

STATEMENT OF WORK

Issue Title: Purchase of Audiology Booths for Building #69 at the Coatesville VAMC Station #542

Date of Report: November 6, 2015

Issue and Status:

Building # 69 was renovated in FY 15. New Audiology Booths will be needed to complete the audiology renovation of building 69. The Audiology Service will move back to building 69 in the spring of 2016 and require 4 double walled suits and 1 double walled booth.

Preapproval is required by the Coatesville VAMC prior to installation of any structure or equipment.

Security Requirements:

The COR is responsible for ensuring that all Contractors comply with physical security policies. A

compliant ID badge must be worn by Contractors at all times while on VA premises.

Contractor may not have access to the VA network or any VA sensitive information under this contract.

All Contractors must receive Privacy training annually using one of the following methods:

- Complete “VA Privacy Training for Personnel without Access to VA Computer Systems or Direct Access

to or Use to VA Sensitive Information” training by using VA’s TMS system

(<https://www.tms.va.gov/>).

Contractors may use the TMS Managed Self Enrollment method to complete the training in TMS. The

COR must ensure that all contractors are validated in the PIH domain.

- Complete the hard copy version of “VA Privacy Training for Personnel without Access to VA Computer

Systems or Direct Access to or Use to VA Sensitive Information”. Signed training documents must be submitted to the COR.

Training must be completed prior to the performance of the contract and annually thereafter. Proof of

training completion must be verified and tracked by the COR.

Scope of work:

Because new audiology booths will be needed in building 69 new customized booths will require. A contract company specializing in the installation of customization of audiology booths will be required to install new customized manufactured audiology booths in the existing space created during the renovation of building 69 at the Coatesville VAMC.

This specification addresses customized prefabricated audiometric examination booths and rooms/suites suitable for the use in testing, calibration, and recording of aural acuity. A booth is defined as a free-standing double walled examination room. A suite is defined as a combination of a double walled control room and a double walled examination room (rooms are parts of suites). The term "audiometric booth" will be used generically when referring to booth, room, or suite. An audiometric booth covered by this specification includes all enclosure panels, components, wiring, lighting fixtures (including dimmers), ventilation silencers, and installation to make the booth completely operable.

The contractor shall provide and completely assemble the audiometric booths and all associated components. Some components may need to be provided by the contractor. Outlets, plug strips, light fixtures, and all other electrical components internal to the booth shall be installed and booth wiring shall be connected to the main junction box connection point. HVAC silencers shall be installed on the audiometric booth walls or roof. Final connection of HVAC services, main electrical power, thermostats, and any other building services is the responsibility of the Government but the contractor will use existing electric lines and IT cabling to make internal connections to the booths.

Installation Requirements: The contractor shall be trained on proper booth installation techniques and shall install audiometric booths and all specified components in the VHA facility.

1. Take measurements within building 69 at the Coatesville VAMC and order 4 suits booths as well as for 1 booth. A bid for each combination should be submitted:
 - a. Order require parts and equipment for the construction of the Suits and Booths to include doors floors windows and walls as well as fixtures to make the suits and booth functional excluding furniture such chairs, desk or shelves.
2. New suits and booths must be ordered within one week from awarding of contract.
3. The work will be completed during normal work week (8:00am to 4:30pm – Monday to Friday) but it can be modified to non-traditional hours upon negotiation and approval by VHA.
4. The awardee must supply all tools, man power, and technical expertise to independently complete the task within the time frame and provide a warranty for all work (see appendix A).
5. The contracted company will have all units fully functional by March 30, 2016 or within 30days of the receipt of the equipment by the contractor from the manufacture they have chosen whichever occurs first.

