ETS·LINDGREN™
ACOUSTIC SYSTEMS

Audiometric Test Booth Overview

Col. Ben Sierra (Ret.)

Wilford Hall Medical Center

Lackland Air Force Base, Texas

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KING PAX TECHNOLOGY CO., LTD.

About ETS-Lindgren Acoustic Systems

Acoustic Systems has been manufacturing high quality modular sound isolation enclosures at our Austin, Texas manufacturing plant since 1971.

Acoustic Systems was acquired in 2002 by **ETS-Lindgren** to add acoustic sound control to their scope of capabilities. ETS-Lindgren is an innovator of systems and components for the detection, measurement and management of RF, electromagnetic, magnetic, and now acoustic energy.

ETS-Lindgren Acoustic Systems relocated manufacturing operations to an expanded facility at our Cedar Park, Texas world head quarters.

About ETS-Lindgren Acoustic Systems

Acoustic Systems works through a network of factory trained sales, installation, and service technicians across the world to provide you the very best and most responsive service possible.

We are very proud to work with King Pax Technology Company from 1989 . King Pax is factory trained and authorizes to sell, install, and service all of our products.

ETS-Lindgren is also a sustaining member of NASED, the National Association of Special Equipment Distributors. By working with a NASED company you are assured of the very best service for not only your test booth but also all of your test equipment and calibration requirements.

NASED

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Basic Acoustics - Overview

- **Acoustics: Measurement of "sound" as it relates to the human ear. Testing isn't done for just "data" but it's relativity to human hearing.**
  - Range of Human Hearing
- **Note that the human hearing range from the threshold of audibility at 0 dB to the threshold of pain at 130 dB represents a tremendous intensity ratio of 10 trillion to 1.**

- **As an analogy, if your ear was a weight scale it would:**
- **Be sensitive enough to weigh the human hair!**
- **Be able to weigh a 30-story high rise building!**
  - Decibels
- **Sound Intensity Level (dB = decibels):**
- **In acoustics, we use decibels (dB) to relate the intensity of sound to an intensity level corresponding to the human ear.**

Basic Acoustics - Terminology

- dB, decibel - A logarithmic unit of measurement that expresses the magnitude of sound power relative to a specified or implied reference level.
- dBA, decibels A-weighted – Single number sound level metric
- STC – Sound Transmission Class
- NRC – Noise Reduction Coefficient
- NIC – Noise Isolation Class

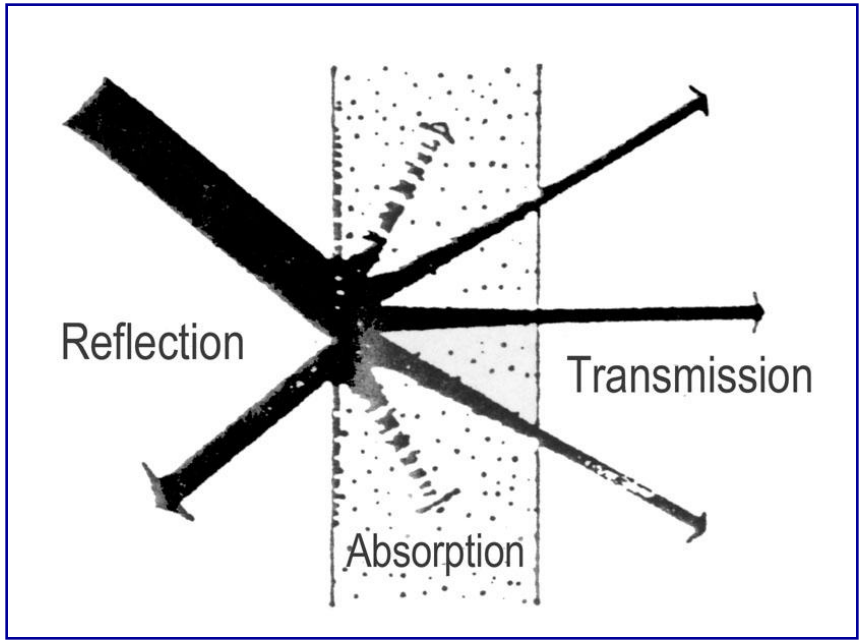
Basic Acoustics - Terminology

Sound Transmission Class (STC)

