



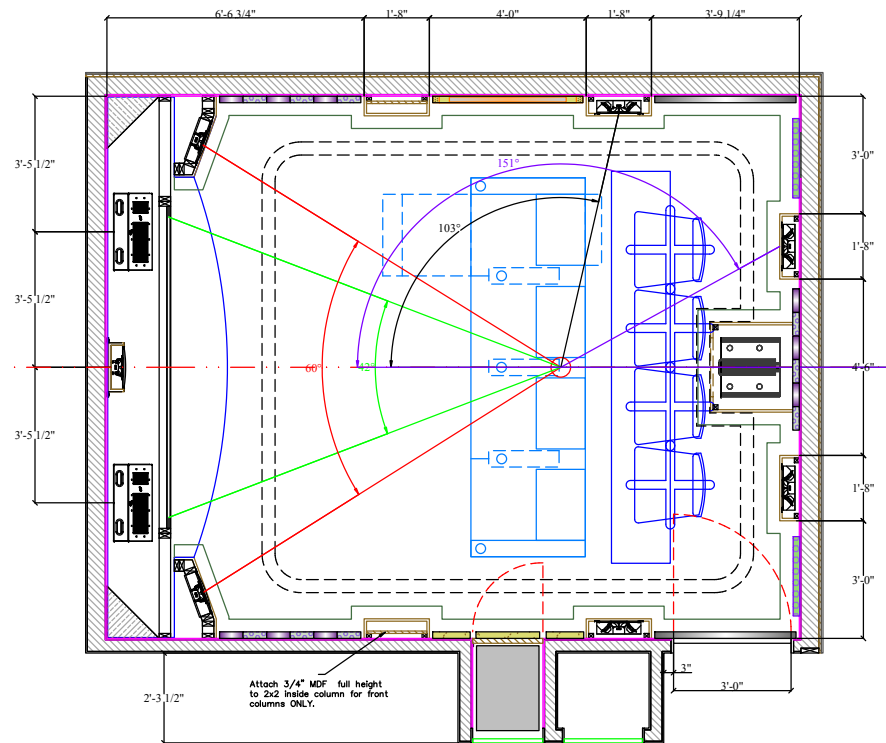
Acoustical Layout

Prepared for:

Sample

Page Listing:

- A1: Floor Plan
- A2: Side and Rear Elevations
- A3: Response Analysis
- A4: Modal Analysis
- A5: Ray Trace Analysis
- A6: Power and Sweet Spot Analysis
- A7: Detailed Acoustical Treatment Plan
- A8: Acoustical Products for Best Performance
- A9: Acoustical Products for Best Performance



