EE417   **Fall 2010**
Homework #4
Assigned Wednesday, November 3, 2010
Due at the start of class on Wednesday, November 10, 2010

A large, rectangular meeting room has floor dimensions 20m wide x 60m long, and a floor-to-ceiling height of 15m. A balcony attached to the middle of the back wall extends 15m into the room. The balcony is 3m thick.

Use the following surface types to calculate estimated reverb time for this room:
The entire main floor area and top of the balcony is assumed to be <u>Occupied audience, orchestra, chorus</u>.
The two side walls and the balcony front and underside are constructed of <u>Wooden walls, 2 in.</u> material.
The ceiling is <u>Acoustic tile on rigid surface</u>.
The back wall above and below the balcony is <u>Glass, heavy plate</u>.
The front of the hall is <u>Concrete block, painted</u>.

a) Using the absorptivity data from Table 12.5.1 in the K&F text and the Sabine equation (12.3.4 and 12.3.6), determine an estimate for the reverberation time (T_{60}) for the room at three frequencies: 125 Hz, 500 Hz, and 4kHz.

b) Determine r_d, the critical distance for this room (see 12.7.2, $r_d = \frac{1}{4}\sqrt{A/\pi}$), using the total absorption (A) at 500 Hz.

c) The effect of sound absorption in the hall due to atmospheric (air) losses can be estimated using the modified Sabine equation (12.3.10 and 12.3.11). Assuming the air in the hall has a relative humidity of 35%, recalculate the reverberation times at frequencies 125 Hz, 500 Hz, and 4 kHz. Comment on the results.