STC is an acronym that stands for Sound Transmission Class. Single number sound transmission loss for a partition (panel, door, wall, window…)

STC ratings:

Determined by Comparing data frequency range of 125Hz to 4000Hz to a standard curve



Basic Acoustics - Terminology

- NIC is an acronym for Noise Isolation Class, a single number rating of a complete sound enclosure.
- NR is an acronym for Noise Reduction and refers to report of the sound isolating effectiveness of a complete enclosure. This is a laboratory test performed to ASTM standard E596.
- NR and NIC provide the best comparison of one sound booth's performance to another when the test data is generated by an accredited acoustic laboratory.

Basic Acoustics - Terminology

- NRC is an acronym for Noise Reduction Coefficient, a single number rating of the sound power absorption property of a panel.
- When considering Audiometric Test Booths it is important to consider sound isolation from outside to inside the booth, as well as the sound absorption inside the booth.

Sound Transmission Loss, Sound Absorption and Noise Reduction

Sound Transmission Loss
- A property of each enclosure component
- The ability to keep incident sound from being transmitted through the component

Noise Reduction

Sound Level Outside – Sound Level Inside

- Depends on both TL and SA (*)

Sound Level Inside

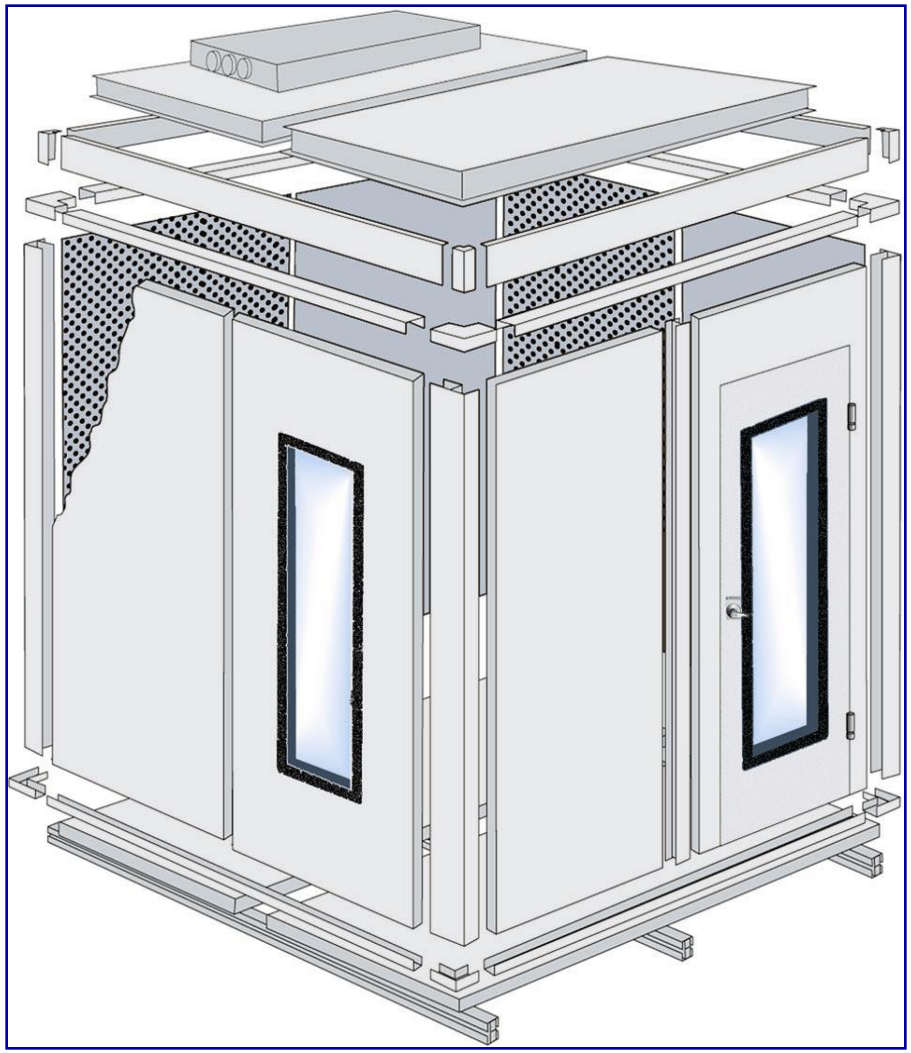
Sound Level Outside

Sound Absorption
- A property of the interior surface of the enclosure
- The ability to keep incident sound from being reflected back into the enclosure