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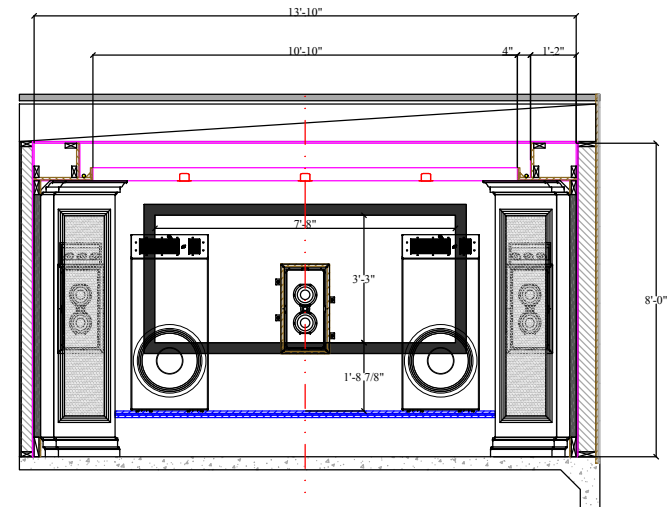
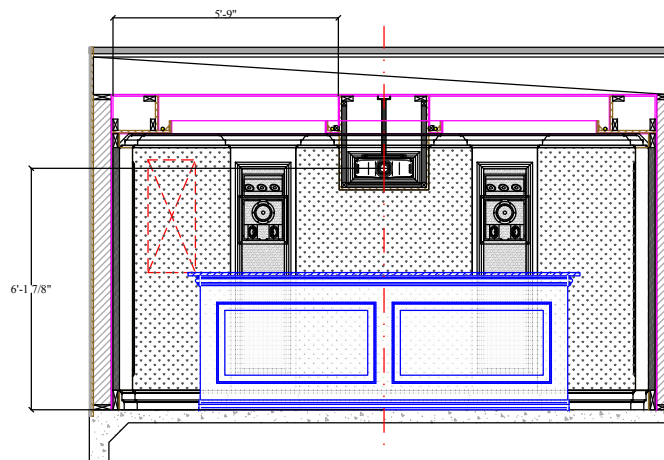
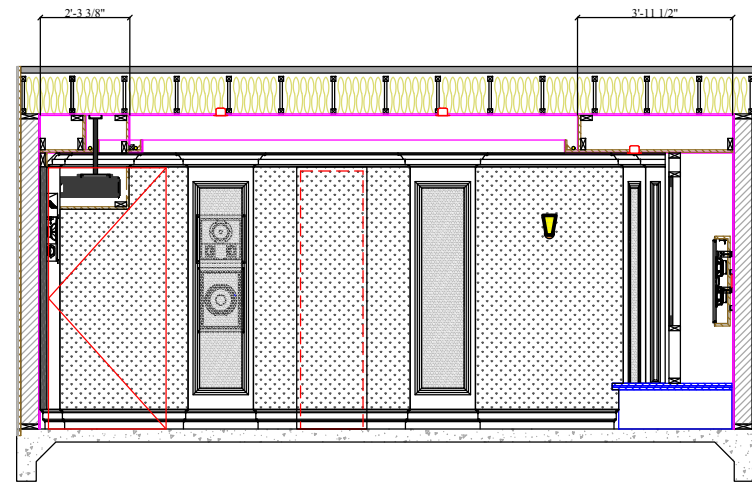
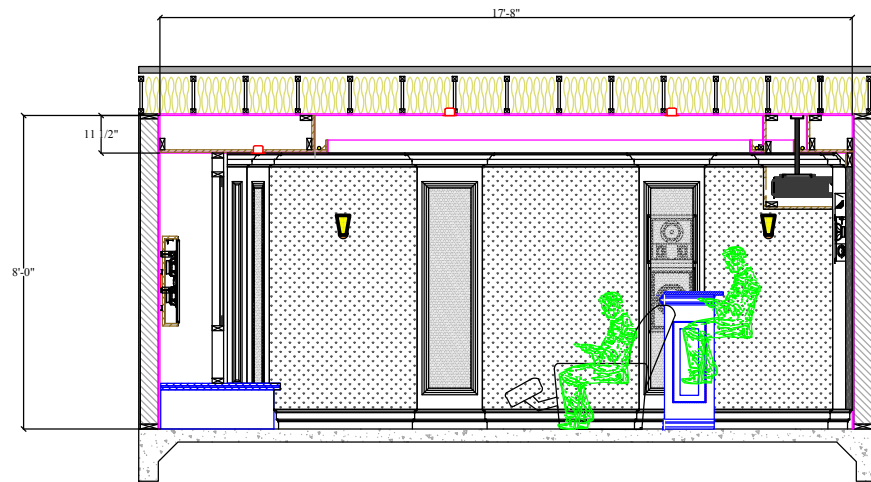
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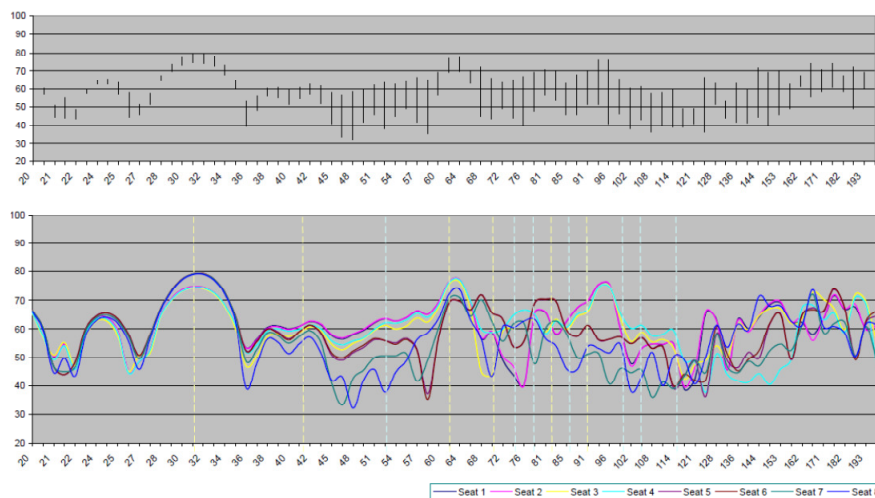
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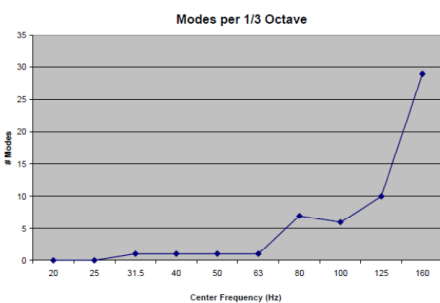
It All Begins Here!

