

# What Are Acoustic Design Criteria?

## Worksheet

Acoustic design criteria set target values, most commonly reverberation time (RT60), calculated with Sabine's formula  $RT60 = 0.161 V / A$ , where  $V$  is room volume and  $A$  is total sound absorption.

## Questions

1. What does reverberation time (RT60) measure?
  - A) Peak sound pressure level
  - B) Time for sound to decay 60 dB after the source stops
  - C) Frequency of a sound wave
  - D) Distance sound travels in one second
2. A room has  $V=100$  m,  $A=20$  m sabins. What is RT60?
  - A) 0.161 s
  - B) 0.805 s
  - C) 1.61 s
  - D) 8.05 s
3. Adding carpet and acoustic panels to a room mainly does what?
  - A) Increases reverberation time
  - B) Decreases reverberation time by raising absorption
  - C) Has no effect on RT60
  - D) Increases room volume
4. Why do classrooms typically target a shorter RT60 than concert halls?
  - A) Classrooms need less speech intelligibility
  - B) Speech clarity requires shorter reverberation than music fullness
  - C) Concert halls are always smaller
  - D) RT60 targets are unrelated to room use
5. A classroom has a volume of 200 m and total absorption of 40 m sabins. Find the reverberation time.
6. A concert hall has  $V = 12,000$  m and needs  $RT60 = 1.8$  s for music. What total absorption is required?
7. An office ( $V = 150$  m,  $A = 25$  m sabins) is compared to the same office after adding acoustic ceiling tiles ( $A = 55$  m sabins).
8. Define: What does RT60 measure?
9. Define: What is Sabine's formula?
10. Define: What increases room absorption?

## Answer Key

1. B) Time for sound to decay 60 dB after the source stops - RT60 is defined as the decay time of 60 dB after the sound source is switched off.
2. B) 0.805 s -  $RT60 = 0.161 \frac{100}{20} = 0.805$  s.
3. B) Decreases reverberation time by raising absorption - Absorptive materials raise A, which lowers RT60 per Sabine's formula.
4. B) Speech clarity requires shorter reverberation than music fullness - Speech intelligibility drops with long reverberation, while music can benefit from a longer, richer decay.
5.  $RT60 = 0.161 \frac{V}{A}$   $RT60 = 0.161 \frac{200}{40}$   $RT60 = 0.805$  s
6.  $RT60 = 0.161 \frac{V}{A}$   $1.8 = 0.161 \frac{12000}{A}$   $A = 0.161 \frac{12000}{1.8} = 1073.3$  m sabins
7. Before:  $RT60 = 0.161 \frac{150}{25} = 0.966$  s After:  $RT60 = 0.161 \frac{150}{55} = 0.439$  s Adding absorption more than halves the reverberation time.
8. The time for sound to decay by 60 dB after the source stops - a key measure of a room's liveness.
9.  $RT60 = 0.161 \frac{V}{A}$ , where V is room volume (m) and A is total absorption (m sabins).
10. Soft, porous materials - carpets, acoustic panels, upholstered seats, ceiling tiles - and audience/occupants.

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