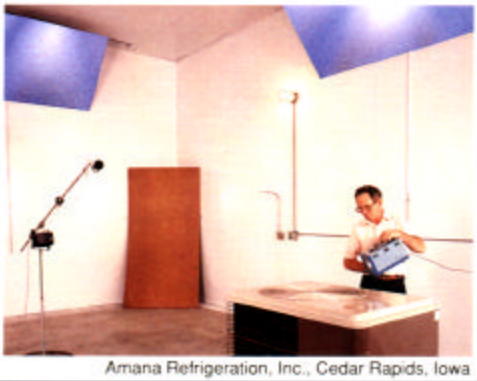
Collins & Aikman Corp., Plymouth Township, Michigan

Anechoic and Reverberation Rooms



Amana Refrigeration, Inc., Cedar Rapids, Iowa

iac INDUSTRIAL ACOUSTICS COMPANY

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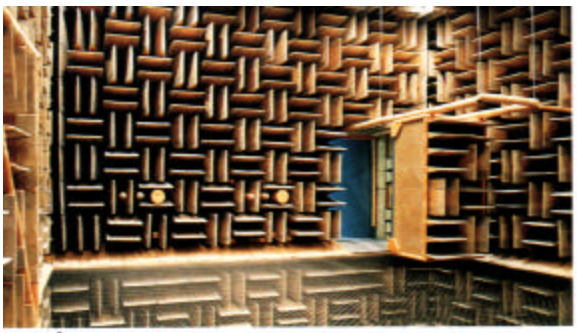
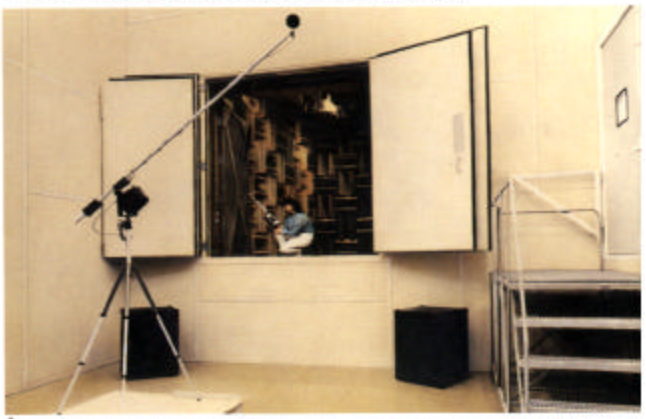


↑ Aerospace Company

↑ Defense Research Agency, 'Aquila', Bromley, Kent, England

General Motors, Brazil ↓



↑ Reverberation & Anechoic Rooms, Sikorsky Aircraft, Stratford, Connecticut

Reverberation Room, Underwriters Laboratories, Northbrook, Illinois ↓

↑ NASA's Langley Research Center, Hampton, Virginia

Apple Computer, Cupertino, California ↓

Microdyne™ Anechoic Rooms and Macrodyne™ Reverberation Rooms

In this brochure, we combine technical data, discussions, and illustrations on several types of Microdyne Anechoic Rooms (or Free-Field Rooms) and Macrodyne Reverberation Rooms:

- **Anechoic**[1] and **Hemi-Anechoic**[1] **Rooms** with foam or glass-fiber wedges.
- **Anechoic Rooms with Metadyne™** Rugged metal protected wedges.
- **Anechoic Rooms** with specially designed level PlanarCHOIC™ Modules.
- **Mini-Anechoic Rooms.**
- **Macrodyne Reverberation Rooms**.

Institutions, universities, colleges and corporations frequently require both anechoic and reverberation room facilities.

Since 1949, Industrial Acoustics Company (IAC) has designed and constructed thousands of acoustic test facilities including more than 150 large and small Anechoic Rooms and Reverberation Rooms.

These controlled environments encompass a wide range of performance specifications – from simple quality control requirements to elaborate, high precision acoustic measurements.

IAC's design engineers and research physicists bring a wealth of experience to provide data for an informed decision on how to select free-field anechoic rooms and diffused-field reverberation rooms.

We will be happy to furnish additional information.

[1]We are following the International Standards Organization, ISO, terminology ***defining*** an Anechoic Room as one with free-field materials on all walls, ceiling, and floor. (We use 'anechoic' and 'free field' interchangeably).

A Hemi-Anechoic* Room is the same as an Anechoic, except floor is usually sound reflective and load bearing. Inverse square law tolerances for both room types are shown in Table 1, page 2.

*The ISO Standards refer to Anechoic and Semi-Anechoic Rooms.