Freq(Hz)	p	q	r	Type	WL (ft)	Spacing	Co	Freq(Hz)	p	q	r	Type	WL (ft)	Spacing	Co
32.01	1	0	0	Axial	35.4	0		104.11	2	2	0	Tangential	10.88	0	X
41.05	0	1	0	Axial	27.6	0.22		104.43	3	1	0	Tangential	10.85	0	X
64.01	2	0	0	Axial	17.7	0.36		108.43	0	2	1	Tangential	10.45	0.04	
70.82	0	0	1	Axial	16	0.1		113.05	1	2	1	Oblique	10.02	0.04	
82.1	0	2	0	Axial	13.8	0.14		119.31	3	0	1	Tangential	9.5	0.05	
96.02	3	0	0	Axial	11.8	0.14		123.16	0	3	0	Axial	9.2	0.03	
123.16	0	3	0	Axial	9.2	0.22		125.91	2	2	1	Oblique	9	0.02	
128.03	4	0	0	Axial	8.85	0.04	X	126.17	3	1	1	Oblique	8.98	0	X
141.63	0	0	2	Axial	8	0.1		126.34	3	2	0	Tangential	8.97	0	X
160.03	5	0	0	Axial	7.08	0.12		127.25	1	3	0	Tangential	8.9	0.01	
164.21	0	4	0	Axial	6.9	0.03	X	128.03	4	0	0	Axial	8.85	0.01	
192.04	6	0	0	Axial	5.9	0.14		134.45	4	1	0	Tangential	8.43	0.05	
205.26	0	5	0	Axial	5.52	0.06		138.8	2	3	0	Tangential	8.16	0.03	
212.45	0	0	3	Axial	5.33	0.03	X	141.63	0	0	2	Axial	8	0.02	
224.05	7	0	0	Axial	5.06	0.05		142.07	0	3	1	Tangential	7.98	0	X
246.31	0	6	0	Axial	4.6	0.09		144.83	3	2	1	Oblique	7.82	0.02	
256.06	8	0	0	Axial	4.42	0.04	X	145.2	1	0	2	Tangential	7.8	0	X
283.26	0	0	4	Axial	4	0.1		145.63	1	3	1	Oblique	7.78	0	X
287.37	0	7	0	Axial	3.94	0.01	X	146.31	4	0	1	Tangential	7.74	0	X
288.06	9	0	0	Axial	3.93	0	X	147.46	0	1	2	Tangential	7.68	0.01	
320.07	10	0	0	Axial	3.54	0.1		150.89	1	1	2	Oblique	7.51	0.02	
328.42	0	8	0	Axial	3.45	0.03	X	151.96	4	1	1	Oblique	7.46	0.01	
354.08	0	0	5	Axial	3.2	0.07		152.09	4	2	0	Tangential	7.45	0	X
369.47	0	9	0	Axial	3.07	0.04	X	155.43	2	0	2	Tangential	7.29	0.02	
410.52	0	10	0	Axial	2.76	0.1		155.82	2	3	1	Oblique	7.27	0	X
424.89	0	0	6	Axial	2.67	0.03	X	156.17	3	3	0	Tangential	7.26	0	X
495.71	0	0	7	Axial	2.29	0.14		160.03	5	0	0	Axial	7.08	0.02	
566.52	0	0	8	Axial	2	0.12		160.76	2	1	2	Oblique	7.05	0	X
291.35	0	0	9	Axial	3.89	0.11		163.71	0	2	2	Tangential	6.92	0.02	
535.3	0	0	10	Axial	2.12	0.1		164.21	0	4	0	Axial	6.9	0	X
All Modes								165.22	5	1	0	Tangential	6.86	0.01	
32.01	1	0	0	Axial	35.4	1		166.81	1	2	2	Oblique	6.79	0.01	
41.05	0	1	0	Axial	27.6	0.22		167.3	1	4	0	Tangential	6.77	0	X
52.06	1	1	0	Tangential	21.77	0.21		167.77	4	2	1	Oblique	6.75	0	X
64.01	2	0	0	Axial	17.7	0.19		171.11	3	0	2	Tangential	6.62	0.02	
70.82	0	0	1	Axial	16	0.1		171.47	3	3	1	Oblique	6.61	0	X
76.05	2	1	0	Tangential	14.9	0.07		175	5	0	1	Tangential	6.47	0.02	
77.71	1	0	1	Tangential	14.58	0.02		175.78	2	2	2	Oblique	6.45	0	X
81.85	0	1	1	Tangential	13.84	0.05		175.97	3	1	2	Oblique	6.44	0	X
82.1	0	2	0	Axial	13.8	0	X	176.25	2	4	0	Tangential	6.43	0	X
87.89	1	1	1	Oblique	12.89	0.07		177.65	4	3	0	Tangential	6.38	0.01	
88.12	1	2	0	Tangential	12.86	0	X	178.83	0	4	1	Tangential	6.34	0.01	
95.46	2	0	1	Tangential	11.87	0.08		179.75	5	1	1	Oblique	6.3	0.01	

