TOP 10 CONSIDERATIONS FOR AUDIOMETRIC TEST BOOTH PLANNING

COMMITTED TO ENHANCING PATIENT EXPERIENCES AND OUTCOMES

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Audiometric test booths, commonly referred to as “sound booths”, are designed to isolate sound to create a quiet environment. The sound booth design is engineered to meet the stringent industry requirements for minimum ambient sound levels for audiometric testing.

A sound booth is an essential tool in the practice of audiology and hearing research allowing for the assessment and treatment of hearing loss. Sound booths and research chambers are also essential in the development of hearing aids, listening devices, cochlear implants, and other diagnostic equipment. Early detection and treatment of hearing loss results in better patient outcomes.

Sound booths are found everywhere from ENT (ear, nose, and throat) and audiology medical practices, retail hearing aid centers, schools, hospitals, and audiology teaching programs to the R&D labs of hearing loss diagnostics equipment and device manufacturers.

High quality audiometric sound booths are an investment. The following considerations should help you arrive at the optimal booth design to address your hearing test needs now, and in the future. With considerations addressing pre- and post-installation of your audiometric sound booth, you will ensure desired performance is achieved and your investment is protected for many years to come.

1. What Types of Testing will be Performed in the Sound Booth

Audiometric sound booths are designed for a variety of test applications. Each test application dictates the design of the booth.

For example, ears covered screening (wearing headphones for a diagnostic hearing test) typically requires a small booth. Setting up a sound field and Visual Reinforced Audiometry (VRA) test requires a larger booth to meet a minimum distance from the speakers to the patient. For sensitive testing such as Auditory Brainstem Response (ABR) for patients who may be in a coma, nonverbal children, or for other Electro EEG based studies, Radio Frequency/Electromagnetic Interference (RF/EMI) shielding enhancement should be considered for the booth design. For pediatric testing, a larger booth should be considered to accommodate a parent and child during the test process. A booth can also provide an excellent environment for hearing aid tuning; a small booth is a good fit for this test application.

Another factor to consider beyond the test application is the desired number of patients to be tested concurrently. Multiple patient testing is an option in larger booths. Ask your booth provider about solutions for current and expected patient test requirements in the future to optimize your design and maximize your investment.

2. What are the Acoustic Requirements for the Sound Booth?

Audiometric sound booths come in a range of types to achieve the desired interior ambient noise levels in a variety of environments. In general, single wall booths are recommended when testing will be conducted in a moderately quiet dedicated office space. Booths with thicker panels are recommended for spaces with higher ambient sound levels. Double wall booths are appropriate for shared spaces or for booths that will face a corridor. As an option, a "suite" booth features an isolated control room for the examiner.

The ambient noise levels in the desired booth location should be measured prior to the installation of the audiometric test chamber. This ensures that the correct sound booth design is selected for the desired end result in the space. For example, a double wall booth is appropriate when the host space ambient sound levels are not in excess of the following values:

Center Frequency (Hz)	63	125	250	500	1000	2000	4000	8000
Maximum Host Site Noise Levels (dB)	60	52	45	40	36	34	33	32

3. Consider Consulting Services to Optimize Your Sound Booth Design and Budget.

Once you have identified where you will locate your sound booth and determined the types of test capabilities for your expected patients, consider consulting services to optimize your sound booth design and meet your target budget. Reputable sound booth manufacturers and skilled installers will not only provide a quality product, but will also have consulting services and application engineers available to discuss your requirements to ensure you are purchasing the product best suited for your needs.

Rather than ordering a sound booth "online" with a quick click, meet with the experts who work full time in designing, manufacturing, installing, and testing a wide variety of sound booths. During a telecom or on site meeting, an educated and experienced consultant can guide you through a discussion on wheelchair access options, patient comfort opportunities, meeting industry standards, reviewing your instrumentation needs, and answer any questions you may have on your specific application. A consultant may also provide drawings showing the booth in its intended location. These are all resources a consultant may provide to help you evaluate the cost and benefit trade-offs of different sound booth designs – before you place an order. As a result of working with an experienced consultant, you will optimize your booth design for your application, while meeting your desired performance and budget objectives.

