Room Sound Pressure Level from Sound Power (Direct and Reverberant)

Sound pressure level at a distance from a source in a room from sound power, directivity and room constant, the direct and reverberant parts and critical distance.

Method: Diffuse-field room equation

Input parameters

Unit system: SI

Parameter	Value	Unit
Source sound power level	95.000	
Directivity factor	2.0000	
Distance from source	5.0000	m
Total room surface area	900.00	m²
Mean absorption coefficient	15.000	%

Calculated results

Parameter	Value	Unit
Room constant	158.82	m²
Direct field level	73.039	
Reverberant field level	79.011	
Total sound pressure level	79.990	
Critical distance	2.5138	m

Notes for this case

• L_p = L_W + 10log[Q/(4πr²) + 4/R], R = Sᾱ/(1 − ᾱ). Inside the critical distance the direct field dominates and distance helps; beyond it the reverberant field dominates and only more absorption lowers the level. Q = 1 free space, 2 on a floor, 4 at a wall–floor edge, 8 in a corner.

Formula and method

$$L_p = L_W + 10\log_{10}\left(\frac{Q}{4\pi r^2} + \frac{4}{R}\right), \quad R = \frac{S\bar{\alpha}}{1-\bar{\alpha}}, \quad r_c = \sqrt{\frac{QR}{16\pi}}$$

Variables

L_W	Source sound power level	-
Q	Directivity factor	-
r	Distance from source	m
S	Total room surface area	m²
$\bar{\alpha}$	Mean absorption coefficient	-
R	Room constant	m²
L_d	Direct field level	-
L_r	Reverberant field level	-
L_p	Total sound pressure level	-
r_c	Critical distance	m

Method and standards

Room equation.

Assumptions and limits

- Diffuse reverberant field; single source; fairly regular room.

References

Diffuse-field room equation

Report details

Report reference	FCC-76N8-358R (the same inputs always give the same reference)
Generated	23 November 2026, 18:09 UTC
Calculator	Room Sound Pressure Level from Sound Power (Direct and Reverberant)
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/instrumentation/vibration-noise/room-sound-pressure-from-power

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.