Response Analysis



Modes less than 300 Hz	
Total:	216
Axial Modes:	20
Tangential Modes:	92
Oblique Modes:	104
Coincidences less than 300 Hz	
Total:	151
Axial Modes less than 165 Hz Within 5%	
Total:	2



Dimensional Analysis Plot:

This graph and accompanying chart, reveals much about the sonic character of your room. Mathematically, it is a graphical representation of the total number of modes which occur in your room per 1/3 octave. This graph illustrates that the room uniformly creates bass modes when each successive 1/3 octave contains an equal or an increasing number of modes as the last. This means that a good room has modes in every 1/3 octave. A desirable dimensional analysis curve shows level always increasing or at least remaining constant. Any decrease in the number of modes, a downward sloped increment, indicates a frequency band without good modal support. This is a part of the bass that is not enhanced by the room. While other parts of the bass can be changed for any room location by subwoofer or listener repositioning, this bass octave will remain largely unaffected. In many cases, this does not cause an issue achieving smooth bass, but depending on the scenario, it can become a significant nuisance. This is the real secret to a good room dimension ratio; seeing how the height, width, and length affect the modal distribution by displaying this curve and understanding modal coincidences.

Understanding the acoustical nature of your listening room begins here!

While room dimensions should not be used solely to determine the suitability of a room for quality sound reproduction, room dimensions can reveal some potential problems. Good sound is possible in ANY room; even a room displaying poor modal distribution. Achieving good sound becomes a more challenging task though when the room dimensions do not evenly support all bass octaves.

In this analysis, we focus on discovering which bass frequencies (referred to as modes), are present in every room. Our goal is to first find out what modes are at work, discovering if we can expect a neutral sounding room or a room injecting its own imprint on all recordings.

Achieving uniform modal distribution means that through adjustment of speaker and listener positions, we will be able to affect all relevant 1/3 octave bands over a larger area of the room. Uneven modal distribution (a poor dimensional analysis) means that in some octaves we cannot expect maximum bass output while others have so much bass that equalization is our only solution.

Modal Coincidences:

A well designed room uses dimensions that do not create multiple modes at or near the same frequencies. While room modes are beneficial by enhancing low frequency energy in a room, coincident modes exaggerate this enhancement at specific frequencies. Our target is to have the enhancement of bass to occur at many frequencies evenly. We therefore, want to minimize the number of coincident modes, particularly at the very low frequencies below 100 Hz. The chart to the right denotes modal coincidences by an "X" near the redundant frequency. We tabulate axial coincidences only if they occur below 165 Hz.



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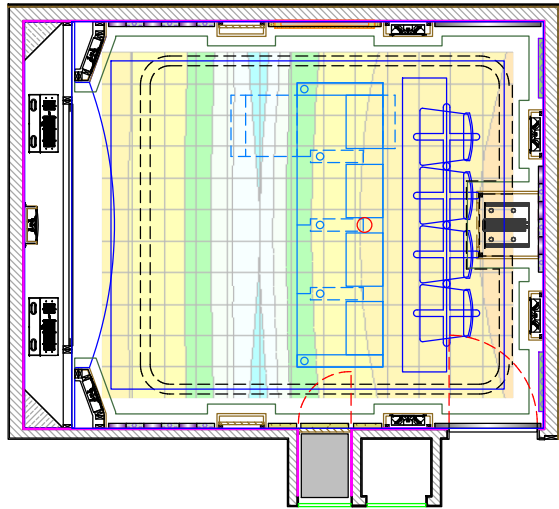
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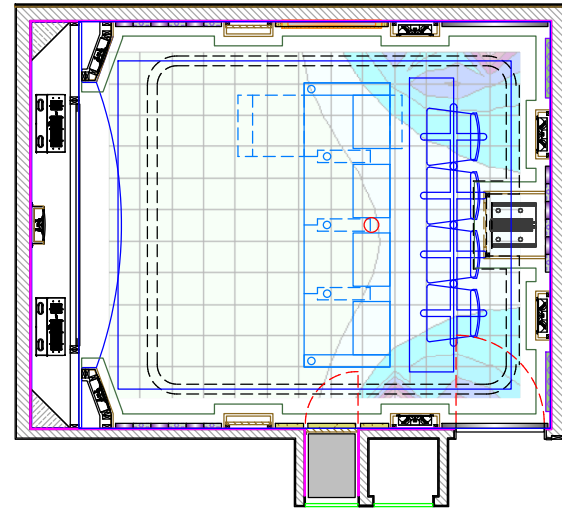
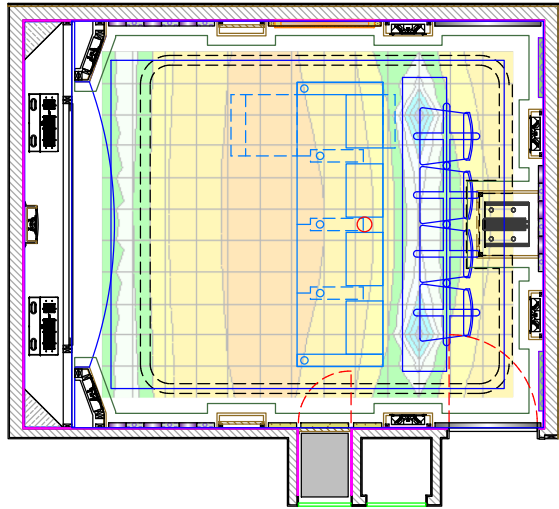
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Modal Analysis



