Pipefitter/Steamfitter
Certification Examination #F-106
Figures, Formulas and Tables

Formula 1. The parts of an offset

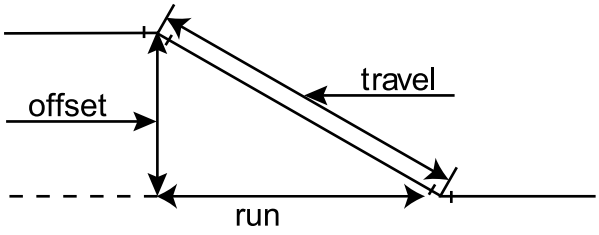


Table 1-A. Offset Factors

To find side	When you know side	Multiply side	For 45° ells by	For 22-1/2° ells by
T	O	O	1.414	2.613
O	T	T	.707	.383
R	O	O	1	2.414
O	R	R	1	.414
T	R	R	1.414	1.082
R	T	T	.707	.933

Formula 2.

One of the basic fan laws states that cubic feet delivered per minute (CFM) varies in direct proportion to the revolutions per minute (RPM).

$$\frac{CFM_1}{CFM_2} = \frac{RPM_1}{RPM_2}$$

$$CFM_2 = \frac{CFM_1 \times RPM_2}{RPM_1}$$

501 Shatto Place, Suite 201, Los Angeles, CA 90020, (877) 457-6482, (213) 380-6482, Fax (213) 365-5335

Formula 3. E=IR where:

E = Voltage

I = Amperes

R = Resistance in OHMS

Formula 4. Perimeter = 2 x length + 2 x width

Formula 5. Volume = length x width x height

Formula 6. The circle:

Area = $\pi r^2 a$ or A = .7854 diameter squared

Circumference = π x diameter

Formula 7. Rectangular solid:

Volume = altitude x base x thickness

Formula 8. Parallelogram:

Area = altitude x base

Formula 9. Triangle:

Area = 1/2 altitude x base

Formula 10. Cylindrical tanks:

Capacity in gallons = diameter squared x .7854 x length x 7.48 gallons

$V = \pi r^2 a$

Formula 11. Spheres:

Surface = diameter squared x π
Volume = diameter cubed x .5236

Formula 12. Rolling offsets:

Finding Travel and Run for a Rolling Offset
Formula:

A = $\sqrt{\text{roll}^2 + \text{set}^2}$

Travel = A x cosecant of angle of fitting (See Trigonometry Table.)

Run = A x cotangent of angle of fitting (See Trigonometry Table.)

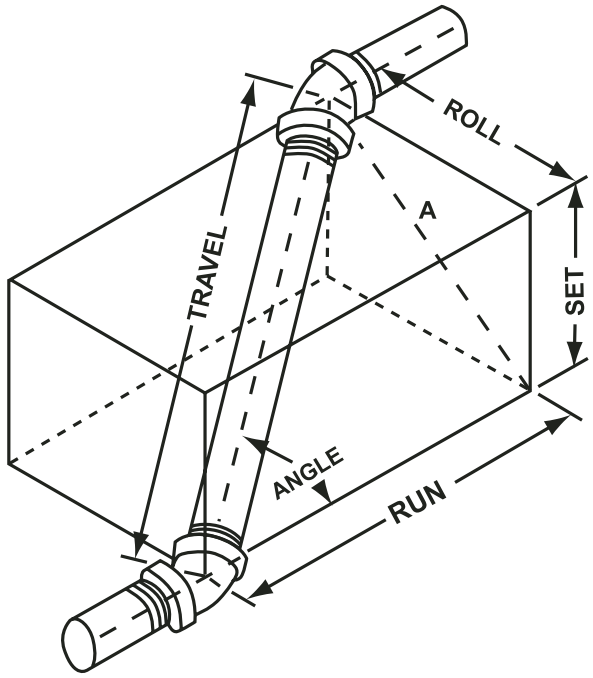


Fig. 45. Rolling offset.

Table 12-A. Trigonometry Table (a portion)

Deg.	Min.	Sine	Cosine	Tangent	Cotangent	Secant	Cosecant
44	30	.70091	.71325	.98270	1.0176	1.4020	1.4267
45		.70711	.70711	1.0000	1.0000	1.4142	1.4142

Formula 13. Total Force:

Total Force = area x pressure
= area x height x density
= AHD

Formula 14. Percentage:

Base = percentage divided by the rate

Formula 15. Density:

Density = weight divided by the volume

Formula 16. Inches of mercury to psi:

Inches x 0.491 = psi

Formula 17. Atmospheric pressure:

Absolute pressure = atmospheric pressure minus vacuum pressure

Formula 18. Water:

H = SW, where:

H = Btu of sensible heat
S = Specific heat
W = Weight in pounds

Formula 19. U-bolts:

Figuring rod lengths for U-bolts

For the values in the following formulas, see Fig. 29.

