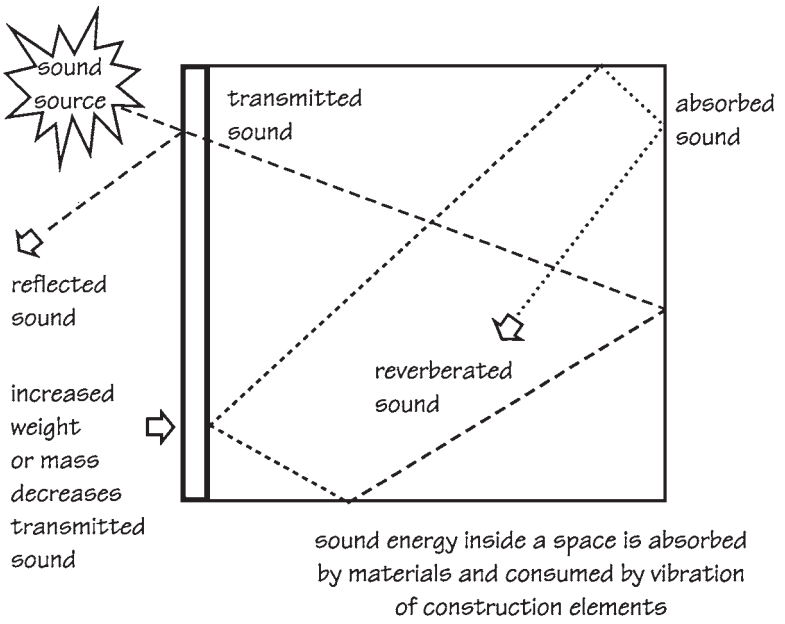
8.8.1 Sound Ratings

There are two principal types of sound ratings: absorption and transmission loss. Sound absorption relates to the amount of airborne sound energy absorbed on the wall adjacent to the sound. Sound transmission loss is the total amount of airborne sound lost as it travels through a wall or floor. Each type may be identified at a particular frequency or by class (*see Fig. 8-43*). Sound absorption coefficients (SACs) and noise reduction coefficients (NRCs) are measured in sabins, sound transmission loss (STL) in decibels. In both instances, the larger the number, the better the sound-insulating quality of the wall.



Type of Rating	Sound Absorption	Sound Transmission
At specific frequencies	Sound Absorption Coefficient (SAC)	Sound Transmission Loss (STL)
Overall performance	Noise Reduction Coefficient (NRC)	Sound Transmission Class (STC)

Sound Absorption Coefficient						
Frequency (cps)	125	250	500	1000	2000	4000
Coefficient (numeric example for ceiling system)	22	62	85	70	65	58

numerical average of Sound Absorption Coefficients (SAC) at middle frequencies = Noise Reduction Coefficient (NRC)

Figure 8-43 Types of acoustical ratings.

8.8.2 Sound Absorption

Sound is absorbed by mechanically converting it to heat. To absorb sound usefully, a material must have a certain "flow resistance"—it must create a frictional drag on the energy of sound. Sound is absorbed by porous, open-textured materials, and by carpeting, furniture, draperies, or anything else in a room that resists the flow of sound and keeps it from bouncing around. If the room surfaces were capable of absorbing all sound generated within the room, they would have a *sound absorption coefficient* (SAC) of 1.0. If only 50% of it were absorbed, the coefficient would be 0.50.

The percentage of sound absorbed by a material depends not only on its surface characteristics, but also on the frequency of the sound. SAC values for most acoustical materials vary appreciably with sound frequencies. A better measure of sound absorption, which takes frequency variations into account, is the *noise reduction coefficient* (NRC), determined by averaging SAC values at different frequencies. Typical NRC values of various building materials and furnishings are given in *Fig. 8-44*. A higher NRC indicates better sound absorption.

Masonry, wood, steel, and concrete all have low sound absorption, ranging from 2% to 8%. Dense brick and heavyweight concrete block will have 1 to 3%, while lightweight block may be as high as 5%. Painting the surface effectively closes the pores of the material and reduces its absorptive capability even further. Conventional masonry products absorb little sound because of their density and their highly impervious surfaces. Specially designed structural clay tile and concrete block units combine rel-

Material	NRC	Material	NRC
Brick, unglazed	0.04	Concrete floor	0.01
Carpet		Vinyl tile on concrete	0.03
on concrete	0.30	Wood floor	0.08
on pad	0.55		
CMU, lightweight		Marble or glazed tile	0.01
coarse texture	0.40	Single-strength window glass	0.12
medium texture	0.45		
fine texture	0.50	Plate glass	0.04
CMU, normal weight		Gypsum bd. on 2 x 4 framing	0.07
coarse texture	0.26	Gypsum board on concrete	0.03
medium texture	0.27		
fine texture	0.28	Plaster or brick on CMU	0.03
Deduct for paint		Wood paneling on furring strips	0.13
all types, sprayed on			
1 coat	-10%	Draperies	
2 coats	-20%	lightweight	0.14
oil, brushed on		medium weight	0.40
1 coat	-20%	heavy weight	0.55
2 coats	-55%		
latex, brushed on		Furniture	
1 coat	-30%	bed	0.80
2 coats	-55%	sofa	0.85
		wood table, chairs, etc.	0.20
Sound-insulated CMU	0.45 to 0.85	leather upholstered chair	0.50
		cloth upholstered chair	0.70

Figure 8-44 Noise reduction coefficients (NRCs) for various building materials and furnishings. (*From BIA* Technical Notes, Vol. 9, No. 5.)