Room Reverberation Time (Sabine) and Absorption Needed

Room reverberation time by Sabine's equation from volume and up to four surfaces with absorption coefficients, and the absorption to add.

Method: Sabine's equation T_{60} = 0.161V/ΣSα (architectural acoustics)

Input parameters

Unit system: SI

Parameter	Value	Unit
Room volume	1,500.0	m³
Area 1	500.00	m²
Absorption 1	2.0000	%
Area 2	300.00	m²
Absorption 2	5.0000	%
Area 3	300.00	m²
Absorption 3	10.000	%
Area 4	0	m²
Absorption 4	70.000	%
Target reverberation time	1.5000	s

Calculated results

Parameter	Value	Unit
Total absorption (m² sabins)	55.000	m²
Reverberation time	4.3909	s
Extra absorption for the target	106.00	m²
Noise reduction from the extra absorption (dB)	4.6646	

Notes for this case

• Sabine's equation suits fairly live rooms (average α below about 0.3); for dead rooms Eyring's form is better. Absorption coefficients vary with frequency: work band by band for design. The surface areas are not checked against the room volume: enter all the room's surfaces.

Formula and method

$$A = \sum S_i \alpha_i, \quad T_{60} = \frac{0.161 V}{A}, \quad \Delta A = \max\left(\frac{0.161 V}{T_t} - A,\ 0\right), \quad \Delta L = 10 \log_{10} \frac{A + \Delta A}{A}$$

Variables

V	Room volume	m³
S_1	Area 1	m²
α_1	Absorption 1	-
S_2	Area 2	m²
α_2	Absorption 2	-
S_3	Area 3	m²
α_3	Absorption 3	-
S_4	Area 4	m²
α_4	Absorption 4	-
T_t	Target reverberation time	s

A	Total absorption (m² sabins)	m²
T_{60}	Reverberation time	s
ΔA	Extra absorption for the target	m²
ΔL	Noise reduction from the extra absorption (dB)	-

Method and standards

Sabine's equation.

Assumptions and limits

- Diffuse sound field; average absorption coefficient A/ΣS below about 0.3 (the page warns above it).
- When the room is already deader than the target, ΔA is 0 and the page says so.

References

- Sabine's equation T_{60} = 0.161V/ΣSα (architectural acoustics)

Report details

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Release checks	2 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/reverberation-sabine

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.