6. Functionality of all booths must meet VHA Requirements identified within the document identified in attached appendix A
7. The existing equipment that will be used within the booths will be tested and certified as working upon the completion of the move by the date or time frame indicated approve.
 - a. The bidding contractor shall submit to the VA, the following plans for each suit and booth as well as certified test reports and data:
 - i. Laboratory Noise Reduction test data measured in accordance with ASTM E596-90 which meet or exceed the requirements addressing acoustical performance identified in appendix A section 13.2. Test data shall be no more than five years old as of the date of the bid. Noise reduction test report shall include complete documentation of the enclosure components and their weights.
 - ii. Laboratory Sound Absorption test data measured in accordance with ASTM C423-90a which meet or exceed the requirement of section 13.4. Test data shall be no more than five years old as of the date of the bid. Sound absorption test report shall indicate that the weight per square foot of the sample tested equals that of the panels used in the noise reduction tests' in this section.
 - iii. Laboratory Sound Transmission Loss test data, measured in accordance with ASTM E90-90, on the audiometric booth door and frame assembly, which meet or exceed the door acoustical requirements of Section C13.3.
 - iv. EM (Electromagnetic field) shielding test data, measured as described in Section C14.2 on the audiometric booth that meets or exceeds the requirements of Section C14.
 - v. Fire test data measured in accordance ASTM E84-87 which meet or exceed the requirements of appendix A.
 - vi. Fire test data on enclosure panels measured in accordance with ASTM E119-88 that meet or exceed the requirements of Section C.15.1.3.
 - vii. Fire test data on enclosure doors measured in accordance with ASTM E152-81 that meet or exceed the requirements of Section C15.1.4.
 - viii. Laboratory test data on all electrical components such as switches, jack panels, light fixtures, receptacles, conduit junction boxes, etc. indicating all are UL or equivalent laboratory approved.

- ix. Written certification that all enclosure components will be constructed in accordance with the construction methods utilized in each of the above tests.
 - x. Written certification that the bidder has had experience with the installation of audiometric booths in clinical settings and that at least 10 such enclosures have been installed during the three years previous to the issuance of this project specification.
 - xi. Plan drawings for all audiometric booths to be installed.
8. All standards referenced in this document are listed in the Section 1 of appendix A.
 9. Prior to project completion, VA will conduct the following post-installation inspections. Should the audiometric booth fail to meet any of the requirements of this specification, contractor shall replace or repair the defective components. In the event that there are substantial deviations between the actual construction of the materials utilized to construct the enclosure and the physical description of the components on the contractor's test reports, the non-complying materials may be rejected.
 10. Upon completion of installation, VA shall conduct inspections to ensure that:
 - a. Audiometric booths are installed such that the floors are level and the walls are plumb.
 - b. The audiometric booth finish has proper paint coverage and no dents or scratches. Any finish defects caused by the contractor must be replaced or repair within the satisfaction of the VA at by the contractor.
 - c. Audiometric booth doors are properly aligned and swing freely without binding other than as necessary for proper sealing.
 - d. All electrical components and jack panels operate properly.
 - e. The Booths are in compliance with Ambient Noise Level and Noise Reduction Requirements: Prior to acceptance and upon completion of installation, connection of building services, and with all electrical, lighting, and HVAC systems in operation, VA will conduct ambient noise level measurements at the typical patient location in the completed enclosure to ensure compliance with the maximum ambient sound pressure levels permitted by ANSI S3.1-1991 (revised to ANSI S3.1-1999 [R2008]). Measurements of enclosure noise reduction will be made in accordance with ASTM E336-90 to ensure compliance with requirements of section 13.2. Results of these noise reduction measurements made in completed enclosures shall be within 6 dB of the specified laboratory noise reduction figures in section 13.2.
 - f. The Booths are in Compliance with Electromagnetic Shielding Attenuation Requirements: Prior to acceptance and upon completion of installation, connection of building services, and with all electrical, lighting, and HVAC systems in operation (but without audiometric equipment connected), VA will perform measurements of EM-shielding attenuation in accordance with the acceptance test procedures of NSA 65-

6, 1964, with additions, exceptions, and clarifications described in section 14.2, to the extent permitted by clearances around the booth and the ambient EM noise level.

15. If the audiometric booth fails to meet the requirements of section 14.e or 14.f (or special requirements specified in the attachment see Appendix A), the contractor shall correct the deficiencies in the audiometric booth and retest the booth until it meets all requirements of this specification. All costs associated with testing and repair of the audiometric booth shall be borne by the contractor.

APPENDIX A

BOOTH AUDIOMETRIC EXAMINATION SPECIFICATIONS

A. Executive Summary

In addition to general specifications, each project shall contain certain site specific requirements that shall address the size of enclosure(s) to be installed, integration of the enclosures into the specific facility site, special functional needs, and any modifications necessary to address unusual sources of ambient acoustical noise, vibration, or electromagnetic interference. The exact configuration to be employed at each facility shall be determined by VA. These additional specification requirements shall be addressed by inclusion of any project-specific requirements in a completed copy of the attachment to the specification.

