Acoustic treatment for critical listening

Design

1. Introductions

Finding the right dimensions for an acoustic listening room has been an issue for several years due to a low frequency that is always encountered. Engineers in the field have suggested several dimensions for appropriate listening rooms, but they have not agreed on standards measures of acoustic critical listening rooms.

The assignment intends to find out the suitable mathematics and relevant acoustic skills that do play a vital role in developing acoustic studios. Six rooms are to be considered in this assignment; the rooms have different dimensions. The client has brought forth the six rooms for studies and hence needs a detailed report. Additionally, the report must comprehensively research on the cost of installation and material and hence come up with a decent budget. Moreover, discussion and calculations involving reverb time and acoustic equations will be tackled in the report since they deal with absorption co-efficiency and room size for critical listening.

2. Request from the Client for the Acoustic Rooms

2. 1 Client’s Request were as Follows

Two premises available for setting up a small critical listening room, the rooms should be slightly attuned where each should be suited for a studio set up for critical listening. As per the client, both rooms were not suitable for acoustic installation due to large space. Therefore, the client requested for the addition of timber wall or gyprock which should be 50cms thick to reduce the spacious rooms' size. Critical listening rooms must always be small in size to make them acoustically viable. The client; s instructions were to add

timber to the wall to reduce space and use alternative dimensions for the rooms after addition of the extra wall.;

2. 2 Rooms to be worked on

The rooms to work on were six in number, the first thing that acoustic engineers should take care of is axial mode. Axial mode analysis in the rooms enables testing of the resonating frequencies so as to know which room is suitable. Suitability is determined by coincidental frequencies along a parallel axis. After testing, room 2B was found to be better than all the other six rooms since it had less coincident residing contained in its frequency spectrum along its dimensions. Calculations of the logarithmic equations are at the appendix.

3 Axial Modes/Reverb

3. 1 definition

An axial mode is defined as the traveling of sound inside a room in either axis formation or parallel axis while opposing the surface commonly noted as X, Y, Z Axis paths. Standing waves are sounds that do bounce from wall to other wall creating different frequencies resonating at their middle. Such incident could be problematic to the engineer since it develops frequencies that are louder than the relative frequency necessitated. Calculations clearly indicated that room 2B was the best suited for the critical listening studio since it only had 7th harmonic coincidence on the axis length and 4th harmonic on its width axis. Such harmonic instances do address the problem of acoustic absorption which can be calculated as (136. 5-143. 2).;

Reverb refers to the effect that results when the reflection of a sound do arrive at the listener at different times. Such reflection often gives a shorter echo or rather delay of the echo. Reverb can lead to comb filtering where frequency signals can either be canceled or amplified. Amplification or canceling depends on whether the frequencies are odd or necessary. Stereo image of the sound must not come out muddy.;

4. The Room Layout

When designing room layout, Live End Dead End approach is used so as to achieve an excellent result with acoustic sounds. Front room that traditionally houses monitors and control to the main studio must be designed with the approach. The approach allows little reflections and also leaves the back end of the room open to accept the incoming reflections thus creating a dead zone at the center of the room. Such arrangement creates a better acoustic judgment for the studio person sitting behind the desk. The monitors were placed a meter away from the side walls so as to give space for more absorption and also to reduce reflections and possible reverb. The monitor must be set independently and not on a desk to provide the monitor height details. In addition to height features, the tweeter drivers on the monitor must be set at eye level to enhance the required high frequencies are achieved. An equilateral triangle drawn at the front of the monitor is to indicate the position of the engineers while mixing. Two ceiling panels should be above the mixing desk with similar dimensions as the absorption panels. Ceiling panels and the carpet in front of the room also add absorption co-frequency.;

5. Acoustic; Treatment

For absorption of lower end frequencies, bass traps are used, they are often placed at the corners of the building or the rooms. Bass traps also have the potential of absorbing lower frequencies in the critical listening rooms. Absorption and stopping of lower frequency ensure that amplifications affecting the sound mix are annulled. Bass trap of choice was Ram 400-1000, which was placed horizontally on the ceiling and also on the wooden walls. The bass trap had the potential to provide high frequencies above 70Hz. Only two bass traps were used at each corner of the rooms at the cost of $352. 00, yet the two rooms required four hence total cost $704. 00.

6. Acoustic Absorption Panels

For absorption room 10 panels were provided whose dimension were 1. 2m by 2, 4m. 3 were on the length, 2 on the wall behind the sitting desk and 2 above mixing desk. Panels will stop reflection and absorb unwanted frequencies. Polyester fabrics were wrapped on the acoustic wall to enhance reflection and absorption of sound. The total cost of the panels plus ceiling cloud hangers used was $9325*10+140= $3390. 2. 0m by 1, 0m diffusers were set to ensure live feel at the back. Q7d diffuser are set, this will scatter 350Hz to 3Hz frequencies in the rooms. The cost for the Diffusor was $520. 00.

7.; Acoustic; Treatment Evaluation

The main of the set design is to reduce reverb hence making the rooms suitable for mixing sound. Reverb timing is to be kept in a flat line level across the spectrum of frequencies. Such action will ensure that all the frequencies stopping and false information is acquired and they have same

echo time. Pre-treatment for reverb is 1. 5ms. However, there were massive fluctuations reaching up to 1KHz resulting to 2. 5ms reverb time. This lead to a reduction of reverb time during pre-testing to 0. 27ms which was lower than the known cap which is 0. 6ms with less reverb time standing waves will encounter many problems during post-testing.

Appendix

Rooms dimensions;

1: 2. 16 : 2. 99

1: 2. 16 : 2. 99

1: 2. 16 : 3. 00.

1: 2. 17 : 2. 98

1: 2. 17 : 2. 99

1: 2. 17 : 3. 00

Calculations;

2; x4; [0. 6 m x 1. 2m]