CONTENTS

Any acoustical 'firsts' are most likely to come from IAC, a pioneer in noise control and acoustical engineering since 1949. For instance, IAC Anechoic Metadyne Metal Protected Wedges are being introduced on page 6. When IAC customizes and fabricates your Anechoic and/or Reverberation Rooms, you will have the highest quality and most advanced test facilities available.

Note: Though we offer standardized Reverberation Rooms, Mini and large Walk-In Anechoic Rooms, IAC has longtime, proven expertise in 'specials' custom-designed for specific acoustical and dimensional requirements. Please do not hesitate to contact us for further information.

Microdyne™ Anechoic Rooms

WHAT IS AN ANECHOIC ROOM?

An anechoic room can be considered analogous to a precision acoustical measurement instrument providing a free-field environment without noise interference.

An acoustical free-field exists in a homogeneous, isotropic medium in which reflecting boundaries, or their effects, are absent. In an *ideal free-field environment*, the inverse square law would function perfectly. This means that the sound level from a spherically radiating sound source decreases six decibels (6 dB) for each doubling of distance from the source. A room designed and constructed to provide such an environment is called an anechoic room.

An anechoic room also provides a quiet environment free from excessive variations in temperature, pressure, and humidity. Outdoors, local variations in these conditions, as well as wind, can significantly and unpredictably disturb the uniform radiation of sound waves. This means a *true acoustical free field is only likely to be found inside an anechoic room.*

For a free field to exist with perfect inverse square law characteristics, room boundaries must have a sound absorption coefficient of unity at all angles of incidence. However, in practical anechoic rooms, *deviations from inverse square law are to be expected.* Permissible tolerances are shown in Table 1.

The aerospace, aviation, ground transportation, communications, electronic, business machinery, computer, automotive, and trucking industries utilize anechoic rooms for the development of quieter products. Medical research facilities, including colleges and universities, are also primary users for such acoustical environments.

CONSTRUCTION OF ANECHOIC ROOMS

For anechoic rooms to function well, a number of acoustical, mechanical, electrical, and aerodynamic considerations apply. These may include some, or all, of the following:

- **Room size vs test object size (page 7).**
- Anechoic treatment selection.
- Cut-off frequency.
- Inside acoustic ambient.
- Noise reduction.
- Vibration isolation.
- Silenced ventilation systems.
- Anechoic doors – operation and sizes.
- Interior floors – cables and/or gratings.
- Lighting and electrical systems.
- Overall structural design considerations.
- RF shielding requirements.

Microdyne Anechoic Rooms are constructed from the Moduline® Component System, used in thousands of installations, consisting of acoustically rated walls, ceilings, floors, doors, windows, ventilation silencers, and vibration isolators.

These rugged, metal-clad, incombustible, building components are linked together into unified structures by means of pre-engineered Moduline joiners to assure acoustical, structural, and mechanical integrity. IAC's Moduline literature provides comprehensive acoustical and structural data on Moduline Noishield® and Noise-Lock® components.

NOISE AND VIBRATION ISOLATION CHARACTERISTICS

A well-constructed room must provide good sound isolation against outside noise so that resulting inside sound will not invalidate acoustic measurements. This may require the use of single- or double-wall construction (Fig. 1) with appropriately designed vibration isolation to adequately reduce air and/or structure borne noise transmission. For best results, anechoic rooms should be individual structures separate from any building walls.

INVERSE SQUARE LAW DEVIATIONS

According to ISO Standard 3745, "an anechoic room provides the preferred environment for measurements with the smallest uncertainty".

Permissible deviations from the theoretical inverse square law are shown below.

TABLE 1 – Maximum Allowable Differences Between the Measured and Theoretical Levels

Type of Room	1/3 Octave Band Center Frequency, Hz	Allowable Differences, dB
Anechoic or Free-Field	<630	± 1.5
	800 to 5,000	± 1.0
	>6,300	± 1.5
Hemi-Anechoic or Simulated Free-Field	<630	± 2.5
	800 to 5,000	± 2.0
	>6,300	± 3.0

FREE-FIELD WEDGES

Sound absorption coefficients are a function of frequency and are critically dependent on type of material, its thickness, and configuration. The low-frequency sound absorption of a material such as an anechoic wedge for sound at normal incidence can be measured in a device called an impedance tube. The lowest frequency at which a material has a normal incidence sound absorption coefficient of 0.99 is called its cut-off frequency.