1. Technical Guidance.

1.1 This specification requires that VA conduct tests of booths after installation in addition to the normal inspection prior to acceptance. The testing is meant to determine whether installed booths meet the specified requirements for ambient noise levels as well as for electromagnetic interference (EMI) shielding attenuation.

1.2 EMI shielding attenuation measurements are far more difficult to ascertain and require special equipment and expertise not available in Biomedical Engineering or Audiology. Acceptance testing of the EMI shielding requires systematic measurements in the clinical environment. Such testing must be conducted in a manner that not only produces technically adequate measurements, but also minimizes the risk of EMI (due to signals generated for test purposes) with medical electronic devices, instruments, emergency communications, TV, and radio reception in patient rooms, lounges, waiting areas, etc. Consequently, this testing must be performed by persons with substantial demonstrated competence regarding measurements on EMI shielded rooms and considerations of electromagnetic compatibility and susceptibility.

2. ENCLOSURE CONFIGURATION AND SIZE

2.1 Configuration: Audiometric booths must be one of the following configurations:

2.1.1 Double Wall Examination Booth.

2.1.3 Double Wall Control/Double Wall Exam Suite.

2.2 Size: Audiometric booths shall have the following minimum LD. (external dimensions) or within needed specifications based on existing floor plan lay out which should not vary by more than 15% of the decisions listed below.

2.2.1 Double Wall Exam Booth I.D.: 10'0" x 9'0" x 6'6" high or 90 S.F.

2.2.3 Double Wall Control/Double Wall Exam Suite Exam Room I.D.: 10'0" x 9'0" x 6'6" high or 90 S.F. Control Room I.D.: 10'0" x 9'0" x 6'6" high or 90 S.F.

2.2.1 Double Wall Exam Booth I.D.: 8'0" x 9'0" x 6'6" high or 72 S.F.

2.2.3 Double Wall Control/Double Wall Exam Suite Exam Room I.D.: 8'0" x 9'0" x 6'6" high or 72 S.F. Control Room I.D.: 8'0" x 9'0" x 6'6" high or 72 S.F.

2.3 A maximum 1% to 15% inch tolerance is allowed on length and width to permit booth to fit into standard footages of space. Heights specified in section 2.2 are without ventilating units or discharge silencers, roof or wall mounted.

2.4 Exterior Enclosure Dimensions: Outside dimension of enclosure will be determined by the specified interior enclosure dimensions, the enclosure configuration, and the thickness of the enclosure panels and airspaces required to meet the specified acoustical performance criteria.

2.5 Exterior Dimensions of Suites with Common Outer Shells: Installations requiring multiple audiometric booths may be installed in common outer shells in order to conserve floor space. Installations involving common outer shells shall be designed such that the acoustical isolation between enclosures at least equals that specified for double wall enclosures in section 15.2 of this document. Specification of audiometric rooms or suites to utilize a common outer shell shall be noted on the attachment.

3. CONSTRUCTION

3.1 Design: Audiometric booth and all components thereof shall conform to the requirements specified herein. All parts of the booth having the same manufacturer's part number shall be completely interchangeable with respect to installation and performance. Booth shall consist basically of the following components:

- 3.1.1 Vibration isolation system.
- 3.1.2 Floor assembly.
- 3.1.3 Wall and roof panel assembly.
- 3.1.4 Acoustical door units.
- 3.1.5 Acoustical window units.
- 3.1.6 Assembly hardware, including connecting panel joints.
- 3.1.7 Electrical and lighting wiring, components and fixtures.
- 3.1.8 Silenced forced air ventilation system or packaged air conditioning silencers for connection to building HVAC systems.
- 3.1.9 Carpeting.
- 3.1.10 Matching Paint and other specified finishes.
- 3.1.11 Dust seals/shields and closure strips.
- 3.1.12 Jack panel.

3.2 Modular Components: The audiometric booth shall be constructed of modular, prefabricated panels and assembly hardware. Enclosure must be capable of being disassembled, moved, and reassembled at some future date with minimal loss of material or acoustical integrity.

