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070315 - dk – v5 - Ovasen Case Study

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A Real Word Case Study
E- Trap by Bag End
Ovasen Studios, New York City

1. Overview - Description of Problem

Regardless of the best initial architectural and/or acoustic planning, programmatic needs of a critical audio listening and production environment can change.

Ovesan Studios is a boutique film mixing audio post production facility, designed by Walters-Storyk Design Group (WSDG) and recently completed during the past year. The site is part of the second floor of a loft type building in lower Manhattan. Based on very restrictive available space, the design calls for two relatively small mixing rooms; small ADR (Foley - Iso recording booth); small lounge; technical equipment closet; etc. Construction is relatively typical “room within room” light weight lid construction, using metal studs, multiple layers of gypsum board, 4” raised and decoupled floor, etc. Floor plan and section below (***figure 1***) shows this layout. Total floor area for the entire project is a less than 1000 s.f. Each control room is relatively small and yet is able to accommodate a large format projection screen, 5.1 audio monitoring, ample control surface and rear room guest seating. It is the acoustic accuracy in the rear room guest seating area of each control room that is the primary concern of this paper.

Mid-construction the client requested that the rear room “guest seating” become critical listening locations in the room. The initial acoustic design analysis of the room did not allow for this level of listening accuracy, literally inches from a hard (rear wall) surface to deliver a similar frequency response as the “sweet spot” (listening position) of the room.

The required isolation for these small control rooms called for (relatively) stiff boundaries and one wonders if any type of thin surface applied treatment would prevent some form of modal build-up at the boundaries of such a small room.

In fact this is exactly what happened in the low frequency range at the rear boundary of the room. (***see figure 2)***. Specifically notice a gain of nearly 15 db centered at around 49 hz.

