Building Booster Pump Pressure and Power

Pressure and power a building booster pump needs to give a minimum pressure at the highest outlet, from height, friction and the supply pressure.

Method: Hydrostatic pressure balance of a building riser

Input parameters

Unit system: SI

Parameter	Value	Unit
Height of the highest outlet above the pump	45.000	m
Pressure needed at the highest outlet (gauge)	1.5000	bar
Friction loss in risers and fittings	6.0000	m
Pressure available at the pump suction (gauge)	0.20000	bar
Design flow	15.000	m³/h
Pump-set efficiency	60.000	%

Calculated results

Parameter	Value	Unit
Pump discharge pressure (gauge)	6.4914	bar
Pressure the pump must add	6.2914	bar
Pump head	64.283	m
Pump input power	4.3690	kW
Pressure at the lowest outlet (at pump level)	6.4914	bar

Notes for this case

• The pump must deliver the pressure wanted at the top outlet plus the static height and friction to reach it: p_d = p_r + ρg(h + h_f). It only adds what the supply does not already give. Outlets low in the building then see nearly the full discharge pressure, which may need pressure-reducing valves (often above about 4–5 bar). Use the simultaneous peak flow, not the sum of all fixtures.

Formula and method

$$p_d = p_r + \rho g(h + h_f), \quad \Delta p = p_d - p_s, \quad P = \frac{\dot{V}\Delta p}{\eta}$$

Variables

h	Height of the highest outlet above the pump	m
p_r	Pressure needed at the highest outlet (gauge)	Pa
h_f	Friction loss in risers and fittings	m
p_s	Pressure available at the pump suction (gauge)	Pa
$\dot{V}$	Design flow	m³/s
η	Pump-set efficiency	-
p_d	Pump discharge pressure (gauge)	Pa
Δp	Pressure the pump must add	Pa
H	Pump head	m
P	Pump input power	W
p_{low}	Pressure at the lowest outlet (at pump level)	Pa

Method and standards

Booster pump.

Assumptions and limits

- Water at about 20 °C; design flow as entered.

References

Hydrostatic pressure balance of a building riser

Report details

Report reference	FCC-34F4-RYQ2 (the same inputs always give the same reference)
Generated	23 November 2026, 18:00 UTC
Calculator	Building Booster Pump Pressure and Power
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/mechanical/pumps/building-booster-pump-pressure

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.