In other words, your sound booth is an investment. Be wary of a vendor who quotes a "box" and does not appear comfortable answering or is dismissive of your questions. You should feel comfortable that your sound booth provider is your partner in improving patient outcomes. In short, not all sound booths are created equal.

4. Validate the Site Specifics for Your Booth Installation – Before You Place an Order.

It is easy to get carried away with the prospect of a new audiometric sound booth and the exciting test capabilities it will offer. However, careful deliberation of placement inside the host building is called for very early in the planning process.

Ceiling height is a very common limitation, with most booths requiring 2.4 m to 2.7 m (8 ft to 9 ft) of clear space under any obstruction depending on booth type. Another commonly overlooked issue is the pathway from the delivery truck to the installation site. The best approach is to trace this path thoroughly with a tape measure and the measurements of the largest assembly component for your booth; this is often the booth door frame or panel. If the site will not be located on a ground floor, is a freight elevator with adequate weight capacity and dimensions easily accessible from the loading dock? Is there a weight capacity limit on upper floors? Are all hallways wide enough, with special attention paid to hallway angles and tight corners?

During the pathway trace, also watch for lighting, signs, plumbing/fire sprinklers, and HVAC duct work that could impede the path to the booth installation site. Double doors may have a center pillar or closing mechanism that could restrict wide loads; doorjambs may also hinder passage. Are regional seismic requirements applicable to the installation site? When you walk the path, we guarantee you will discover things you have never noticed before!

Power to the sound booth, wheelchair access, and other minor, but critical items, are often overlooked. For example, is a power drop of sufficient voltage and current available where the booth will be placed? Will the door to the booth be able to open/close unencumbered? Should the booth's door have a hinge on the left or right? What works best for the intended location? What is the optimal location for the viewing window of the booth? Sound booths are inherently challenging for wheelchair access. This is largely due to the acoustic and vibration isolated floor system requiring a step-up into the booth. The ideal condition is to recess the booth into a pit for flush entry. Other options include raised access floors and ramping. Door width is important to address for wheelchair access.

These are all considerations to take into account up front to avoid surprises later such as potential cost overruns and subsequent schedule delays when preparing for a sound booth installation. No one wants to call patients and reschedule appointments due to delays in the sound booth installation.

In summary, all sound booths require clearance for installation; it is important to review the available space with a representative of the booth provider to determine the best utilization of the available space. A local representative will review the path from your unloading area to the desired booth location for suitability. Finally, as part of this planning, remember to consider schedules for delivery of the booth and instrumentation.

When you are ready with the considerations above in mind, start your sound booth procurement work with a reputable company who specializes in turnkey consultation on all planning aspects for a successful booth: design, installation, and subsequent equipment integration.

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5. Review Patient Comfort Options Available for Your Sound Booth.

Once it is time for a hearing loss test, you will want to provide a welcoming, comfortable environment for your patients and perhaps their parents or guardians as well. A relaxed patient results in less stressful and more accurate testing. The added benefit? Increased patient throughput.

There are many enhancements available for a sound booth to promote patient comfort. A few examples include:

- Door Windows: A window in the door provides additional ambient light. However, a window is not recommended if the booth is located in a busy area. In this case, a small window only should be considered. A full-length window is a great addition when the booth is located in a dedicated, quiet office.
- Lighting: As with any environment, lighting sets the tone. Good quality LED lighting with dimming capability assures a bright atmosphere with the ability to tone down the light when necessary for one-way observation from outside the booth or for focused VRA testing.
- Ventilation System: Sound booths have an acoustically engineered ventilation system to ensure a comfortable climate for the patient. These systems are designed to be connected to the building HVAC, and when that is not an option, a ventilation system should have variable speed capability to enable airflow control and increase airflow between tests. Quiet system fans are an option to minimize distracting noise while providing optimal ventilation.
- Interior Design: Interior treatment packages consisting of aesthetically pleasing acoustic wall coverings enhance the interior walls of the booth. Taking into consideration pattern and color, these treatments provide a unique way to elevate patient comfort.