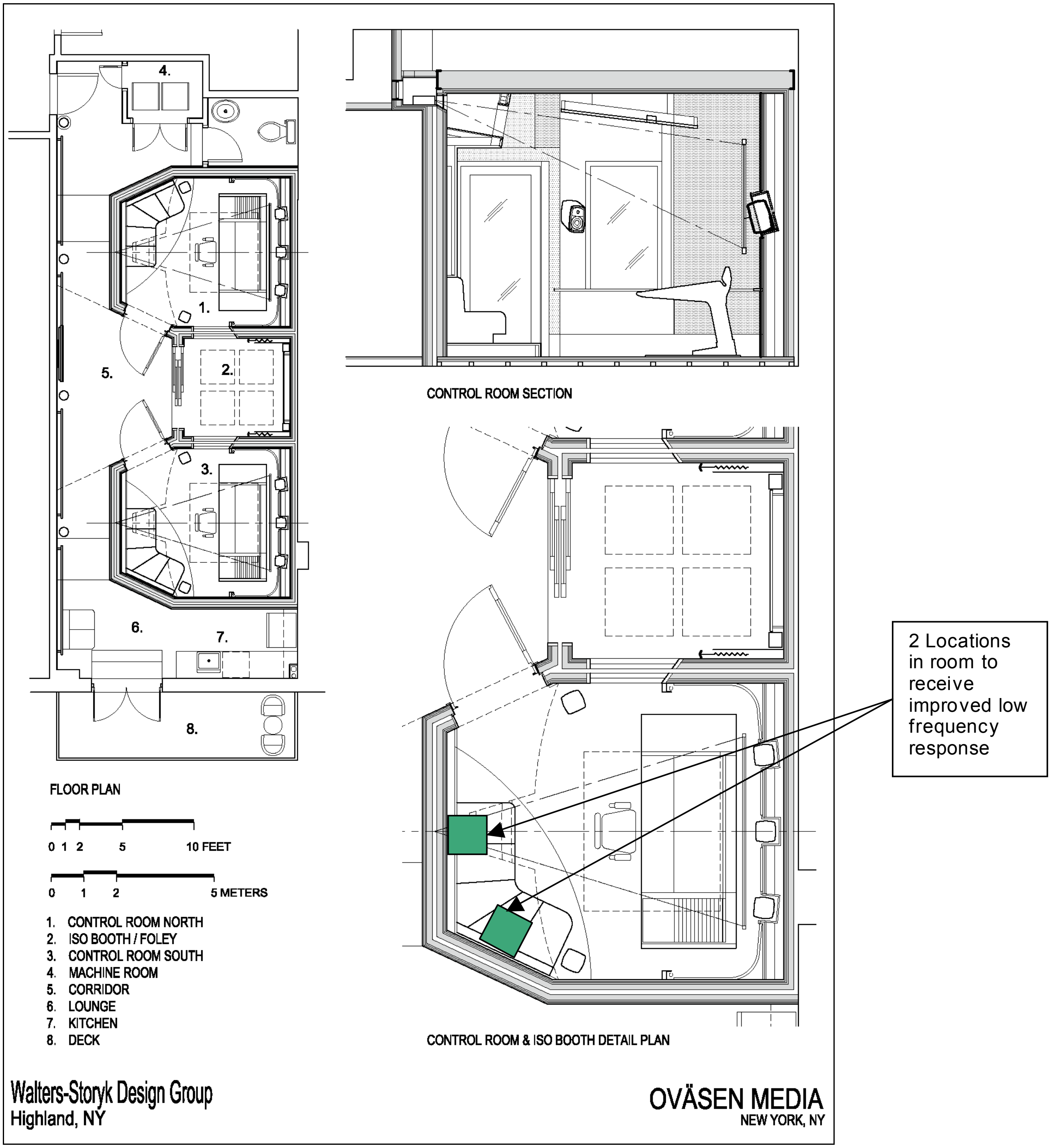

figure 1 – facility floor plan and detailed plan – section of control room

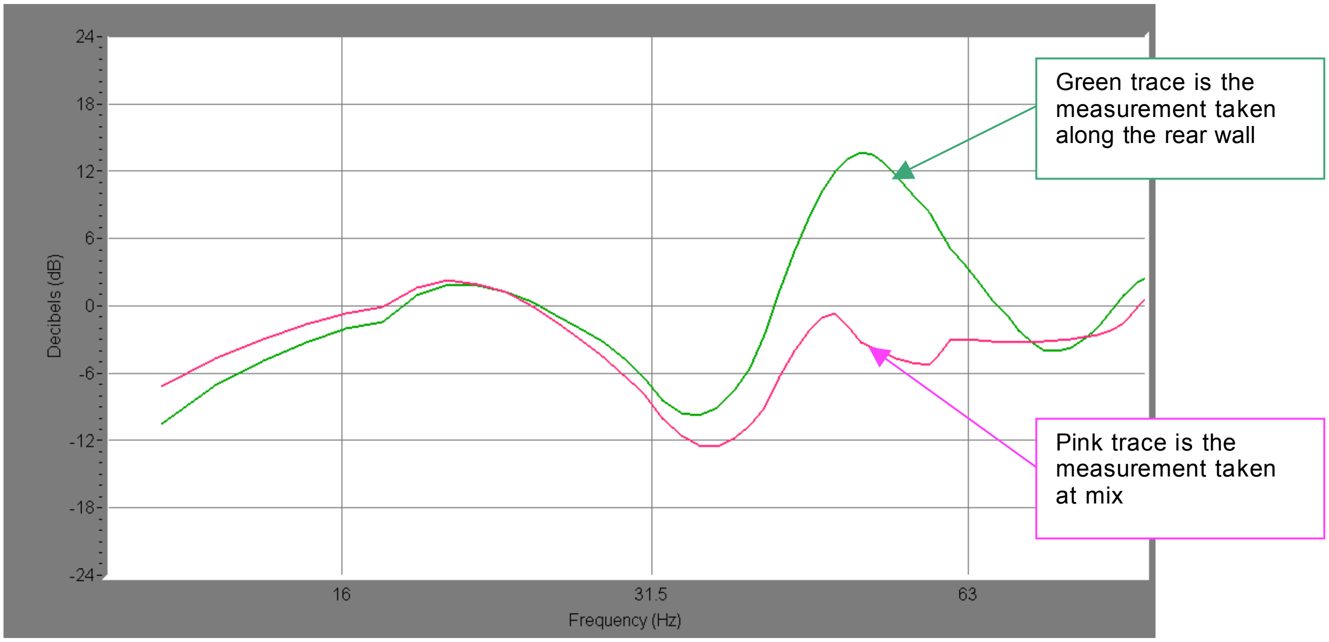

figure 2 – initial room frequency response curves – narrow band – low frequency only – rear listening position (guest area) of typical control room.