3.3 Independent Structure: Audiometric booths shall be independent, free standing structures, providing all required structural support for the enclosure as an integral part of its design. Booth shall not make structural contact with the facility at any place except at the floor/wall connection and at the vibration isolation systems and, except for the floor, shall not depend on the facility for any of its structural support. Audiometric booths shall be furnished as completely prewired, upon assembly, and ducted for HVAC services. Electrical service shall be wired so as to allow for single point electrical tie-in for each booth by the Project General Contractor or VA Engineering Service personnel. HVAC silencers shall be configured so as to allow the connection of standard flexible vibration isolating ductwork from the main facility

HVAC ductwork (when specified in the attachment) to the audiometric booth silencers by the Project Contractor or VA Engineering Service personnel.

3.4 Structural Requirements: Audiometric booth panels and structural support system shall be of sufficient structural design so as to be capable of supporting uniformly distributed roof loads of 55 pounds per square foot and lateral wall loads of 20 pounds per square foot.

3.4.1 Load on Facility Floor: Audiometric booths shall present a maximum average live load to the facility of no more than 100 pounds per square foot. The average live load of the audiometric booth is defined as the total assembled weight of the booth divided by the exterior plan area it occupies and does not include any additional loads added by the personnel or equipment that occupies the booth. Bidder shall supply VA Engineering upon request with a detailed floor loading distribution, specifying location and magnitude of point and line loads presented to the facility floor by the enclosure outer shell and vibration isolation rails.

4. FLOORS

4.1 Isolated Acoustical Floors: All audiometric booths shall employ a minimal isolated acoustical floor systems in both control and examination room areas. Isolated floor systems with a ramp for ADA access on patient side for all examination rooms shall support the examination room walls so as to fully isolate the floor, walls and ceiling of the enclosure from facility area vibrations. Isolated floors in control room areas of single wall control/double wall exam suites may be set inside of the wall panels to facilitate efficient construction of the suite. Isolated floors in control room areas of double wall control/double wall exam suites shall fully support and isolate the wall and ceiling panels of the control room.

4.2 Floor Panels: Floor panels shall be fully insulated. Structural framing shall be minimum 11 gauge cold rolled steel channel sections or meet industry standards, spaced as required to meet the structural requirements of section 4.3. Top walking surface shall be minimum 11 gauge sheet steel or meet industry standards. Bottom floor panel closure skin shall be minimum 20 gauge sheet steel or meet industry standards. Floor panels shall be fully insulated with acoustical filler material which is inert, mildew resistant, and vermin resistant.

4.3 Structural Requirements: Floor panel and isolation system shall accommodate a 60 pound per square foot live load without structural deflection which exceeds $L/240$.

4.4 Quality of Construction: Floor panels shall be welded so as to provide a flat, smooth walking surface, and sheet steel shall be attached to floor panel framework in a manner so as to prevent "popping" or "oil-canning". Any defects in floor panels that are caused as a result of broken welds or other defective construction methods shall be fully repaired by the contractor at the time of installation.

5. WALL AND CEILING PANELS

5.1 Prefabricated Panels: The audiometric booth shall be constructed of prefabricated steel wall and ceiling panels that meet the modularity requirements of section 3.2. Panels shall be 4" thick, unless specified otherwise due to special acoustical considerations. Panels shall be constructed of a welded framework of formed steel channel, a solid sheet steel outer panel skin, a perforated steel inner panel skin, and shall be fully insulated. Structural framing shall be minimum 18 gauge steel channel sections on no less than 24" centers. Panel outer skin shall be minimum 16 gauge electro-galvanized or meet industry standards, bonderized cold rolled steel. Panel inner skins shall be minimum 22 gauge electro-galvanized or meet industry standards, bonderized perforated steel, with perforations not exceeding 1/8" diameter and a perforation pattern that provides at least the minimum sound absorption required in section 13.4 or meet industry standards.

5.2 Panel Weight: Audiometric booth wall and ceiling panels shall meet the acoustical requirements in section 13.4. The actual per square foot weight of the wall and ceiling panels required to meet these acoustical requirements may vary, provided the overall enclosure floor loading does not exceed the requirements of sections 3.4 and 3.4.1. In no case shall the average per square foot weight of the wall and ceiling panels used in construction of the booth be less than 8 pounds per square foot.