However, the controlling parameter for a well functioning anechoic room is its inverse square law performance. One practical well-proven method to achieve a free-field is to shape sound-absorbing material into wedge configurations for mounting onto the interior surfaces. The cut-off frequency

1

Noise Reduction curves for Schedule 40 and Schedule 60 Sound Isolation Rooms measured without anechoic wedges. *Additional attenuation will be realized depending on depth of anechoic treatment used.* Other variables depend on the degree of low-frequency vibration present in the floor structure, the location of the room inside a specific noise field, and the quality of room assembly.

2

Inverse Square Law Curves demonstrate the excellent performance characteristics of IAC Microdyne™ Anechoic Rooms – (internal clear dimensions: 32 ft-0 in. x 26 ft-0 in. x 24 ft-6 in. high [9754 x 7925 x 7468mm]. Glass-fiber wedges. Cut-off frequency 70 Hz.)

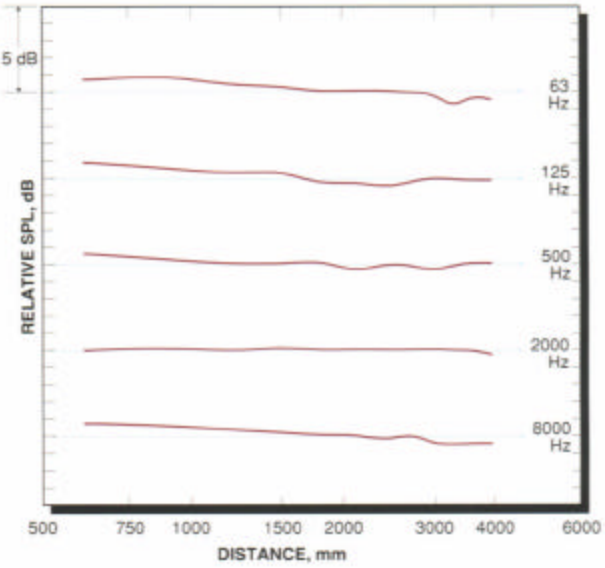
3

Approximate wedge depths and corresponding cut-off frequencies are shown in Table. IAC will determine precise dimensions through tests in a large impedance tube (24 in. x 24 in. x 288 in. long – 610 x 610 x 7315mm) in conjunction with the actual glass-fiber or foam materials to be used.

4

Inverse Square Law Curves for Microdyne Simulated Open-Field or Hemi-Anechoic Rooms also demonstrate acoustical performance well within specified tolerances of applicable ISO Standards – (internal clear dimensions: 20 ft-0 in. x 33 ft-0 in. x 12 ft-0 in. high [6096 x 10058 x 3658mm]. Foam wedges. Cut-off frequency 75 Hz.)

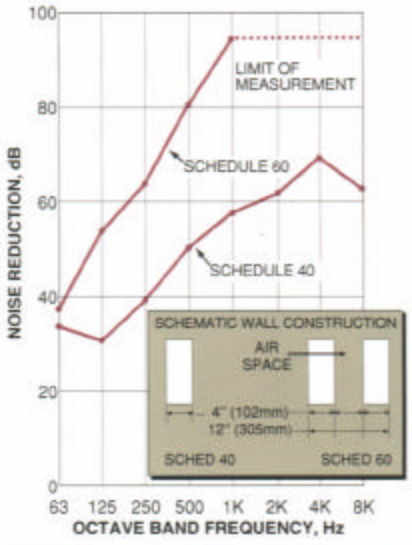
2 MEASURED DEVIATIONS FROM INVERSE SQUARE LAW



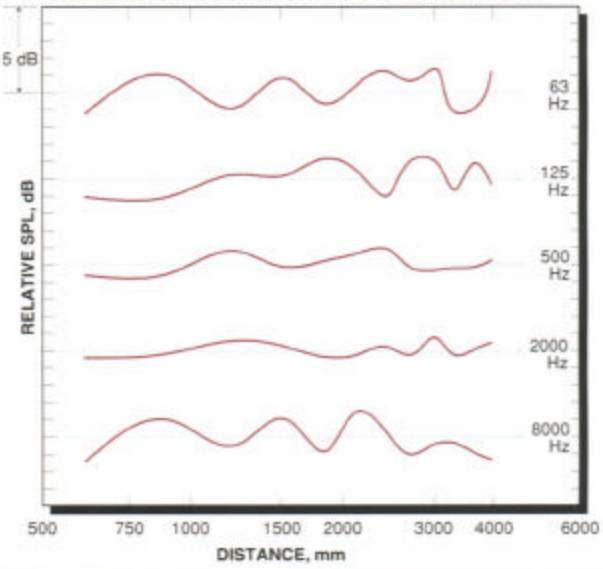
3 APPROXIMATE WEDGE DEPTHS

Cut-Off Frequency, Hz	60	75	90	100	125	150	200	250
Wedges Mounted on Hard Wall, **in.** mm	**51** 1295	**46** 1168	**41** 1041	**38½** 978	**33** 838	**28½** 724	**21** 533	**17** 432
Wedges Mounted on Moduline® Panel, **in.** mm	**47** 1194	**42** 1067	**37** 940	**34½** 876	**29** 737	**24½** 622	**17** 432	**13** 330