A = D+F
B = one-half outside diameter of the pipe
C = nut thickness
D = outside diameter of the pipe
E = amount of rod protruding through the nut
F = diameter of the rod
L = 1.571 x A
T = thickness of the plate
W = 2B + 2C + 2E + L + 2T (length of rod required)

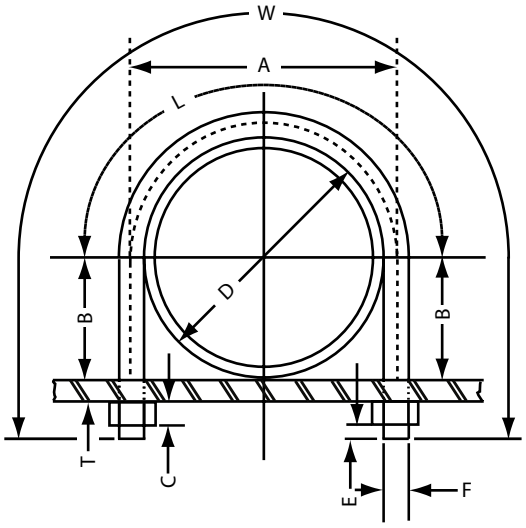
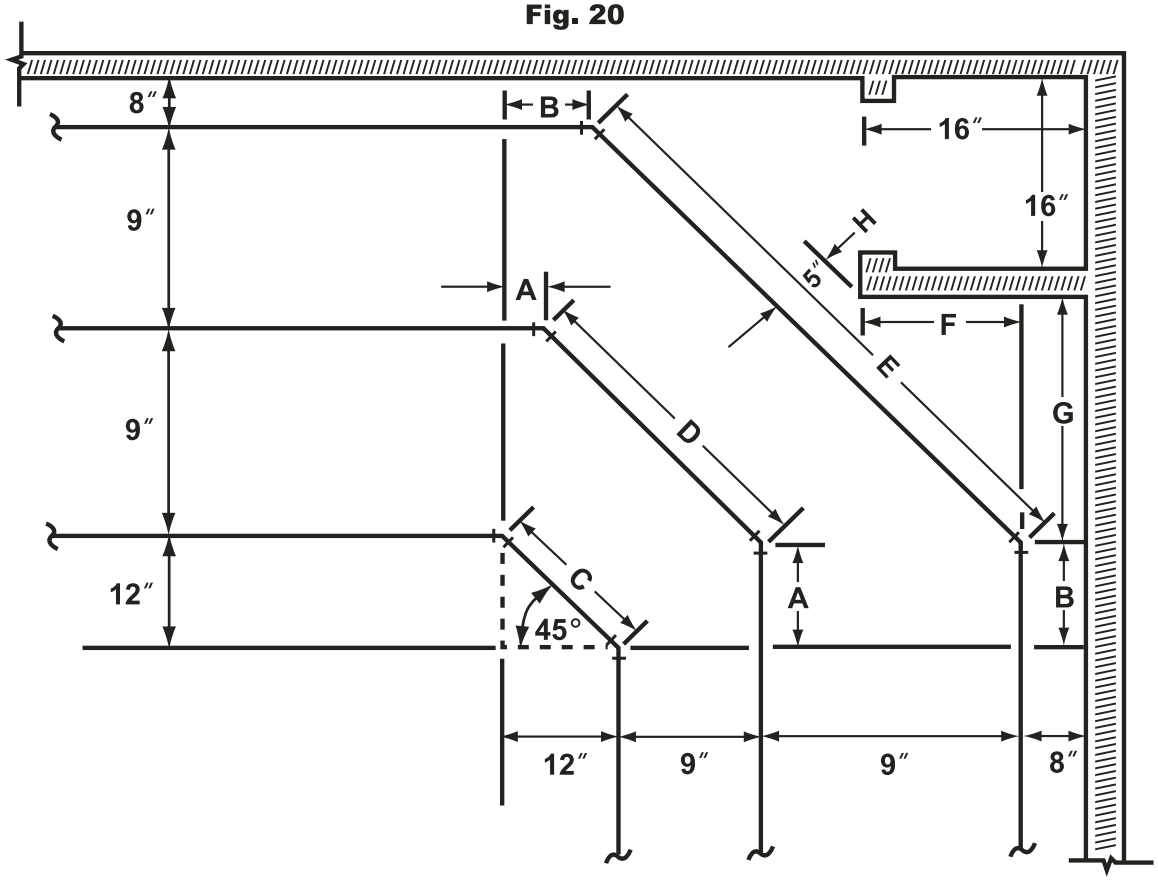


Fig. 29. Values for U-bolt formulas.

Fig. 20



Formula 21. Linear expansion of piping:

Where E = expansion in inches per 100 ft. of pipe
F = starting temperature
T = final temperature
E = consent x (T-F)

Table 21-A. Constants per 100 ft.

Metal	Constant
Steel	.00804
Wrought Iron	.00816
Cast Iron	.00780
Copper and Brass	.01141

Formula 22. Centigrade/Fahrenheit conversion

$$C = \frac{5}{9}(F - 32)$$

$$F = \frac{9}{5}C + 32$$

Formula 23. Liquid pressure is proportional to density

P = H x D
To find the pressure in lbs. per sq. inch (psi), divide lbs. per sq. ft. by 144 (the number of sq. inches in one square foot)

Formula 24. Specific weight:

$$\text{Specific weight} = \frac{\text{weight in air}}{\text{loss of weight in water}}$$

Formula 25. Absolute pressure: = psig + (barometer) x .491 = psia