5.3 Panel Fill Materials: Audiometric booth walls, ceilings, floors, and doors shall be fully insulated with acoustical filler material which is inert, mildew resistant and vermin resistant. Insulation shall be packed into the panel so as to fully fill the panel cavities, leaving no voids. Fill materials shall provide at least the minimum sound absorption properties required in section 13.4. All fire rating requirements specified in section 15 must be met.

5.4 Quality of Construction: Panels shall be welded so as to secure outer panel skins to the panel framework to prevent bulges, creases, or looseness in the skin. Inner panel skins shall be spot-welded or pop-riveted to the panel framework to secure the perforated steel to the framework, to constrain the acoustical fill material, and to prevent "oil-canning" of the inner panel skin. All exposed welds shall be ground smooth.

5.5 Quality of Construction for EM-shielding Requirements: For shielded audiometric booths, panels shall be constructed to meet the EM SA (electromagnetic shielding attenuation) requirements expressed as attenuation in dB (decibels), as specified in Table 4B, section 14. Electrical connections necessary to meet these EM SA requirements, including, but not necessarily limited to, connections at joints between panels, shall be made using procedures and materials resistant to corrosion in conditions of normal use. Booths must be warranted to meet the requirements of section 14 for at least 3 years after installation or meet industry standards.

6. DOORS

6.1 Door Assemblies: Each audiometric booth shall be provided with one acoustical door and frame assembly per room, unless specified otherwise. Door and frame assembly shall consist of one door on single wall enclosures and two doors on double wall enclosures.

6.2 Door Construction: Door and frames shall be constructed of formed steel framework and sheet steel skins. Door leaves and frames shall be constructed of materials specified in section 5 of this document for wall and ceiling panel construction. Doors shall be factory prehung when possible and mounted in the frame on cam lift type door hinges. Doors shall be sealed and held in the door frame with positive latch hardware.

6.3 Door Hardware: Each door assembly shall be provided with a pair of camlift hinges, entry and exit handles, push and pull plates, self-closer, and all required door seals. Door hardware or locking mechanisms is specified in the attachment (Section 1 of this appendix).

6.4 Door Acoustical Performance: The transmission loss of the door and frame assembly shall have a minimum STC (Sound Transmission Class) rating of 47 as specified in section 13.3.

6.5 Door Thresholds: Door shall be sealed at the threshold with a compression type other door threshold seals which contain moving parts shall not be acceptable. Door thresholds shall be constructed of a tapered steel plate. The door threshold shall not be raised more than 1/4" above the floor coverings inside or outside the booth, whichever is higher.

6.6 Quality of Construction: Door leaves and frames shall be welded so as to secure skins to the internal framework in a manner that prevents bulges, creases, or looseness. All exposed welds shall be ground smooth. Exposed surfaces of door and frame shall be filled as required and ground smooth prior to painting.

6.7 Door Configurations: Enclosure door configuration for double wall examination rooms shall be one of the following:

6.7.1 Inswing/Outswing

6.7.2 Piggyback

6.7.3 Tandem Outswing

6.8 Door Clear Openings: Unless specified in the attachment (Section 1), the clear opening of all doors shall not be less than 36" x 73 1/2". Doors with larger clear openings may be specified on the attachment.

6.9 Door Dust Shields: Door openings on double wall booths shall be furnished with dust shields between door openings. Dust shields shall be flexible, non-metallic, black material and shall not compromise the vibration isolation between the inner and outer enclosures.

6.10 Door Fire Ratings: Acoustical door and frame assemblies shall meet the fire rating requirements of section 15.1.4 of this document.

6.11 Door EM -shielding Requirements: For shielded audiometric booths, acoustical door and frame assemblies shall be provided with EM -shielding gasketing. These

gaskets shall provide at least the required EM-shielding attenuation for the booth to meet the minimum requirements of Table 4A, section 14.

7. WINDOWS

7.1 Window Assemblies: Each audiometric booth or room shall be provided with one patient viewing window and windows in doors as specified in this section.

