	$4.0 \times 10^{-4}$
Ductile iron—uncoated	$2.4 \times 10^{-4}$	$8.0 \times 10^{-4}$
Concrete, well made	$1.2 \times 10^{-4}$	$4.0 \times 10^{-4}$
Riveted steel	$1.8 \times 10^{-3}$	$6.0 \times 10^{-3}$

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*Steps 6 & 7*

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**Roughness of Commercial Steel Pipe**

$$\varepsilon = 0.0045 \text{ (mm)}$$

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*Steps 6 & 7*

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**Relative Roughness:****Discharge Pipe:**

$$\frac{D_{\text{Discharge}}}{\varepsilon} = \frac{52.501}{0.0045} = 11666.89$$

**Suction Pipe:**

$$\frac{D_{\text{Suction}}}{\varepsilon} = \frac{62.713}{0.0045} = 13936.22$$

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