

Noise Control Partial Barriers

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Noise Control Terminology

- Noise reduction (NR):

$$NR = L_{p1} - L_{p2}$$

- Insertion loss (IL)

$$IL = L_p - L_{p'} = (\text{After} - \text{Before})$$

At same location

- Attenuation: reduction of noise at greater distances
- Sound absorption
 - Sound absorption coefficient (α) = fraction of sound absorbed
 - Varies with frequency
- Sound transmission loss (TL) = $10 \log(L_{w_{\text{incident}}}/L_{w_{\text{thru}}})$
 - Governed by physical properties of material & type of construction

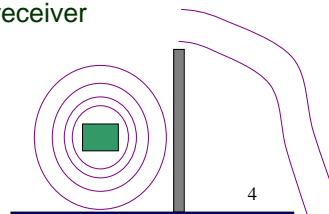
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Partial Barriers

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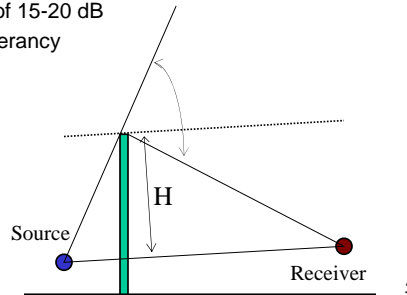
Acoustical Partial Barriers

- Solid partition or barrier between source and receiver (i.e., worker)
- Blocks direct line of sight to source, so sound arrives only by reflection and diffraction at the edges of the barrier
- Shadow zone on receiver's side of the barrier
- Critical for receiver to be in direct field, not reverberant field
- Effectiveness depends on:
 - Relative location of barrier to source and receiver
 - Effective dimensions
 - Frequency spectrum
 - Absence of opening or gaps

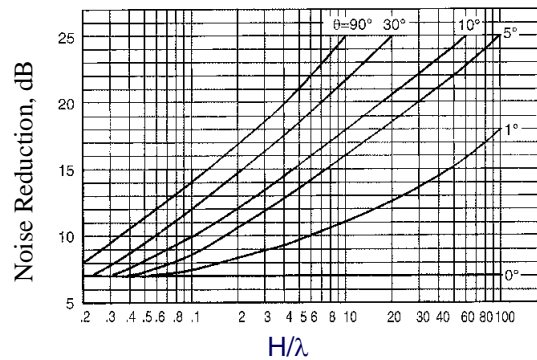


Example 9.11

- Barrier with
 - height, $H=4$ ft
 - Angle = 30°
- Steps:
 - Compute wavelength for each frequency
 - Compute ratio, H/λ , for each frequency
 - Look up NR in Table 9.13
 - assumes free-field
 - diffraction will limit to max of 15-20 dB
 - less with increasing reverberancy



Example 9.11 - continued



Noise Reduction Through a Partial Barrier								
Octave Band Center Frequency								
	63	125	250	500	1000	2000	4000	8000
Speed sound	1130	1130	1130	1130	1130	1130	1130	1130 ft/sec
Wavelength, λ	17.9	9.04	4.52	2.26	1.13	0.57	0.28	0.14 ft
Barrier effective ht	4	4	4	4	4	4	4	4 ft
H/λ	0.22	0.44	0.88	1.77	3.54	7.08	14.2	28.3 ft-sec
Angle of deflection	30	30	30	30	30	30	30	30 degrees
NR (fig. 9.46)	7	9	11	14	17	20	23	25 dB

Partial Barriers - continued

- Table 9.13
 - assumes free-field
 - diffraction will limit to max of 15-20 dB
 - less with increasing reverberancy
- Distance from the sound source where transition from direct to reverberant field:

$$r = 0.14 (\bar{\alpha}S)^{0.5}, \text{ ft or m}$$

- Must do for each important frequency
- Example: for absorbance of 0.5, $S=12,200 \text{ ft}^2$
 - Receiver no further than 11 ft from source
 - Barrier between source and receiver

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Channel Noise



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The End

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