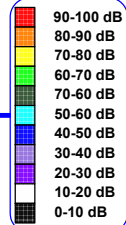
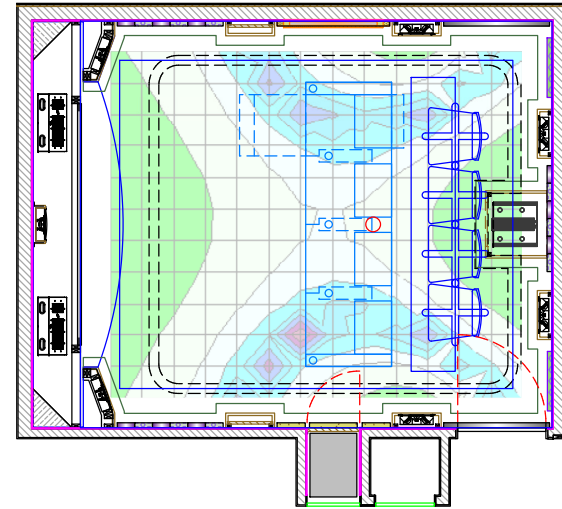
30.01 Hz

64.01 Hz



41.05 Hz

70.82 Hz



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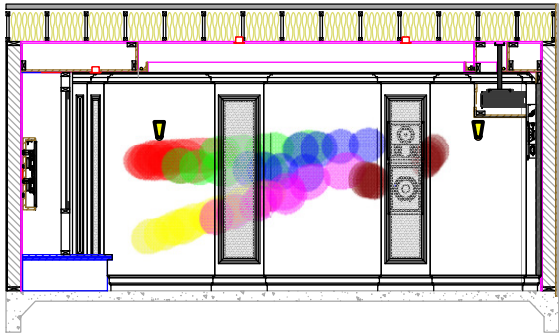
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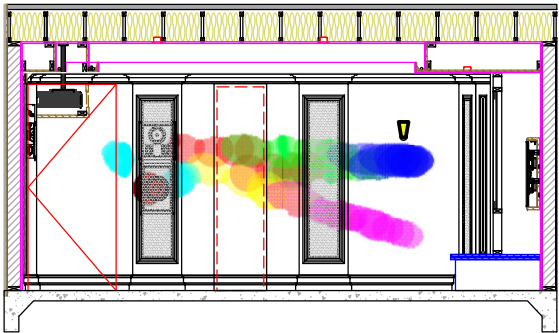
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Acoustical Ray Trace Plots

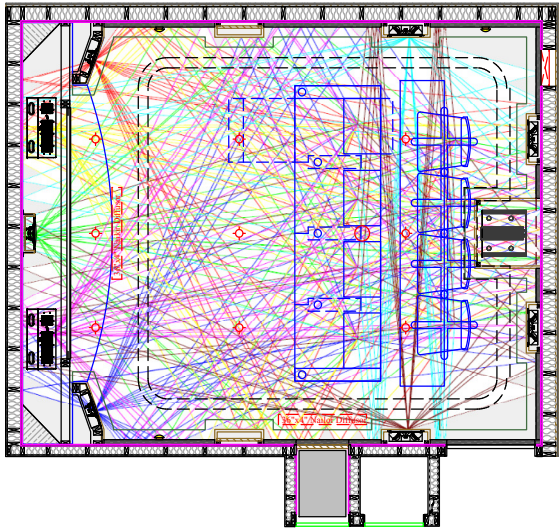


Right Side Trace Plot



Left Side Trace Plot

Plan View Trace Plot



Rear Trace Plot



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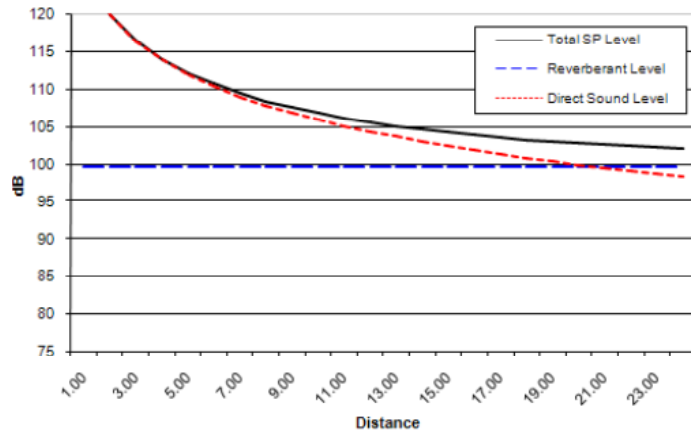
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Power Analysis