*** Vibration Isolation**

Vibration Transmission may control sound levels inside at low frequencies

Manufactured Modular Acoustic Panel System



Components must perform as a unit

- Maintain high levels of isolation with panels specified for the performance required.
- Ability to move and configure as needs change.
- More economical than standard construction.
- Predictable Acoustic Performance

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Manufactured Modular Acoustic Panel System

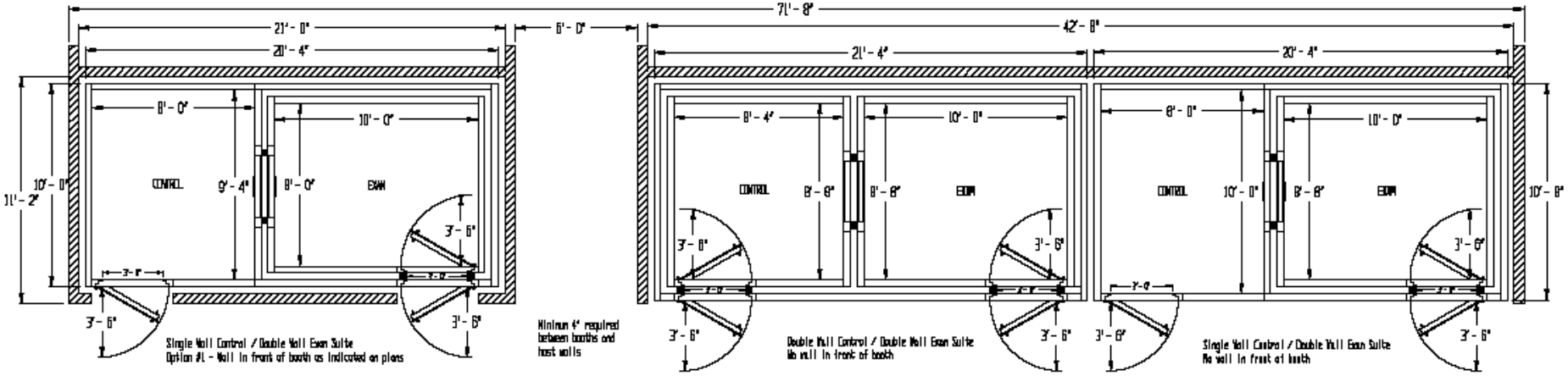
Our modular booth design addresses key areas of sound transmission:

- Walls
- Ceiling
- Doors
- Windows
- Ventilation Paths
- "Pass-Thrus" (e.g. electrical outlets, jack panel, etc...)
- Structure-Borne Noise and Vibration
- Electrical Connections