1 NOISE REDUCTION WITHOUT WEDGES



4 MEASURED DEVIATIONS FROM INVERSE SQUARE LAW



of this configuration is inversely proportional to the depth of the wedge.

IAC's 24 in. x 24 in. x 288 in. long (610mm x 610mm x 7315mm) impedance tube is used for critical adjustment of wedge dimensions before finalizing each design.

Due to variations in material characteristics, statistical quality control procedures are employed during wedge production to assure specified acoustical performance. This may result in small dimensional changes. When wedges are mounted on a sound-absorptive IAC Noise-Lock® panel, its depth can be shortened, thereby reducing room dimensions and costs.

IAC MICRODYNE™ ANECHOIC ROOMS

Schedule 60 (Dual wall) Construction

The IAC Microdyne Schedule 60 Anechoic Room is designed for the research physicist or engineer who must make precise sound measurements in a free-field acoustical environment. The Microdyne Schedule 60 Anechoic Room provides high sound transmission loss (TL) characteristics and a completely anechoic wedge-lined interior to meet these requirements.

For maximum sound isolation, the IAC Schedule 60 Microdyne Anechoic Room is designed as a room-within-a-room structure, featuring IAC Noise-Lock Moduline® components. The inner room is set on a vibration isolation system created for the specific weight and frequency cut-off of the room.

Schedule 40 (Single wall) Construction

The IAC Microdyne Schedule 40 Anechoic Room is designed for applications and locations where the noise reduction characteristics of Schedule 40, single-wall and ceiling construction, provide adequate noise isolation.

The single-wall construction results in smaller outside dimensions and is particularly suitable for placement in less noisy areas. In every other respect this series is similar to the Microdyne Schedule 60 series; the same standard and optional features apply.

IAC MICRODYNE HEMI-ANECHOIC ROOMS

The IAC Microdyne Schedule 60 and Schedule 40 Hemi-Anechoic Rooms, double- and single-wall structures respectively, are used for sound level measurements in a space which, except for reflective ground conditions, provides free-field environments. This results in hemispherical radiation patterns for sound waves emanating from a source. Such an environment is particularly suitable for the acoustical testing of road or floor-mounted equipment such as *automobiles, trucks, tractors, fork-lifts, stationary engines, office machinery and computers* as may be required by certain measurement standards.

The IAC Microdyne Hemi-Anechoic Rooms are available in Schedule 60 and Schedule 40 designs with, and without, IAC Acousti-Flote™ Floor Systems. Since no floor wedges are used, these rooms can often be erected on existing concrete floors when vibration isolation is not required.

Except for the floor, IAC Microdyne Hemi-Anechoic Rooms are equipped with the same standard features and options as the Microdyne Anechoic versions. Hemi-Anechoic Rooms are also referred to as Simulated Open-Field Rooms.

The use of Microdyne Anechoic Rooms combined with up-to-date sound pressure and intensity instrumentation enhances the quality, accuracy, and repeatability of acoustical measurents. High precision instrumentation, to be fully effective, requires highest quality anechoic rooms, reverberation rooms, and other test environments.