SPL	distance	SPL	distance
126	1.00	105	13.00
120	2.00	105	14.00
116	3.00	104	15.00
114	4.00	104	16.00
112	5.00	103	17.00
111	6.00	103	18.00
109	7.00	103	19.00
108	8.00	103	20.00
107	9.00	102	21.00
107	10.00	102	22.00
106	11.00	102	23.00
105	12.00	102	24.00



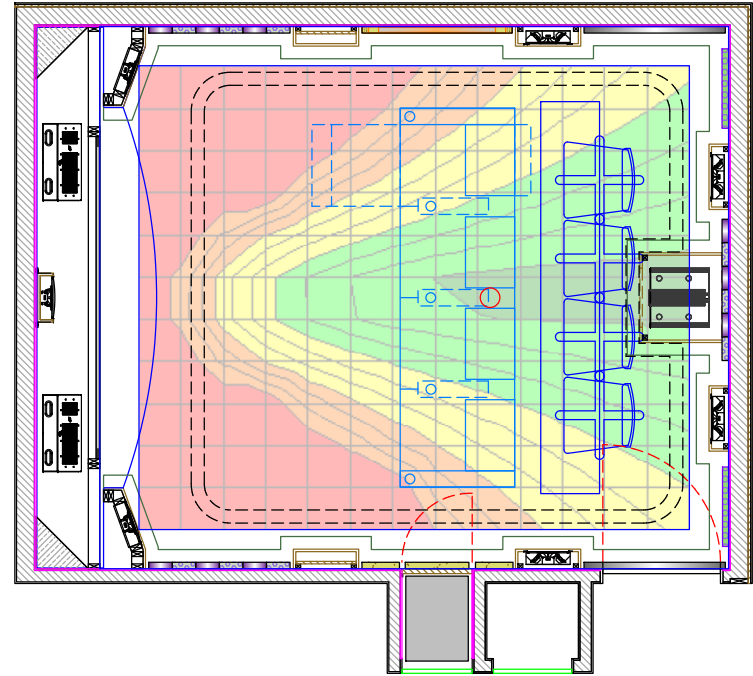
This is an approximate calculation. Various real world factors can influence the ultimate accuracy of the results

Power Requirement Calculation for a Sealed Room:

The power requirement calculation for a sealed room looks at the necessary amplifier power and speaker sensitivity required to drive the total SPL to 105 dB THX reference level at a given distance within the listening area. It is an approximation given the sensitivity of the speaker per manufacturer specifications, the amplifier power (wpc) measured in 8 ohms per manufacturer specifications, and the estimated absorptive coefficient expected within the treatment schedule. It also informs the consumer of the anticipated direct sound level above the reverberant level. Direct sound below the reverberant level has a tendency to lose focus, and the overall dimensionalsoundfield loses stereo imaging.

It must be noted that is strictly an approximation. Significant changes can occur as a result of speaker driver type, amplifier rating, and overall final treatment strategy.

Sweet Spot Analysis



Sweet Spot Analysis

Identifying the right place to sit in a group theater is more than simply making sure the center seat is at the proper separation from the speakers. Rows too close to the front speakers can often have disappointing results for the listeners seated to the far left or right. The "SweetSpot" analysis allows us to model the area to determine the true seats where high performance listening is possible. The green area represents the range where high performance is optimized. Moving into yellow/orange sections, we begin to see a diminishing of the sound stage balance and focus. Of course, red areas are out of bounds for high performance. There's always a "best seat" and this is represented by the darker green region.