Engineered Design Capabilities

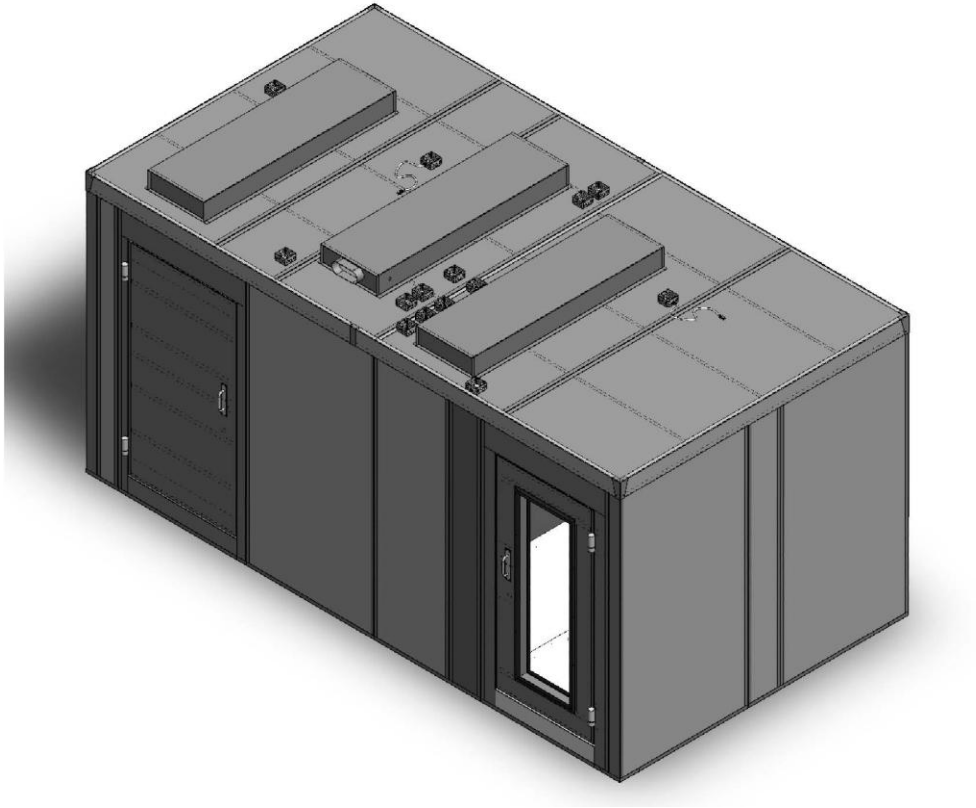
- King Pax and ETS-Lindgren work with our clients to create a solution that specific to the project performance and integration requirements.

- AutoCad drawings are created for review to ensure project requirements are represented by the proposed sound booth solution.



Acoustic Panel Manufacturing Capabilities

- Once our customer has reviewed and approved the proposed solution each and every booth is modeled in SolidWorks to ensure the proper fit and function of all components of the modular solution.

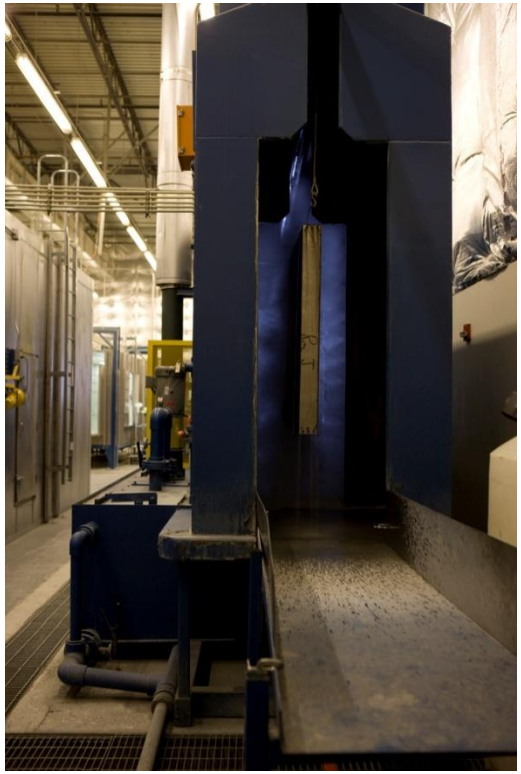


Acoustic Panel Manufacturing Capabilities

- Solid model transmitted to state-of-the-art high precision CNC turret punch.