STANDARD FEATURES

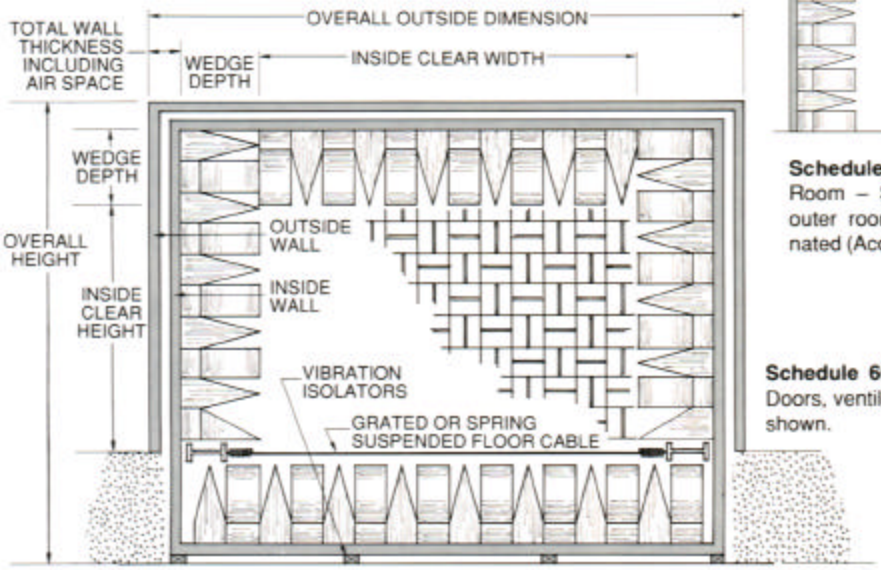
Microdyne Anechoic and Hemi-Anechoic Rooms come equipped with the following features:

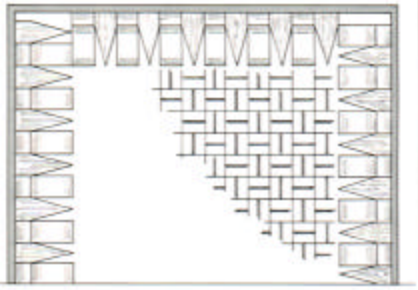
- Anechoic glass-fiber wedges with required low frequency cut-offs.
- Double- or single-wall and ceiling construction.
- IAC Tranquil-Aire® Ventilation Systems – coupled to building supply.
- Lighting, interior – minimally acoustically reflective.
- Tubular cable ports.
- Interior non-reflective cable floor above floor wedges for fully Anechoic Rooms. Nylon catch net below the cable floor.
- IAC Acousti-Flote Floor System with 6½ Hz, rubber-in-shear vibration isolators for fully anechoic room.
- One 36 in. x 84 in. (914mm x 2134mm) clear opening Noise-Lock Wedge Door.

OPTIONS

- Glass-fiber wedges with fabric or wire mesh protection.
- Foam wedges.
- Metadyne™ Anechoic Wedges protected with perforated metal casings, *patent pending*, (see page 6).
- PlanarCHOIC™ treatment where suitable, (see page 7).
- Floor grating for heavier loads.
- Additional or larger Noise-Lock Doors.
- Access panels for equipment and test openings.
- Acousti-Flote Floor for Hemi-Anechoic Rooms.
- Double IAC Acousti-Flote Floor for Schedule 60 Rooms.
- Air mounts, springs or other type vibration isolators.
- Independent ventilation system.
- RF shielding.

MICRODYNE™ ANECHOIC AND HEMI-ANECHOIC ROOMS





Schedule 40 Microdyne Hemi-Anechoic Room – Similar to Schedule 60, except outer room and wedge/cable floor eliminated (Acousti-Flote™ Floor optional).

Schedule 60 Microdyne Anechoic Room – Doors, ventilation system, lighting fixtures not shown.

FIGURE 1

TABLE 2 – ANECHOIC ROOMS WITH ACOUSTI-FLOTE FLOOR, 125 Hz CUT-OFF

Model No.	Inside Dimensions, ft mm			Schedule 40				Schedule 60			
				Outside Dimensions*, ft mm			Weight, lb kg	Outside Dimensions*, ft mm			Weight, lb kg
	Length	Width	Height	Length	Width	Height		Length	Width	Height	
A–1	8'–0" 2,438	6'–0" 1,829	7'–0" 2,134	13'–6" 4,115	11'–6" 3,505	13'–3" 4,039	10,700 4,850	14'–10" 4,521	12'–10" 3,912	13'–11" 4,242	17,900 8,100
A–2	10'–0" 3,048	7'–0" 2,134	8'–0" 2,438	15'–6" 4,724	12'–6" 3,810	14'–3" 4,343	13,300 6,050	16'–10" 5,131	13'–10" 4,216	14'–11" 4,547	21,800 9,900
A–3	12'–0" 3,658	10'–0" 3,048	8'–0" 2,438	17'–6" 5,334	15'–6" 4,724	14'–3" 4,343	17,300 7,850	18'–10" 5,740	16'–10" 5,131	14'–11" 4,547	27,100 12,300
A–4	15'–0" 4,572	12'–0" 3,658	8'–0" 2,438	20'–6" 6,248	17'–6" 5,334	14'–3" 4,343	21,600 9,800	21'–10" 6,655	18'–10" 5,740	14'–11" 4,547	33,800 15,300
A–5	20'–0" 6,096	15'–0" 4,572	10'–0" 3,048	25'–6" 7,772	20'–6" 6,248	16'–4" 4,978	31,400 14,250	26'–10" 8,179	21'–10" 6,655	17'–0" 5,182	49,600 22,500

