University of Southern California	**Prof. Schiler**
School of Architecture	**Spring 2005**
Arch 315: Design of the Luminous and Sonic Environment	**Homework Assignment #7**

1.) There is an old auditorium that is 60' x 120' x 30'. The floor of the auditorium is wood, and the walls and ceiling are plaster on wood lath. What is the reverberation time of the auditorium when it is empty?

T = 0.05 * V/a
V is the room volume, in ft^3
a is the total absorption, in sabins
a = 60'*120'*0.10+60'*120'*0.05+(60'*30'*2+120'*30'*2)*0.05
= 1620 sabins
T = (60'*120'*30')/1620 = 6.67 s

Is that a good auditorium for giving lectures?

No.

Is that a very "live" space?

Yes, it's a very noisy one.

If you wished to increase the flexibility of the auditorium, what would you do?

The point is to reduce the reverberation time.
Add absorptive materials to the walls, ceiling or floor.

2.) There are two rooms next to one another. Each one is 20' x 30' x 12' in size and they share one of their 20' walls. The floors are concrete, the walls are normal stud and gypsum board, and the ceiling of the occupied room is also plaster. The other room is a mechanical equipment room, in which there is a standing noise level of 75 dB. What is the noise level going to be in the occupied room as a result of noise transmitted from the mechanical equipment room?

a = 20'*30'*0.00+20'*30'*0.05+(20'*12'*2+30'*12'*2)*0.05
= 90 sabins
NR = TL + 10 log(a_2/S)
NR is the Noise reduction,
TL is the barrier transmission loss, in dB
a_2 is the total absorption of the receiving room, in sabins
S, Area of barrier wall, ft^2
NR = 33 +10 log (90/(20'*12')) = 28.74 dB
IL_{new} = 75 - 28.74 = 46.26 dB.

Is that annoying?

It's actually OK.

Name three things that could be done to improve the situation, and calculate the results of doing one of them.

A. Use another building construction to increase TL, such as #27, TL=59 dB
B. Increase a_2
C. Increase a_1.
D. Reduce the contact of the two rooms.