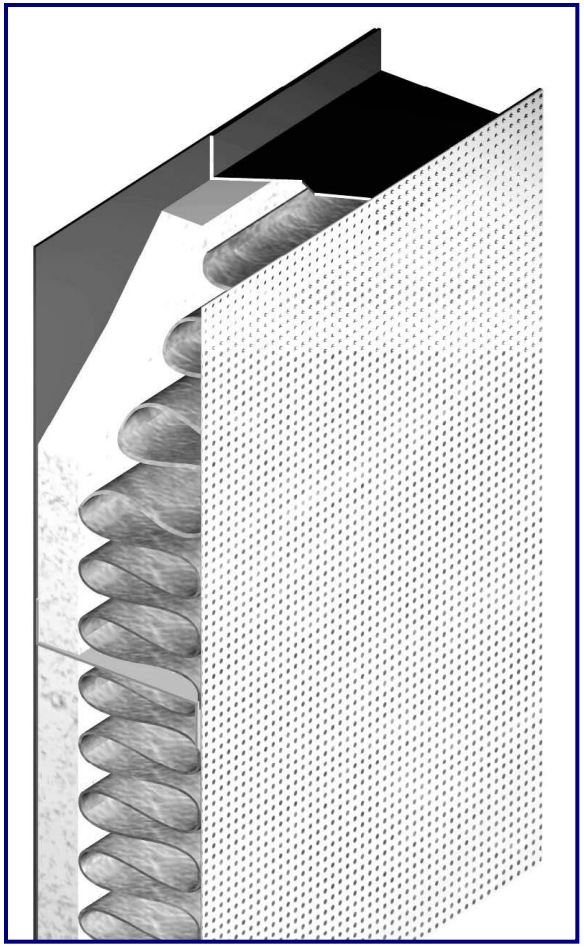
Acoustic Panel Manufacturing Capabilities

- Formed and welded panel assemblies receive a high-tech industrial powder coat paint finish



Manufactured Modular Acoustic Panel System

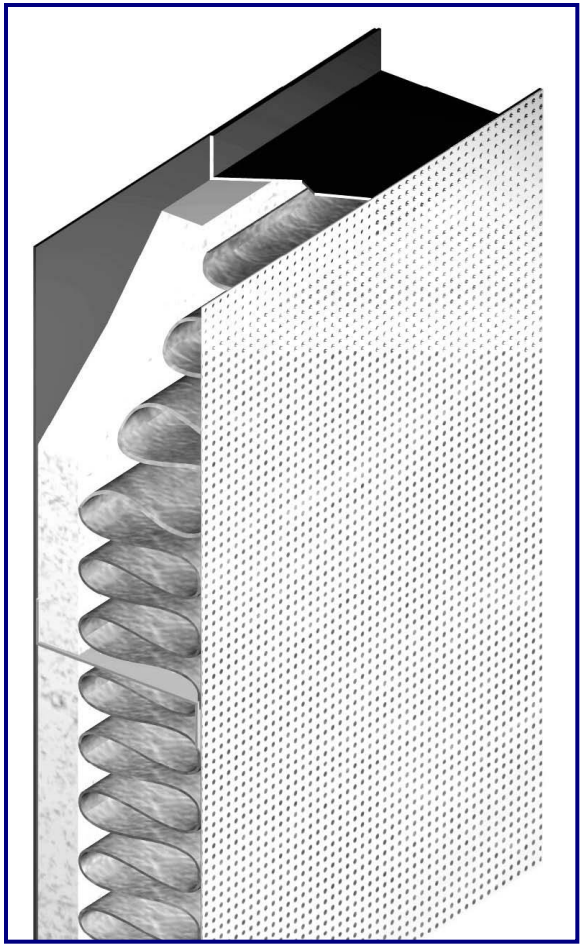
- Cut-away view of a manufactured, modular panel designed for use in audiometric test applications.
- Each panel of our systems are produced under quality-controlled conditions so that a consistent acoustic shielding effect is achieved.
- The exterior of the panel is solid steel, with a dense gypsum layer laminated to the steel and a woven layer of acoustic fill material.
- The inner skin is perforated steel to provide the optimum balance between sound transmission and sound absorption.



Cut-away view of a Single-wall modular panel

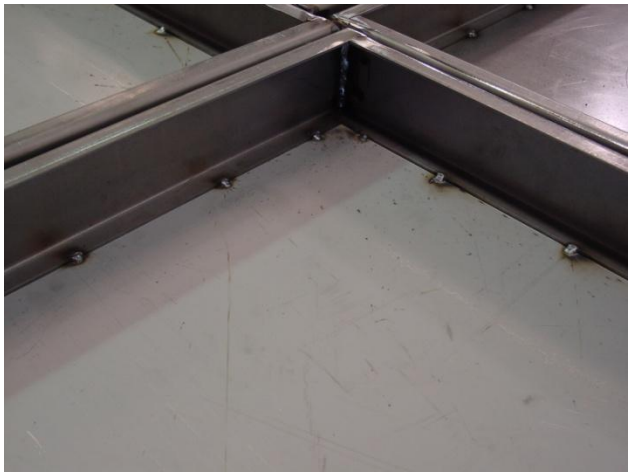
Manufactured Modular Acoustic Panel System