**Outside dimensions do not include ventilation silencers or structural components.*

TABLE 3 – HEMI-ANECHOIC ROOMS, NO ACOUSTI-FLOTE FLOOR, 125 Hz CUT-OFF

Model No.	Inside Dimensions, ft mm			Schedule 40				Schedule 60			
				Outside Dimensions*, ft mm			Weight, lb kg	Outside Dimensions*, ft mm			Weight, lb kg
	Length	Width	Height	Length	Width	Height		Length	Width	Height	
S–1	15'–0" 4,572	12'–0" 3,658	10'–0" 3,048	20'–6" 6,248	17'–6" 5,334	12'–9" 3,886	17,500 7,950	21'–10" 6,655	18'–10" 5,740	13'–5" 4,089	28,600 13,000
S–2	20'–0" 6,096	15'–0" 4,572	10'–0" 3,048	25'–6" 7,772	20'–6" 6,248	12'–9" 3,886	23,000 10,400	26'–10" 8,179	21'–10" 6,655	13'–5" 4,089	37,400 17,000
S–3	25'–0" 7,620	20'–0" 6,096	12'–0" 3,658	30'–6" 9,296	25'–6" 7,772	14'–9" 4,496	34,000 15,400	31'–10" 9,703	26'–10" 8,179	15'–5" 4,699	54,000 24,500
S–4	40'–0" 12,192	30'–0" 9,144	14'–0" 4,267	45'–6" 13,868	35'–6" 10,820	16'–9" 5,105	65,500 29,700	46'–10" 14,275	36'–10" 11,227	17'–5" 5,309	100,000 45,500
S–5	50'–0" 15,240	40'–0" 12,192	16'–0" 4,877	55'–6" 16,916	45'–6" 13,868	18'–9" 5,715	98,800 44,800	56'–10" 17,323	46'–10" 14,275	19'–5" 5,918	150,000 68,000

**Outside dimensions do not include ventilation silencers or structural components. Add 7 in. (178mm) if Acousti-Flote Floor is required.*

METADYNE™ ANECHOIC PROTECTED WEDGES

Metadyne Anechoic Wedges, another IAC 'first', provide acoustical performance of the highest standard and are fully encapsulated in perforated metallic casings. Features include:

- Impact resistance.
- Resistance to erosion and circulation of fibrous materials.
- Readily cleanable and paintable surfaces.
- High fire-resistance (in case of oil spills or use of flammable wedge materials).
- Interchangeability and adjustability.

The rugged wedge construction and its long life cycle offer advantages to laboratories working with heavy equipment and/or flammable materials.

Fig. 2 shows that Metadyne Anechoic Wedges for Hemi-Anechoic Rooms provide deviations from theoretical free-field inverse square law well within ISO Standards per Table 1 on page 2. Fig. 3 shows Metadyne room at Ford Motor Company.

This new design was developed in the IAC Aero-Acoustic Laboratories in New York City where a hemi-anechoic prototype room, fully treated with Metadyne wedges, was constructed. as shown in Fig. 4. This room is available for inspection and demonstration.

The new wedge construction, together with the inverse square law data obtained, was studied by Ford Motor Company. Because of excellent acoustic performance, safety, and maintenance features, twelve large Microdyne Hemi-Anechoic Rooms equipped with Metadyne Wedges were purchased.

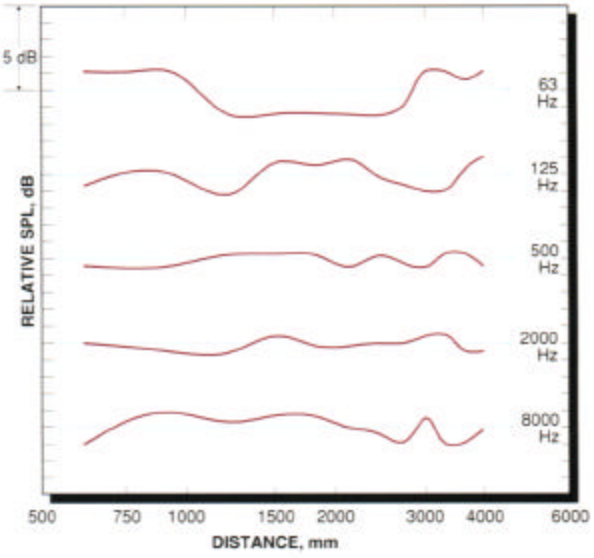


Fig. 2 – Inverse square law curves for Hemi-Anechoic Room with Metadyne Wedges fall well within acceptable ISO tolerance standards. Inside clear dimensions: 21 ft-1 in. x 31 ft-2 in. x 11 ft-10 in. high (6426 x 9500 x 3607mm). Cut-off frequency 60 Hz.