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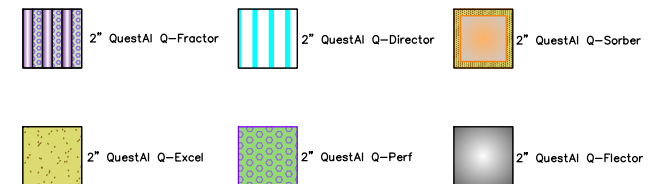
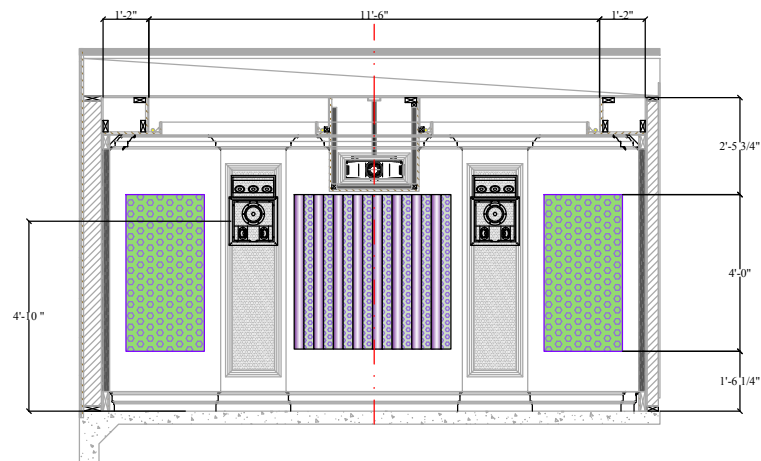
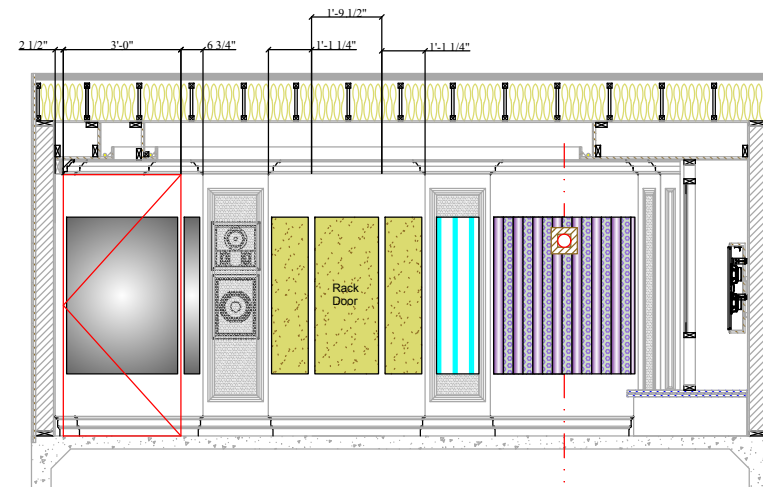
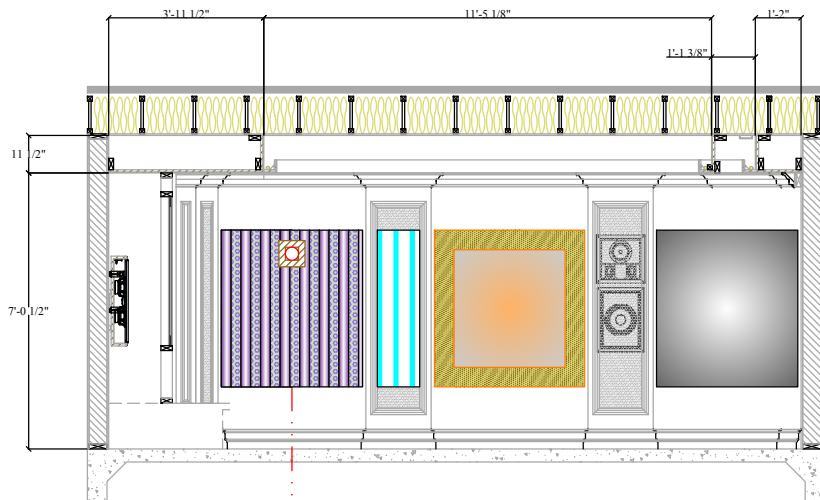
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Acoustical Products for Best Performance

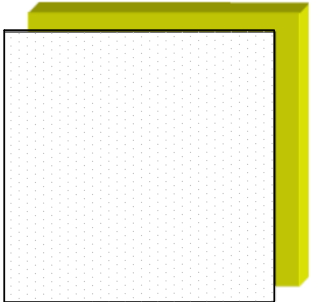


QAI Q-EXCEL

This is our traditional fiberglass product enhanced for use in home theater and high performance large venue installations. A 6lb. density provides a better surface for upholstered panels providing sharper edges. The stiff board like nature of the product make it ideal for tough installations where placement is tight. Built from our LEED qualified materials these panels combine excellent sound absorption with a classy appearance.

QAI Q-EXCEL	125 Hz:	.42
	250 Hz:	.89
	500 Hz:	1.12
	1000 Hz:	1.07
	2000 Hz:	1.10
	4000 Hz:	1.09
	NRC:	1.05

All components have a Class "A" rating per ASTM E84 and are available raw/upholstered with radius, square, or beveled edges. For more information, please visit questai.com.