- Single or double wall enclosures are provided depending on interior ambient sound level requirements and host site noise levels.
- Type AS-A504, 4” thick panels are utilized in audiometric applications to provide the optimal combination of sound transmission and noise reduction.
- Single wall Type 2, 4” enclosures yield a laboratory NIC of 45 when lab tested to the ASTM E596 standard.
- Double wall Type 2, 4” enclosures yield a laboratory NIC of 64 when lab tested to the ASTM E596 standard.



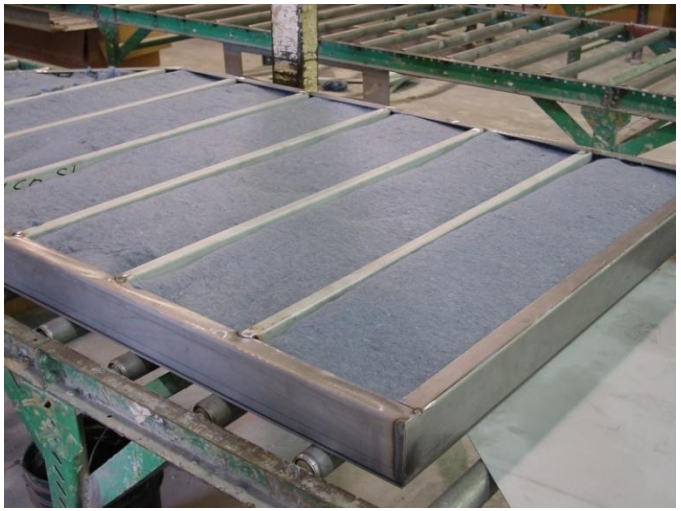
Cut-away view of a Single-wall modular panel

Manufactured Modular Acoustic Panel System

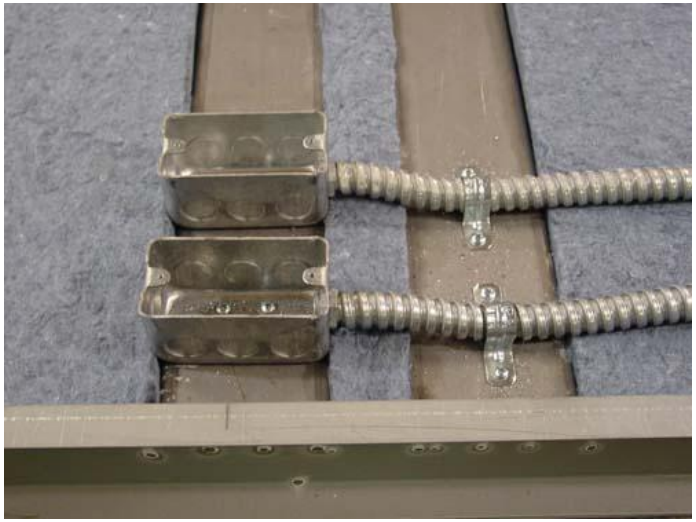


- Welded steel panel structures ensure consistent performance and strength

- Additional heavy gauge steel reinforcements and an 11 gauge steel walking surface provides superior floor strength and reduces flexing and thus the potential for squeaking.



Manufactured Modular Acoustic Panel System



- Rough in recessed conduit drops for phone, data, and alert device access

- Recessed electrical devices for seamless appearance. All electrical wall panels are UL Classified to be wired in accordance with current National Electric Code.

Quality Assurance

DET NORSKE VERITAS

MANAGEMENT SYSTEM CERTIFICATE

Certificate No. CERT-11548-2006-AQ-HOU-ANAB

This is to certify that

ETS-Lindgren, L.P.

at

1301 Arrow Point Drive, Cedar Park, TX 78613 USA

has been found to conform to the Management System Standard:

ISO 9001:2008

This Certificate is valid for the following product or service ranges:

The Design, Manufacture, Calibration, Construction and Service of Acoustic and Electromagnetic Compliance (EMC) Equipment and Facilities

Initial Certification date:
September 06, 2006

This Certificate is valid until:
September 16, 2012

The audit has been performed under the supervision of
Bob Burns
Lead Auditor

Place and date:
Houston, Texas, September 17, 2009

for the Accredited Unit:
DET NORSKE VERITAS
CERTIFICATION INC., HOUSTON TEXAS

Rudy Frueboes
Management Representative

Lack of fulfillment of conditions as set out in the Certification Agreement may render this Certificate invalid.