Fig. 4 – Prototype hemi-anechoic room fully treated with Metadyne Wedges at IAC Aero-Acoustic Laboratory in New York. Inside clear dimensions: 8 ft-2 in. x 12 ft-2 in. x 6 ft-10 in. high (2489 x 3708 x 2083mm).

Fig. 3 – Hemi-Anechoic Room with Metadyne Wedges, Advanced Engineering Center, Ford Motor Company, Dearborn, Michigan.

PlanarCHOIC™ FREE-FIELD ROOMS

These IAC Hemi-Anechoic Rooms, usually in relatively large sizes, can be placed on hard floors in the absence of structurally transmitted vibration and noise. They are suitable for sound measurements of *cars, truck cabs, fork-lifts, construction equipment, transformers, and other equipment.* Several car and truck manufacturers use PlanarCHOIC Rooms.

PlanarCHOIC Rooms, while maximizing space utilization, come with specially engineered, planar anechoic modules with perforated metal surfaces. They are available in Schedule 40 or Schedule 60 construction.

Special care must be taken in the relationship of PlanarCHOIC Room volume to test object dimensions to assure a free-field measurement environment. Also, correctly specified measurement locations are essential for accuracies as in Table 1. Features are the same as for Metadyne™ Wedges,(p. 6).

PlanarCHOIC measured inverse square law plots and room are shown in Figs. 5 and 6, respectively. (See page 3 for noise reduction data.)

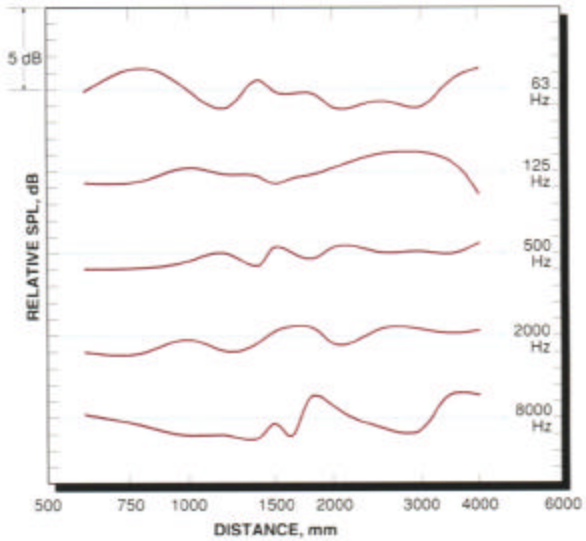


Fig. 5 – Inverse square law curves for PlanarCHOIC Room; inside clear dimensions: 59 ft-5 in. x 29 ft-5 in. x 15 ft-0 in. high (18110 x 8966 x 4572mm). Cut-off frequency 63 Hz.

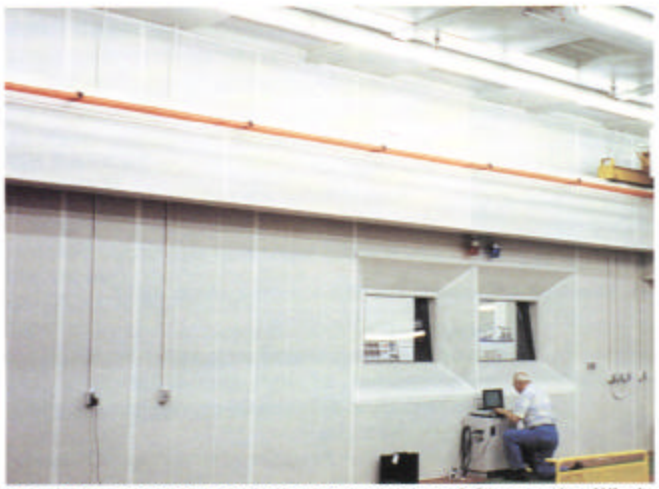


Fig. 6 – Typical PlanarCHOIC Room with Noise-Lock® Observation Windows.