2. Solution to the Problem

There were 2 possible solutions to this problem.

a. Design and retrofit some type of surface applied low frequency treatment (most likely membrane or resonator in nature). Several designs were considered, the most promising being target membrane absorbers (custom designed that would be located behind the transparent front room projection screen). Space limitations in the rear of the room prohibited any type of effective surface applied treatment. Likewise, behind the screen there are three flush mounted main monitors, etc. – not much room for this type of installation.

b. An electronic phase cancelling solution (in addition to whatever system tuning that is being used in the room). This paper demonstrates the success of such as system and its placement and room adjustment. The system used is the “E-Trap” manufactured by Bag End.

The E – Trap proved to be viable solution for a series of reasons: cost effectiveness, ease of usage and installation, and the time frame. In this particular installation, two modes were addressed, thus two E-Trap units were used in each control room.

3. Installation of the E-Traps

1. Configuring an FFT based measurement device (SMAART measurement – PC based)

FFT parameters to the following:

Sample Rate: 4000
FFT Size: 8K
Time Constant: 2048 ms
Frequency Resolution: 0.5 Hz
Averaging: Begin with 8 for initial tuning and confirm with 128 to increase the signal to noise ratio of the measurement

A frequency window of 20Hz to 80Hz was selected (based on frequency range that was critical) with an amplitude window of 24dB to 24dB. These settings provide a good starting point for most low frequency room measurements.

2. Identification of room modes

Identify the room modes with an FFT analyzer. Feed pink noise to only the sub and began to move the microphone around the room to identify the room modes. Depending on what type of room mode it is dictates the placement of the E-Traps. With basic intuition and a microphone the critical modes were determined – length mode at 49.6 Hz and width mode at 52.2 Hz.

3. Identification and placement if E-Traps – reduction of mode peaks

In this control room, there was limited space for E-Trap placement. Mode reduction on the rear wall (remember – this was the main objective of these adjustments) was successfully reduced with E-Trap placement on the floor behind the console. This was a huge advantage in that there would no need for additional cabinetry or power for the units.

Specific procedures from installation (Dave Kotch)

a. Tape the calibration microphone on the rear wall in the pressure zone (rear wall listening position)

b. Placed E-Trap in the corner / power up amp.

c. Adjust the fine frequency to the mid point and coarse frequency to the approximate frequency of the mode.

d. Turn the contour up about 2/3rds of the way and adjust the feedback control until it feeds back and reduce it until the feedback is eliminated.

e. Using FFT analyzer, begin to notice a reduction of the mode that is being treated. Flip the microphone on the E - Trap from the front microphone position to the rear microphone position and vice versa while watching the FFT analyzer and observe the difference. In our instance, due to the E - Trap's proximity to the subwoofer, a large gain reduction was initially achieved on unit 1 by using the microphone on the rear of the E-Trap as opposed to the front.

Placement of the E-Trap units is very critical. Before adjusting any of the settings reposition the unit. This is a very iterative process. Some of the largest gain reductions were achieved by physically repositioning the unit. In the case of unit 1 tipping it back by about 45 degrees proved to provide and additional 3-4 dB of gain reduction.

Once the placement of the E-Trap units was deemed appropriate through trial and error, a re-adjustment of the frequency settings was required to confirm optimization. After the frequency adjustments were set, feedback and contour set all the way down, then feedback was re-adjusted until the appropriate amount of gain reduction was achieved before the unit becomes unstable. The next step is to adjust the contour control with is both “Q” and feedback. Turning the contour control up will provide greater gain reduction in our case however it did split the mode making it a series of smaller modes. A subjective decision was made to achieve greater gain reduction with the split mode, again this may not be suitable for all applications.