HEAD OFFICE: Det Norske Veritas Certification, Inc. 1400 Ravello Drive, Katy, Texas 77449. TEL: (281) 396-1000. FAX: (281) 396-1903

- Complete Quality Assurance
- ETS-Lindgren's manufacturing system is ISO 9001:2008 quality certified

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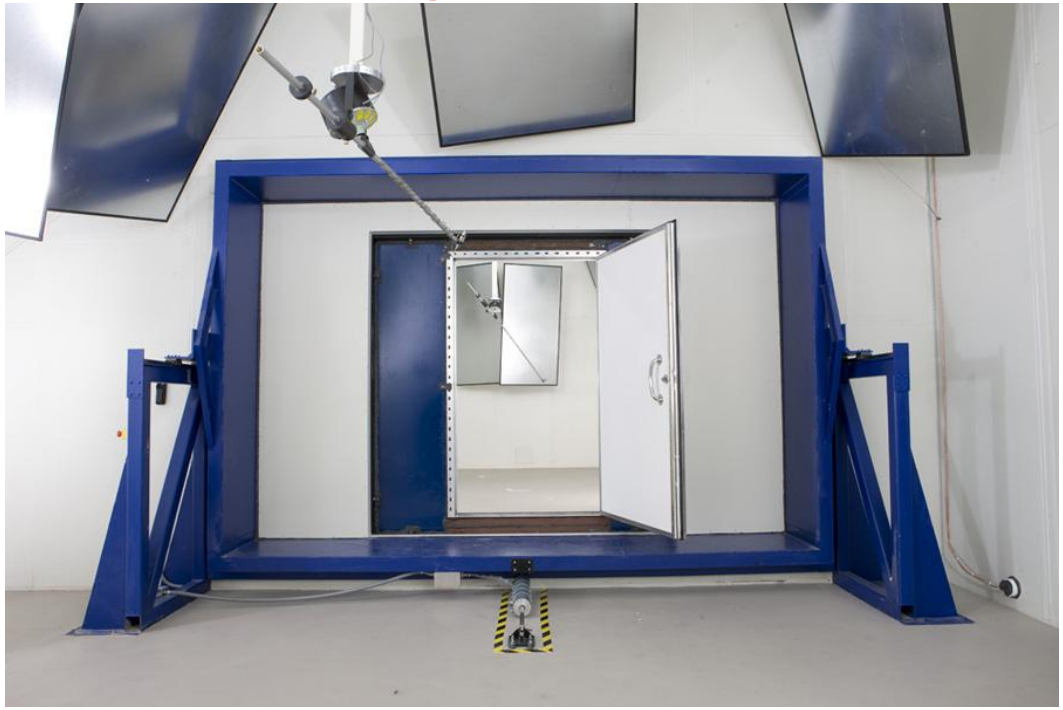
Quality Assurance

- ETS-Lindgren maintains an onsite fully accredited (NVLAP lab code 100286-0) acoustic test laboratory
- Acoustic lab gives us the unique ability to perform tests on acoustic components and assemblies

Quality Assurance



- Facility includes two reverberation chambers providing the capability to test noise reduction, sound transmission, and sound absorption

Quality Assurance

- Our large hemi-anechoic test chamber demonstrates our capability to build to the most stringent engineering requirements and allows for the testing of sound power emissions of various devices

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Products manufactured by Acoustic Systems include hemi and full anechoic chambers, small device test enclosures, and predictable field enclosures.