6. Coordinate Your Sound Booth Interface with Instrumentation.

There are a number of features and options available for a sound booth for an optimal interface with the instrumentation planned.

Consider access points for alert and network for fire alerts and laptops/internet access. Multiple interior power outlets provide convenient access. Will you need conventional three-prong power outlets or will a USB port suffice? Consult with your booth provider on the design of the booth to ensure seamless integration with your test equipment. A little time spent on addressing the instrumentation up front saves more time later once the booth is installed.

Custom and pre-engineered booths are available for instrumentation interface; review the options to determine the best fit for your test and instrumentation requirements. Often your specific application may require some customization, which is never a problem for an experienced and reputable sound booth provider. Remember, do not try to fit a square peg in a round hole; if you can customize your instrumentation interface for your specific needs at no additional charge, you will be much happier with your sound booth purchase in the end.

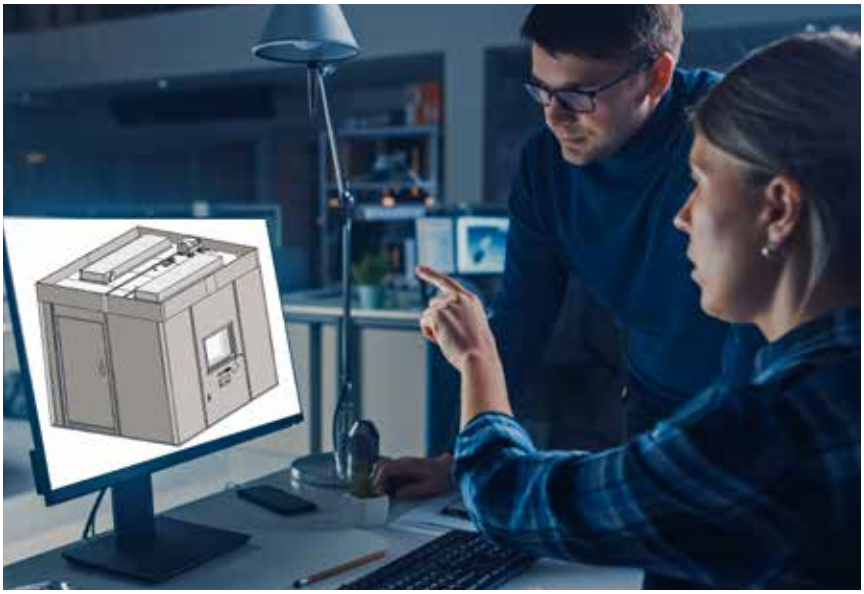
7. Investigate the Quality Assurance Provided from Design to Manufacturing.

For design verification, ask to see a model of your audiometric sound booth, using software such as SolidWorks™. A model ensures the booth design will be accurately incorporated during the manufacturing process. The product is supplied as designed and when delivered as a modular system, will assemble perfectly once built on site. With a model, the fit of all elements is checked as is the clearance and mating of all doors, electrical, and ventilation elements before the booth components are shipped.

Confirm that your sound booth is designed to meet ANSI S3.1 criteria for an audiometric test environment. Then, verify on site that interior ambient requirements comply with the standard and instrumentation used has been calibrated according to industry standards. Ask your booth provider to share data on past booth installations that document compliance with ANSI S3.1. Ideally, the engineered booth solution has been tested as a complete unit in a National Voluntary Laboratory Accreditation Program (NVLAP) certified acoustic test lab for noise reduction to ensure compliance with industry standards.