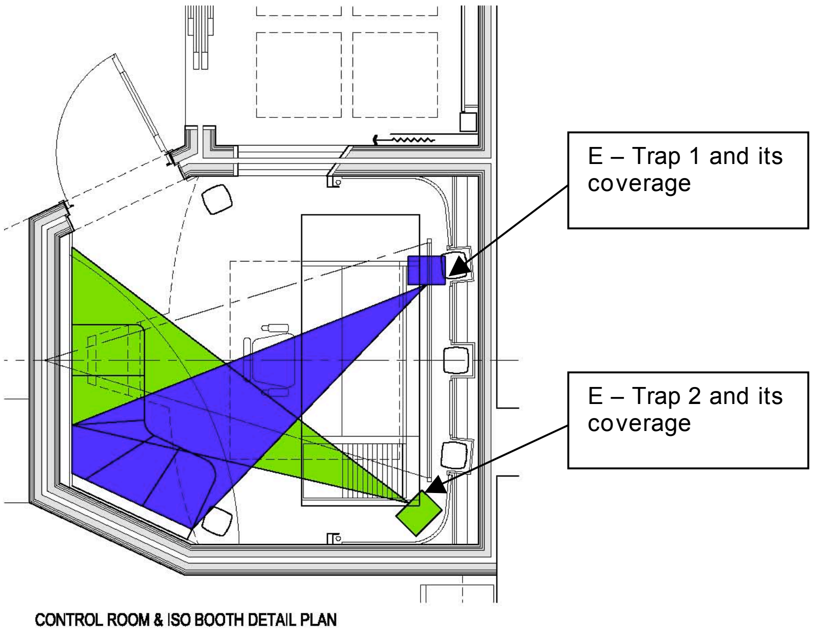

Figure 3 – E-Trap locations and coverage

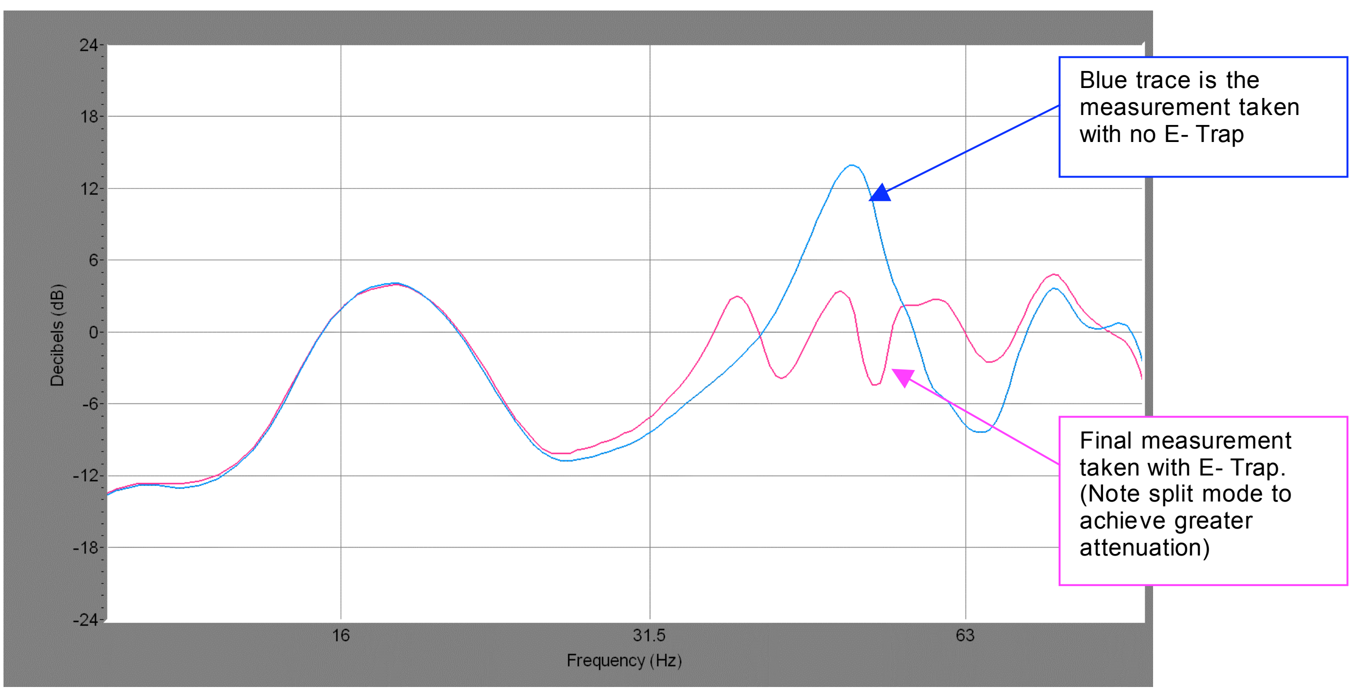

Figure 4 – final tuning of E-Trap #1 - pre and post E-Trap install frequency response curves (narrow band) at rear room couch position. Notice significant improvement at low end – approx. 