

Trade Math Rolling Offset & Multipliers

UA Local Apprenticeship & Journeyman Licensing Standard

Free Apprentice Edition
EduProSuite.pro

1. STANDARD PIPE FITTING MULTIPLIERS & CONSTANTS

Fitting Angle	Multiplier (Travel = Offset × Constant)	Advance Constant	Application / Notes
45° Fitting	1.414 (or $\sqrt{2}$)	1.000 (Advance = Offset)	Most common industrial offset. Run = Set.
60° Fitting	1.155 ($2 / \sqrt{3}$)	0.577	Steeper clearance. Travel is 1.155 times offset.
30° Fitting	2.000	1.732 ($\sqrt{3}$)	Gentle trajectory. Travel is exactly double the offset.
22.5° Fitting	2.613	2.414	Long gradual transition in confined piping raceways.

2. ROLLING OFFSET 2-STEP CALCULATION PROCEDURE

Step 1: Calculate True (Compound) Offset

A rolling offset changes both elevation (Rise) and horizontal position (Roll):

$\text{True Offset} = \sqrt{(\text{Rise}^2 + \text{Roll}^2)}$

Example: Rise = 9", Roll = 12" → True Offset = $\sqrt{(81 + 144)} = \sqrt{225} = 15.00"$

Step 2: Calculate Travel Length

Multiply True Offset by the angle fitting multiplier (for 45° fittings):

$\text{Travel (Center-to-Center)} = \text{True Offset} \times 1.414$

Example: Travel = 15" × 1.414 = 21.21" (approx 21-3/16")

Step 3: Cut Length (End-to-End) Deduction

$\text{Cut Pipe Length} = \text{Travel} - (\text{Fitting Takeoff} \times 2)$

Deduct the manufacturer center-to-face allowance for both fittings.

3. HYDROSTATIC PRESSURE & VOLUME CORE FORMULAS

Metric / Concept	Standard Formula	Constant to Memorize
Static Head Pressure	$\text{Pressure (PSI)} = \text{Head (Feet)} \times 0.434$	1 Vertical Foot of Water = 0.434 PSI
Head from PSI	$\text{Head (Feet)} = \text{Pressure (PSI)} \times 2.31$	1 PSI = 2.31 Feet of Water Column
Water Weight in Pipe	$\text{Gallons} \times 8.34 \text{ lbs} = \text{Total Weight (lbs)}$	1 Gallon of Water = 8.34 lbs (approx 8.33)
Volume of Cylindrical Pipe	$\text{Gallons} = D^2 \text{ (inches)} \times \text{Length (feet)} \times 0.0408$	Quick field volume multiplier

 **Union Exam Pro Tip:** In apprenticeship entry exams, always convert fractions to decimals before squaring, then round back to the nearest 1/16" only at the very final step.