7.2 Window Construction: Windows shall be double glazed, clear, 1/4" minimum thickness, laminated (safety) glass. Window panes shall be mounted in acoustically tight, neoprene-gasketed frames and shall be separated by a 4" airspace. Airspace within the frame shall be filled with an acoustical insulation to dampen window resonances and shall be covered by a perforated steel liner. Desiccant material shall be installed between window panes to prevent condensation, and shall be so placed that the view through the window is not obstructed.

7.3 Patient Viewing Window Size: Unless specified otherwise, the size of the patient viewing window shall be no less than 30" wide and 24" high and shall be located no less than 32" above the examination room floor. Patient viewing windows of larger sizes may be specified on the attachment (Section 1 of this appendix).

7.4 Windows in Doors: Audiometric booth doors shall be provided with a minimum of 12" x 12" windows as specified in section 7.2, in the door leaves.

7.5 Window Dust Shields: Double wall enclosures and suites shall be provided with dust shields between the window units. Dust shields shall be flexible, nonmetallic, black material and shall not compromise the acoustical and vibration isolation between the inner and outer enclosures.

7.6 Alternate Window Constructions: Windows of alternative construction materials may be employed when utilizing alternative panel construction and acoustical/EM shielding performance options or if there are special functional requirements for the windows. Alternative window construction shall be compatible with the acoustical/EM-shielding requirements of the alternative performance option specified in the attachment (Section 1 of this appendix).

7.7 EM -shielded Windows: For shielded audiometric booths, EM -shielded window screening shall be used. This window design shall enable the booth to meet the performance requirements of Table 4A, in section 14.

7.8 Window Fire Rating: All windows in wall assemblies shall meet the fire rating requirements specified in section 15.1.5.

8. VENTILATION AND AIR CONDITIONING SYSTEMS

8.1 Ventilation System: Audiometric booths shall have a ventilation system that provides airflow to each enclosure. Ventilation systems shall include air transfer silencers to meet the acoustical performance requirements and ventilation openings

and grills on the interior of booths. The ventilation system shall be either a self-contained, fan-forced system or be ducted to facility building HVAC services. Type of ventilation system to be employed must be specified on the attachment (Section 1).

8.2 Materials and Construction: The audiometric booth ventilation system silencer and fan housings shall be either an integral part of the enclosure design or packaged HVAC silencers inserted in the facility ductwork. Outer casings for HVAC silencers and fan housings shall be of galvanized sheet steel construction and shall be constructed in accordance with ASHRAE guidelines. Liner materials shall be of inorganic mineral or glass fiber materials of a sufficient density to obtain the required acoustical performance. Acoustical liner materials shall be inert, mildew resistant and vermin resistant and shall have ASTM E84-87 fire ratings that meet or exceed the requirements of section 15.1.1.

8.3 Self-Contained Ventilation Systems: When specified in the attachment (Section 1), the audiometric booth will be provided with a self-contained, fan-forced ventilation system. Ventilation silencers and fan assemblies shall be wall or roof mounted. The fan-forced ventilation system shall be designed so as to draw conditioned air from the facility area through the audiometric booth and to return it to the facility area. The fan-forced ventilation system shall provide a minimum of one complete air change every 10 minutes. Fans shall operate on 110 volt, 60 Hz, single phase power. The fan system for each booth shall be provided with a wall mounted switch to operate the ventilation system.

8.4 Direct Coupled Ventilation Systems: As specified in the attachment (Section 1), the audiometric booth shall be provided with a ventilation system designed to be connected to the facility building HVAC systems. Audiometric booth silencers shall be equipped with 6" diameter flexible duct ring connection points to be used for connection to the building HVAC systems to provide vibration isolation from the duct work of the building HVAC system. Ventilation silencers shall be wall or roof mounted. Ventilation silencers shall accommodate an airflow rate that will allow for one complete air change every 10 minutes.

8.5 Pressure Drop in Direct Coupled HVAC Systems: Audiometric booths which are connected to building HVAC systems shall be equipped with silencer systems that provide pressure drops that do not exceed 0.25 inches H₂O at an airflow rate corresponding to one complete air change every 10 minutes. All airflow and pressure drop measurements shall be in accordance with ASHRAE guidelines.

8.6 Acoustical Performance of Self-Contained Ventilation Systems: The resultant noise levels inside of the audiometric booth shall not exceed the values specified in section 17.4.

