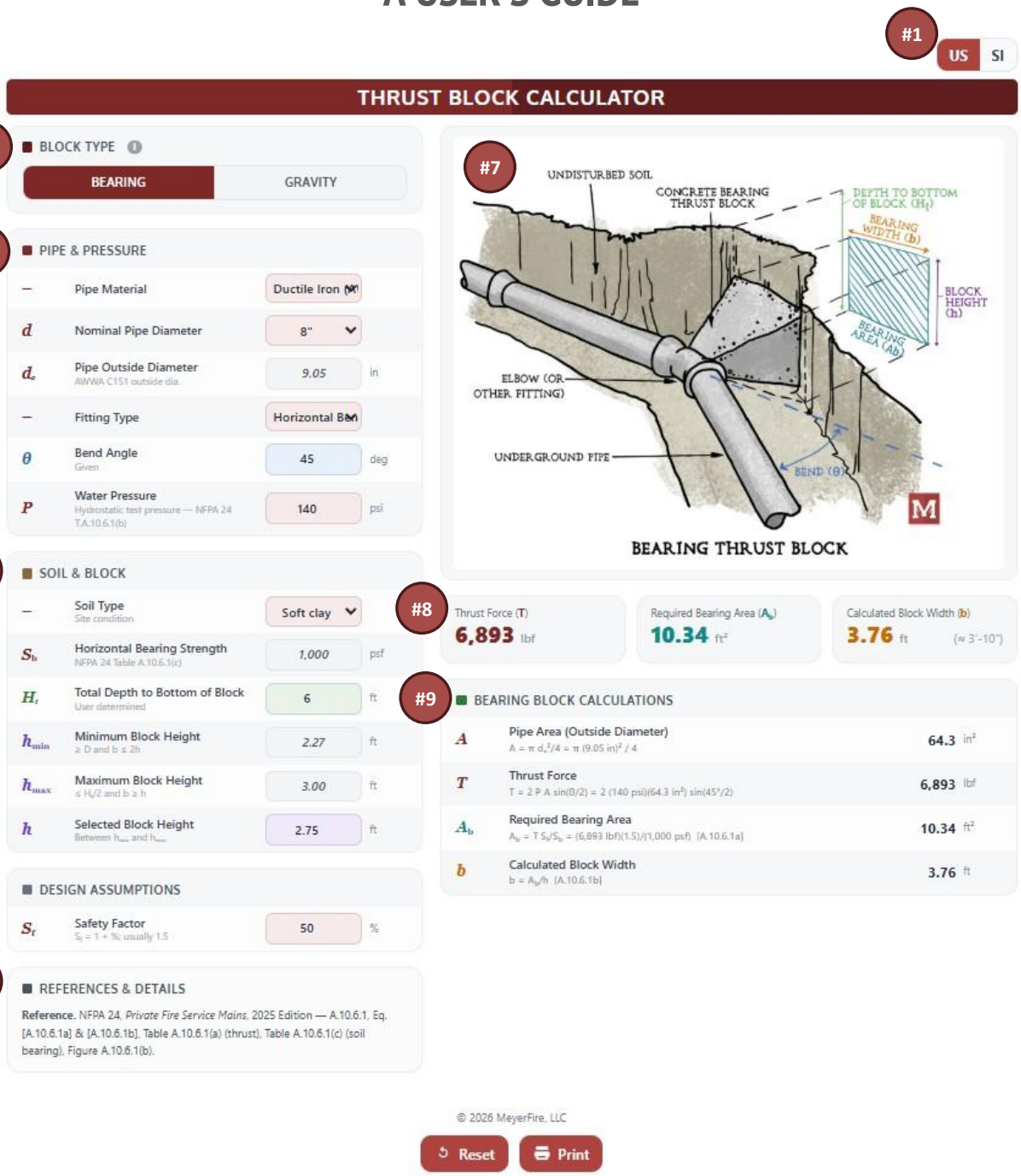
THRUST BLOCK CALCULATOR

A USER'S GUIDE



DESCRIPTION

PURPOSE: The Thrust Block Calculator sizes concrete thrust blocks for underground fire mains to NFPA 24 (2025). It (1) calculates the thrust force at a bend, tee, or dead end from the pipe size, water pressure, and bend angle; (2) sizes a bearing block — the required bearing area against undisturbed soil and the resulting block dimensions; and (3) sizes a gravity block for vertical down-bends, where the block's own weight resists uplift. It supports ductile iron, PVC C900, and steel pipe, works in US or SI units, and prints a clean one-page report.

#1 UNIT TOGGLE: Switch between US customary and metric (SI). Every input and result updates instantly.

#2 BLOCK TYPE: Choose Bearing or Gravity. A bearing block resists thrust by bearing against undisturbed soil (horizontal bends, tees, dead ends, and concave-up vertical bends); a gravity block uses the block's own weight to resist uplift at concave-down vertical down-bends. The information tooltip explains when to use each.

#3 PIPE & PRESSURE: Enter the pipe material (ductile iron, PVC C900, or steel), nominal diameter, fitting type, bend angle θ, and water pressure P. The outside diameter d_o is looked up automatically. Use the hydrostatic test pressure per NFPA 24.

#4 SOIL & BLOCK: Select the soil type — its horizontal bearing strength S_b comes from NFPA 24 Table A.10.6.1(c). Enter the total depth to bottom of block H_t; the tool then shows the allowable minimum and maximum block heights (h_{min}, h_{max}) so you can set a valid selected height h.

#5 DESIGN ASSUMPTIONS: Set the safety factor S_f — typically 50% (a 1.5 factor) for thrust-block design per NFPA 24.

#6 REFERENCES & DETAILS: Cites the governing NFPA 24 (2025) sections, equations, tables, and figure the calculation is based on.

#7 DIAGRAM: A labeled illustration of the selected block type, color-matched to the inputs and results — depth H_t, block height h, width b, bearing area A_b, and bend angle θ.

#8 RESULT CARDS: The headline outputs at a glance. Bearing: thrust force T, required bearing area A_b, and calculated block width b (with a practical rounded feet-and-inches value). Gravity: required block volume V_g in cubic yards, required weight W, and the minimum horizontal bearing area A_b.

#9 CALCULATIONS: The full step-by-step breakdown — pipe area A, thrust T, and each governing NFPA 24 equation with your values substituted, so every result is traceable.

RESET & PRINT: Reset returns every input to its default. Print produces a clean one-page report of the entire analysis in whichever unit system you've selected. (These buttons sit below the tool.)