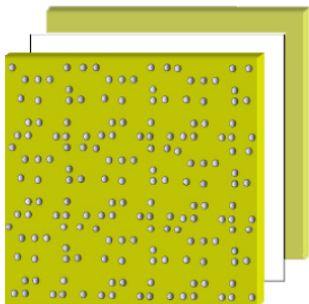


QAI Q-FLECTOR

This product provides a dual purpose. First, the combination of two inches of medium density fiberglass material under a vinyl barrier creates a highly effective bass trap. Second, the vinyl barrier itself becomes a high frequency reflector. In one key application, our engineering department uses the Q-Flector in concert with Q-Perf at specular reflection points. This has provided a paradigm improvement in the technique of separating the "good from the bad" early reflections. In addition, the Q-Flectors highly desirable high frequency reflectivity allows its use in many locations throughout the room. This flexibility means improved low frequency response without removing desirable high frequency diffusion.

QAI Q-FLECTOR	125 Hz:	.66
	250 Hz:	.87
	500 Hz:	.82
	1000 Hz:	.47
	2000 Hz:	.18
	4000 Hz:	.18
	NRC:	.6

All components have a Class "A" rating per ASTM E84 and are available raw/upholstered with radius, square, or beveled edges. For more information, please visit questai.com.



QAI Q-PERF

Consisting of perforated binary patterned fiberglass face with an internal septum barrier, Q-Perf both absorbs and diffuses sound. Q-Perf is used for a variety of applications in home theaters. It's unique ability to enhance soundstage depth while increasing the perceived focus of stereo imaging is unique in the industry.

QAI Q-PERF	125 Hz:	.23
	250 Hz:	.83
	500 Hz:	.78
	1000 Hz:	1.01
	2000 Hz:	.9
	4000 Hz:	.78
	NRC:	.9

All components have a Class "A" rating per ASTM E84 and are available raw/upholstered with radius, square, or beveled edges. For more information, please visit questai.com.



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Acoustical Products for Best Performance

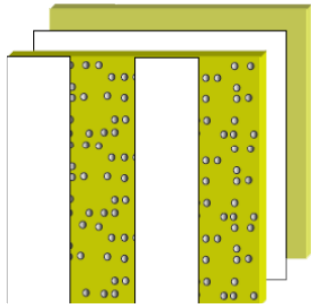


QAI Q-SORBER

This product has made true high performance acoustics possible in a mere 2" deep treatment. While our other treatments present amazing hybrid capabilities, this product focuses on one; wide band absorption. The unique design employs dual density fiberglass makeup cleverly integrated into a diaphragmatic frame and cavity. This product is used in QAI Systems 2 and 3 in all locations once used by mere fiberglass. In addition, its amazing low frequency absorption makes it our thin wall bass trap. You'll find Q-Sorbers behind main speakers, SBIR reflection points and anywhere our engineers need to absorb harmful reflections at all frequencies. Used in conjunction with our high technology treatments, the Q-Sorber has become an essential tool required to create high performance home theater and sound rooms.

QAI Q-SORBER	125 Hz:	.73
	250 Hz:	.95
	500 Hz:	1.17
	1000 Hz:	1.16
	2000 Hz:	1.16
	4000 Hz:	1.13
	NRC:	1.10

All components have a Class "A" rating per ASTM E84 and are available raw/upholstered with radius, square, or beveled edges. For more information, please visit questai.com.



QAI Q-FRACOR

Consisting of our Q-Perf product augmented by finely tuned vinyl reflectors, it is a highly interactive acoustical diffraction grating. Q-Fractor Plus is used in precise locations in a home theater as dictated by our proprietary acoustical modeling software. It's unique ability to enhance sound stage depth while increasing the perceived focus of stereo imaging near the front and sides of the room is unique to the industry. Q-Fractor Plus designed into a system produces desirable lateral reflections resulting in a very pleasing, cohesive and enveloping experience.

All components have a Class "A" rating per ASTM E84 and are available raw/upholstered with radius, square, or beveled edges. For more information, please visit questai.com.



QAI Q-DIRECTOR

The Q-Director is not a diffusor but rather a redirector of sound energy. Each reflection is sourced from a different speaker. The clutter of overlaid reflections confuses sonic imaging. The Q-Director is placed in very specific locations, calculated using Quest's Lens System Technology software, which resolves a solution to clarify the sonic image. This clarification enhances sound stage width and spaciousness to the sound field. Integrating the Q-Director into the acoustical treatment strategy requires holistic analysis of all speaker and listener positions.

QAI Q-DIRECTOR	125 Hz:	.02
	250 Hz:	.06
	500 Hz:	.19
	1000 Hz:	.08
	2000 Hz:	.05
	4000 Hz:	.05
	NRC:	.20

All components have a Class "A" rating per ASTM E84 and are available raw/upholstered with radius, square, or beveled edges. For more information, please visit questai.com.



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