this averaging method. However, lightweight partitions often have "acoustical holes" at critical frequencies (*see Fig. 8-47*). STL averages did not identify these deficiencies, and did not accurately translate acoustical test results into useful design data. *Sound transmission class* (STC) ratings were developed to describe acoustical characteristics more accurately. STC ratings represent the overall ability of an assembly to insulate against airborne noise. They have proven more reliable in classifying the performance of both heavy- and lightweight materials over a wide range of frequencies. The higher the STC rating a wall has, the better the wall performs as a sound barrier.

For homogeneous walls, resistance to sound transmission increases with unit weight (*see Fig. 8-48*). When surfaces are impervious, sound is transmitted only through diaphragm action. The greater the inertia or resistance to vibration, the greater is the ability to prevent sound transfer. The initial doubling of weight produces the greatest increase in transmission loss.

Porosity, as measured by air permeability, significantly reduces transmission loss through a wall. STC values vary inversely with porosity. Unpainted, open-textured CMU, for instance, will have lower STC values than would be expected on the basis of unit weight alone. Porosity can be reduced, and STC values increased, by sealing the wall surface. The STC value is increased by about 8% with one layer of gypsum board, 10% with two coats of paint or plaster, and 15% with two layers of gypsum board. Sealing both sides of a wall has little more effect than sealing only one side. A sealed surface not only decreases sound transmission, it also reduces sound absorption, which may not be desirable. As a general rule, leave porous surfaces unsealed in noisy areas such as stairwells or corridors, and seal them in living spaces.

Cavity walls have greater resistance to sound transmission than solid walls of equal weight. Having two wythes separated by an air space interrupts the diaphragm action and improves sound loss. Up to about 24 in., the wider the air space, the more sound efficient the wall will be. Cavity walls are very effective where a high transmission loss, of the order of 70 to 80 dB, is required. If the wythes are only an inch or so apart, the transmission

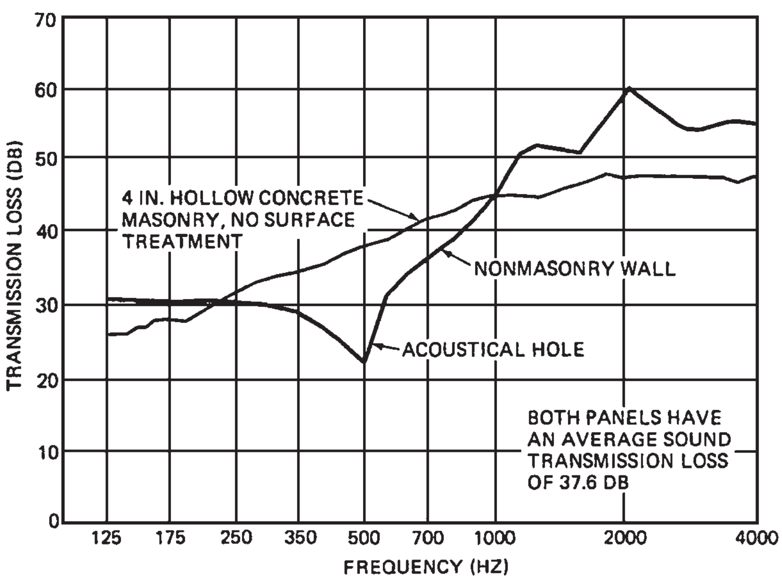
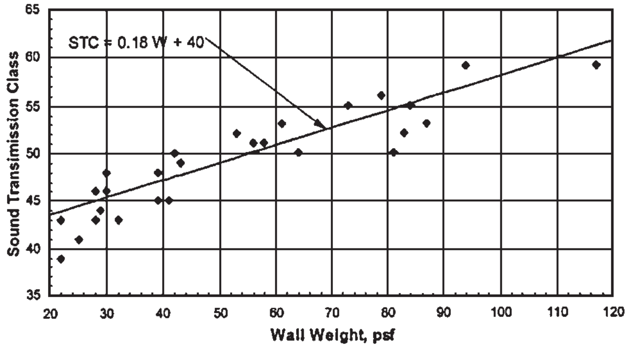


Figure 8-47 Graphic illustration of an "acoustical hole." (*From National Concrete Masonry Association,* TEK Bulletin 9, *NCMA, Herndon, VA.*)



(*From TMS* Standard Method for Determining the Sound Transmission Class Rating for Masonry Walls *TMS 0302-00*)

Average Weight of Single-Wythe Hollow Unit Masonry Walls (lb/ft 2)§

	Medium Weight Units 105-125 lb/ft³ Average 120 lb/ft³			Normal Weight Units 125 lb/ft³ or More Average 138 lb/ft³			Hollow Clay Units	
Nominal Thickness (inches)	6	8	12	6	8	12	5	8
Ungrouted	31	35	50	69	92	140	32	45
Fully grouted	56	77	118	68	92	140	45	88
Vertical cores grouted at								
16" on center	46	60	90	58	75	111	—	71
24" on center	42	53	79	53	68	99	35	64
32" on center	40	50	73	51	65	93	—	61
40" on center	38	47	70	50	62	89	—	58
48" on center	37	46	68	49	61	87	33	55

§ Average weight of completed walls of various thickness in pounds per square foot of wall face area. A small quantity has been included for bond beams and reinforcing steel. Grout and mortar made with sand and gravel aggregate.
(*From Schneider and Dickey,* Reinforced Masonry Design)

Average Weight of Double-Wythe Grouted and Reinforced Brick Walls§

Wall Thickness (inches)	Wall Weight (lb/ft 2)
8	86
8½	93
9	100
9½	106
10	112
10½	118
11	125
11½	131
12	138
13	151
14	164

§ Based on average brick weight of 10 lb/ft 2 of vertical surface per inch of thickness and grout core at 13 lb/ft 2 per inch of thickness.
(*From Schneider and Dickey,* Reinforced Masonry Design)

Figure 8-48 Sound transmission class (STC) and wall weight.