59 hz – with reduction of low end build-up. See figure 3 for position and coverage.

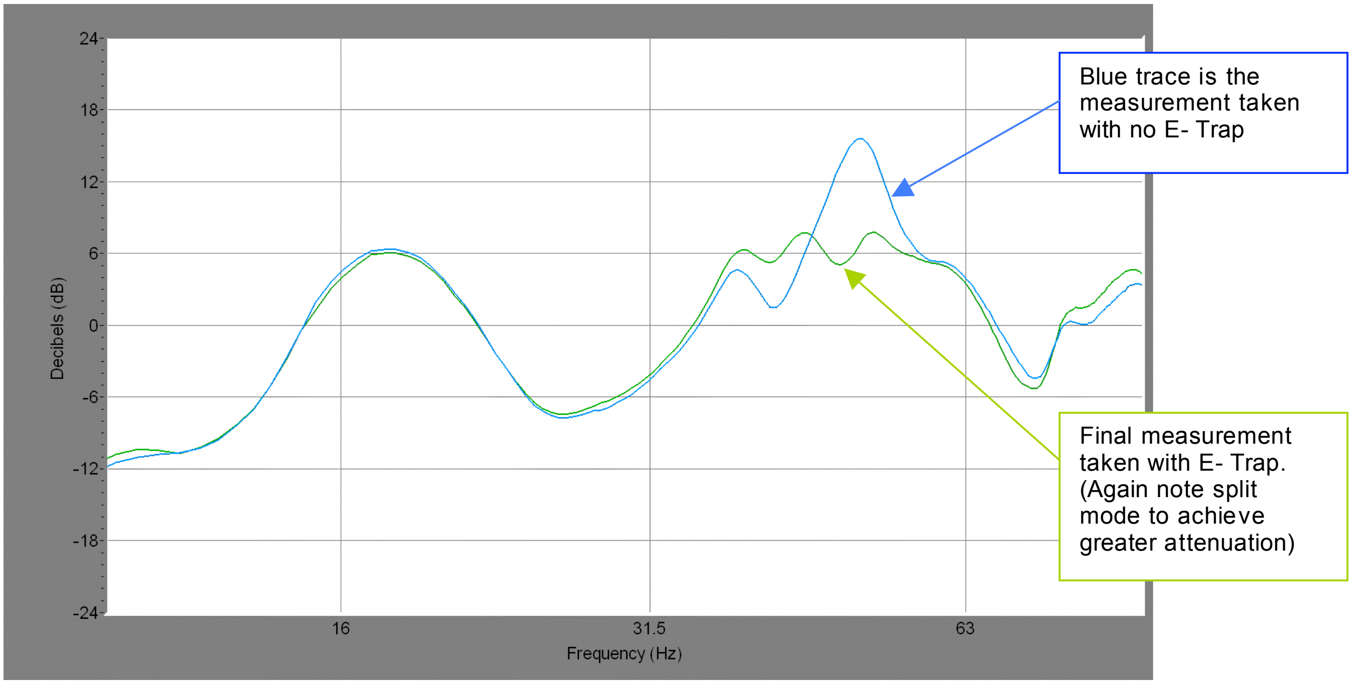

Figure 5 - final tuning of E-Trap #2. See figure 3 for position and coverage.

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