

# PIPE AND TUBING FORMULAS

## I. Mechanical Properties

A = Area of cross section  
 W = Weight in pounds per foot  
 I = Moment of inertia

Z = Section modulus  
 R = Radius of gyration  
 C = Distance of extreme fibre from neutral axis

### ROUND PIPE & TUBING — WHERE

D = outside diameter  
 d = inside diameter  
 T = wall thickness

### SQUARE TUBING — WHERE

D = outside measurement  
 d = inside measurement  
 T = wall thickness

### RECTANGULAR TUBING — WHERE

h = outside measurement - long side  
 d = inside measurement - long side  
 a = outside measurement - short side  
 e = inside measurement - short side  
 T = wall thickness

$$A = 3.1416 (D-T) T$$

$$W = 10.69 (D-T) T$$

$$I = .0491 (D^4 - d^4)$$

$$Z = .0982 \frac{(D^4 - d^4)}{D}$$

$$R = \sqrt{\frac{D^2 + d^2}{4}}$$

$$C = \frac{D}{2}$$

$$A = 4 (D-T) T$$

$$W = 13.5984 (D-T) T$$

$$I = \frac{D^4 - d^4}{12}$$

$$Z = \frac{D^4 - d^4}{6D}$$

$$R = .2887 \sqrt{D^2 + d^2}$$

$$C = \frac{D}{2}$$

$$A = ah - ed$$

$$W = 6.7992 (a+h-2T) T$$

$$I = \frac{ah^3 - ed^3}{12}$$

$$Z = \frac{ah^3 - ed^3}{6h}$$

$$R = .2887 \sqrt{\frac{ah^3 - ed^3}{ah - ed}}$$

$$C = \frac{h}{2}$$

### I. Internal Properties Round Pipe & Tubing

1. Circumference in inches = 3.1415927 x d
2. Surface per lineal foot  
 Square Inches = 37.699112 x d  
 Square Feet = .26179939 x d
3. Lineal feet of tube per square foot of surface  
 $\frac{3.8197186}{d}$
4. Transverse area in square inches = .78539816 x d<sup>2</sup>
5. Volume of capacity per lineal foot  
 Cubic Feet = .0054541539 x d<sup>2</sup>  
 U.S. Gallons = .04079905 x d<sup>2</sup>

### II. External Properties Round Pipe and Tubing

1. Circumference in inches = 3.1415927 x D
2. Surface per lineal foot  
 Square Inches = 37.699112 x D  
 Square Feet = .26179939 x D
3. Lineal feet of tube per square foot of surface =  $\frac{3.8197186}{D}$
4. Transverse area in square inches = .78539816 x D<sup>2</sup>
5. Volume of displacement per lineal foot  
 Cubic Feet = .0054541539 x D<sup>2</sup>  
 U.S. Gallons = .04079905 x D<sup>2</sup>