As a rule of thumb, require approval of submittal drawings prior to manufacturing the booth, state the specific test reports required to document performance of the booth, and request a certificate of compliance that test data taken on sample components is comparable to the material to be supplied for your audiometric sound booth.

Finally, confirm the sound booth manufacturer is ISO 9001 certified for the manufacturing and service of acoustic test enclosures. ISO certification is a good indicator of attention to quality during all phases of the manufacturing process.



8. Verify Compliance with Acoustic Industry Standards.

Active technical contributions to and involvement in the industry standards committees is essential to ensure products continue to evolve and meet the latest technology trends as well as standards requirements. If your booth provider has an active presence on the standards committees, you can be assured your audiometric sound booth will meet today's standards. You will be advised on pending future changes to the standards and are educated when planning the design of your sound booth. Check to see if your sound booth provider has an engineer on staff who actively contributes to industry standards to ensure your booth design is compliant as well as incorporates the latest technology.

As a minimum, your sound booth provider should supply test reports to document compliance with the following test standards essential to acoustic test enclosure design and performance validation:

- ASTM C423 Sound Absorption – Measures the sound absorption characteristics for the various panel designs used in sound booth construction
- ASTM E596 Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures – Provides overall noise reduction performance of a complete acoustic enclosure
- ASTM E90 Laboratory Measurement of Airborne Sound Transmission Loss – Determines the sound attenuation characteristics of a component part of a sound isolation enclosure such as a door or wall panel
- ANSI S3.1 Maximum Permissible Ambient Noise Levels for Audiometric Test Booths – Your sound booth provider should have the capability to verify the ambient sound levels inside your booth post installation

9. Remember: Quality Project Execution Ensures a Successful Project Outcome.

You may have the best materials available for your sound booth, but if not assembled properly, the sound booth may not achieve the intended performance necessary for quality testing, especially for sensitive tests. To avoid potential problems during installation, secure a sound booth provider with extensive experience in the design and installation of audiometric sound booths. Verify your provider has an established quality assurance program with factory trained and certified sound booth installers. Ask for customer references on similar sound booth installations. Is the installer familiar with or new to the manufacturer of the sound booth? If not, that could be a red flag. Look for installers who are partners with sound booth manufacturers. A long partnership between the manufacturer and installer reduces risk and increases success as expertise develops over time. Established relationships extend their partnership to the customer so all parties work together to contribute to a sound booth experience that meets and exceeds expectations.

In short, sound booth installation is a critical component to ensure a successful project outcome. After all, a great sound booth is only achieved with a great installation team.

10. Consider a Maintenance Program to Address Optimal Performance for Years to Come.

Quality sound booth providers often have established local partners who can offer responsive service in the unlikely event your new sound booth needs attention. These local partners may also assist you on future requirements to relocate your sound booth, add a sound booth to your current test facility, or calibrate your equipment annually. As part of your calibration service, your sound booth provider will inspect the key components of your booth and recommend any needed maintenance. As a best practice during the annual instrumentation calibration, this is a good opportunity to also evaluate the current sound level of your booth to confirm performance is maintained. A sound check should also be performed after a sound booth has been moved or relocated. Sound booth providers with long established relationships with installation partners can also offer instrumentation training and annual equipment calibration. To confirm the quality of this service, check to make sure your partner is certified and can document his/her expertise.

While a seemingly minor detail, sound booth components can have a major impact on your patient throughput if a part needs replacement. Having a local partner nearby to quickly service replacement parts such as lights, door seals, and power supplies ensures little to no downtime. Your patient schedule will not be adversely impacted should you need to stop operation to source and secure a replacement part.

Once your sound booth is on site, keep it fully operational and at peak performance for years to come with a maintenance program in mind.

Follow these "Top 10 Considerations" to address your audiometric sound booth needs now, and in the future! ETS-Lindgren is the partner that consistently delivers the solutions you need. Contact your local ETS-Lindgren representative, phone us at +1.512.531.6400, or visit our website at www.ets-lindgren.com.

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