ROOM SIZE vs TEST OBJECT SIZE

According to ISO Standard 3745, the preferred volume of the test object should be less than 0.5% of the working volume of the room:

"To make measurements in the far radiation field of the source, it is recommended that the volume of the test room be at least 200 times greater than the volume of the source whose sound power level is to be determined."

If the ratio of the cubical test object (Tv) to the cubical volume of the test room (Lv) is $Tv^3/Lv^3 \leq 0.005$, the following equation can be developed:

$$L \geq 5.88\ T \qquad \text{Eq. 1}$$

where: L = room length, width, or height, meters
T = test object length, width, or height, meters

It is clear from this relationship that for large test objects the anechoic room dimensions could become impractical and/or very expensive. However, ISO Standards also require near-field measurement positions no closer than 1 meter from test object and 1/4 wavelength from anechoic treatment.

The following equations can therefore be useful in determining anechoic-room dimensions for measurements at one meter from a hypothetical rectangular parallelepiped enclosing the test object –

Length or width of Anechoic Room:

$$L = T_1 + \lambda/2 + 2 \qquad \text{Eq. 2}$$

where: L = minimum room length or width, meters
T_1 = maximum length or width of test object, meters
λ = wavelength of cut-off frequency, meters

Height of Anechoic Room:

$$H = T_2 + \lambda/2 + 2 \qquad \text{Eq. 3}$$

where: H = minimum height of test room, meters
T_2 = maximum height of test object, meters
λ = wavelength of cut-off frequency, meters

For Hemi-Anechoic Rooms, height becomes:

$$H = T_2 + \lambda/4 + 1 \qquad \text{Eq. 4}$$

The hemi-anechoic room height cannot be cut in half, relative to the fully anechoic room, since the test object must always have a vertical dimension.

Based on numerous installations, anechoic rooms designed in accordance with equations 2, 3, and 4 have excellent near-field measurement characteristics. Test reports and other information available on request.

MINI-MICRODYNE™ ANECHOIC ROOMS

Single and Multi-Compartment Mini-Anechoic Rooms are used for new product development and quality control testing of small components such as *computer disc drives, timers, small electric motors, small fans, audio-video production and recording devices, health-care examination and diagnostic equipment, automotive components and accessories, small household appliances, and other components not requiring large walk-in rooms.*

A microphone is connected to an outside sound-level meter and/or other monitoring instrumentation. The sound-generating component is placed on a grating or suspended from a hanger.

The room is positioned on vibration isolators to minimize structural noise transmission. It includes wall penetrations to accommodate cables, contact wiring, and other connections for monitoring and testing.

Acoustical and Construction Data, Mini-Anechoic Model 5656*

Outside: 56 in. x 56 in. x 80 in. high (1422 x 1422 x 2032mm).
Inside Space: 36 in. x 36 in. x 60 in. high (914 x 914 x 1524mm) between wedge tips.
Construction: 4 in. (102mm) thick Noishield® modules with solid, cold-rolled textured steel outside.

Weight: 1750 lb (795 kg).
Cut-Off Frequency of foam wedges: 300 Hz.
Noise Reduction: outside-to-inside NIC 50.
Color: Desert Sands.
**Other models can be designed to meet specific requirements.*

MULTI-COMPARTMENT MICRODYNE MINI-ANECHOIC ROOMS

Multi-Compartment Mini-Anechoic Rooms are designed for testing a number of components simultaneously; quality control of components produced in quantity is one example.

A compartmentalized unit may be more economical to purchase and operate than several free-standing individual booths. Two, three, four, or more compartments can be provided; all mounted on vibration isolators to minimize structural noise transmission

Also included are wall penetrations to accommodate cables, control wiring and connections. Rooms are shipped assembled and ready for service.

Acoustical and Construction Data, Standard 4-Compartment Mini-Anechoic Model 6868*

Outside: 68 in. wide x 68 in. high x 36 13/16 in. deep (1727 x 1727 x 935mm).
Inside Space: 20 in. (508mm) each in width, height and depth between wedge tips per compartment.
Construction: 4 in. (102mm) thick Noishield® modules with solid, cold-rolled textured steel outside.

Weight: 1600 lb (726kg).
Cut-Off Frequency of foam wedges: 300 Hz.
Noise Reduction: outside-to-inside NIC 50.
Noise Reduction Between Compartments: NIC 45.
Color: Desert Sands.
**Other models can be designed to meet specific requirements.*

All Mini-Anechoic Rooms are shipped assembled and ready for service.