However, our core and primary focus remains Hearing Conservation and Audiometric Test Rooms and Suites

Hearing Conservation Booths

- Acoustic Systems' offers pre-assembled and modular booths for hearing conservations programs
- Also multi-station test booths for high volume occupational and military testing

Audiology Booths

Our “MC” Series of sound booths provide impressive isolation and allow for on-site configuration and layout flexibility

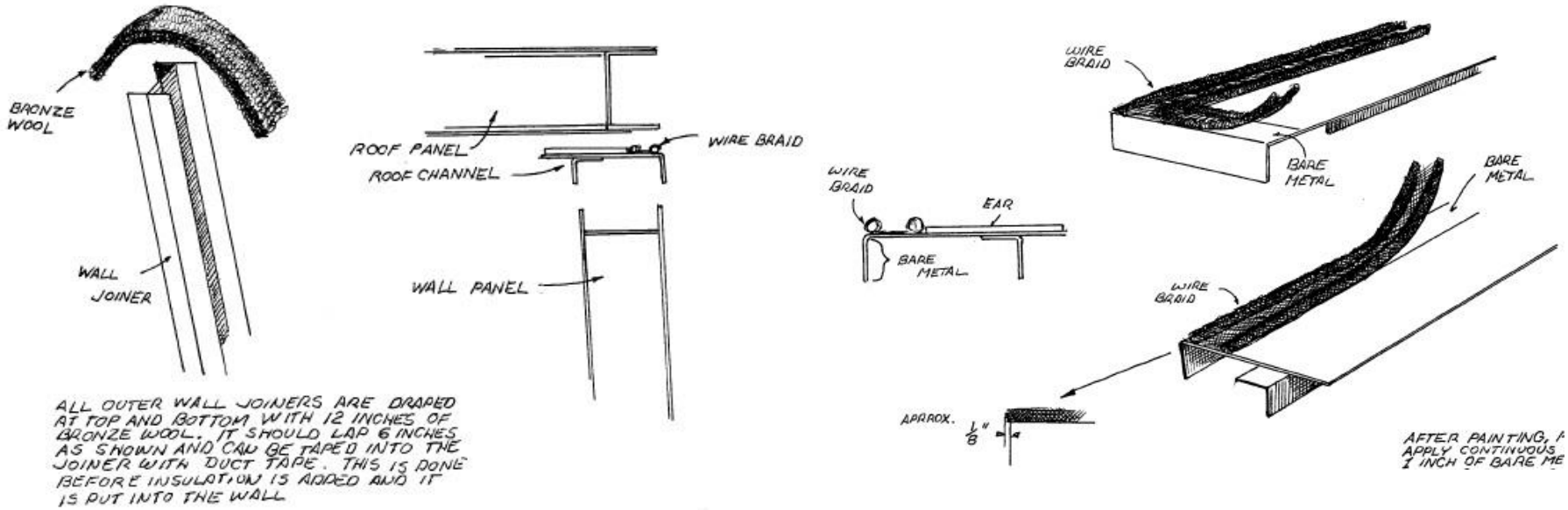
Audiometric Exam Rooms and Suites

- We offer a variety of standard sizes to choose from in both single and double wall configurations.
- We design and build custom booths to meet customer's exact requirements

Audiometric Exam Rooms and Suites

- A variety of aesthetic and functional options are available
- Larger windows, windows in door, cable access, conduit drops for data / phone, wall treatment, and interior speaker wiring are just a few of the available options.

Specialty Applications



- RF shielding is available as an option for booths to be used for sensitive testing (i.e. ABR, EEG).
- ETS-Lindgren engineering and expertise enhance the shielding effectiveness of audiometric test booths

原廠受訓認證證書


ETS·LINDGREN
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ETS-Lindgren Acoustic Systems Hereby Certifies

Pony Hung-Yuan Yeh
of
King Pax Technology Company, Ltd.

Has Demonstrated Full Capability and Competency for the Installation, Assembly, Relocation, and Certification of Performance of all Acoustic Systems Sound Isolation Test Booths.

Acoustic Systems certifies the above as a "Factory Authorized Sales and Service Representative" satisfying all qualifications to meet or exceed the specified performance of Acoustic Systems' products.

2007

Felix Perez
Installation Training Supervisor

Scott Dunlap
Audiometric Sales Manager


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An ESCO Technologies Company

Enabling Your Success

ETS-Lindgren相關產品資訊請洽

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