8.7 Acoustical Performance of Direct Coupled HVAC Systems: The resultant noise levels inside of the audiometric booth shall not exceed the values specified in section 17.4, provided that the facility HVAC system sound pressure levels at the connection point to the audiometric booth silencers do not exceed the levels in Table 1 in this section.

Table 1: Maximum Allowable Sound Pressure Levels (SPL) at Connection Point of Facility HV AC System to Audiometric Booth Silencer

Octave Band	Single Wall Control Room	Double Wall Booths/Rooms/Suites
Preferred Center Frequency (Hz)	Preferred Center Frequency (Hz)	Preferred Center Frequency (Hz)
63	57	64
125	48	57
250	41	51
500	35	45
1000	31	41
2000	29	39
4000	28	38
8000	27	37

8.8 Noise Levels of Ventilation Systems Outside the Audiometric Booth: For a freestanding, double walled examination booth which is located within a room in the facility, the fan assembly used in the ventilation system shall not produce noise levels which would preclude live-voice testing or other activities in the room housing the booth.

8.9 Thermostats for Control of Direct Coupled HVAC Systems: When specified on the attachment (Section 1), audiometric booths shall be provided with recessed junction box and conduit for use in providing thermostatic control of HVAC systems. The thermostat and connection to HVAC systems are the responsibility of the Government.

9. ELECTRICAL

9.1 Electrical Systems: All electrical components and conduits shall be recessed into the wall panels and shall be wired in accordance with NEC standards. All electrical components shall be UL (or equivalent laboratory approved) listed Hospital Grade components and shall operate on 110 V, 60 Hz, single phase power. Audiometric booths shall be supplied completely pre-wired, when assembled, to a single plug or electrical junction box for each booth. Power source and connection of power to booth are the responsibility of the Government.

9.2 Electrical Outlets: The following minimum number of recessed duplex 110V electrical outlets shall be provided:

9.2.1 Double Wall Examination Booths: 2 each recessed duplex outlets inside enclosure and 1 each 6 outlet plug strip (surface mounted on recessed box) on outside of enclosure.

9.2.2 Single Wall Control/Double Wall Examination and Double Wall Control/Examination Suites: 2 each recessed duplex outlets in the examination room and 1 each 6 outlet plug strip in each room. Additional plug-in power strips may be specified on the attachment (Section 1).

9.3 Electrical Service: The Government will connect each audiometric booth to a 110 volt, 20 amp, electrical service. For shielded audiometric booths, the contractor is

responsible for notifying VA regarding modifications necessary to achieve EM SA requirements.

9.4 Electrical Systems Grounding: All audiometric booth electrical systems shall be grounded in accordance with NEC standards.

9.5 Grounding of Booth: For shielded audiometric booths, suitable grounding shall be provided to achieve EM SA requirements. Connection to earth ground is the responsibility of the Government. Proper grounding arrangements must be available at the VA facility site. If not, the contractor is responsible for notifying the VA.

9.6 Additional Electrical Components: Additional outlets or other electrical components to be provided may be specified in the attachment (Section 1).

10. LIGHTING

10.1 Lighting Systems: Audiometric booths shall be provided with pre-wired, recessed incandescent or fluorescent light fixtures. The ballast required for a fluorescent light fixture shall be external to the booth.

10.2 Standard Lighting Levels: A sufficient number of fixtures shall be employed so as to provide a minimum of 60 foot candles of light at 36" above the booth floor.

10.3 Supplemental Lighting: Track or bullet type lighting may be specified in order to provide supplemental or spot lighting. Specifications on light fixture type, make and model and number of fixtures to be employed shall be included in the attachment (Section 1).

10.4 Light Switches: Lighting fixtures shall be provided with one wall mounted, recessed light switch to operate all lights in the enclosure. Additional light switches or individual switching for different types of lighting may be specified in the attachment (Section 1).

10.5 Light Dimmers: Recessed light dimmers for incandescent fixtures shall be provided when specified in the attachment (Section 1). All light dimmers shall be low noise type dimmers. Light dimmers shall be provided in control rooms of suites which specify the use of one-way glass windows.

11. JACK PANELS

11.1 Jack Panel System: Each audiometric booth shall be provided with a flush mounted, pre-wired jack panel system for connection of test equipment between control and examination rooms.

11.2 Jack Panel Connectors: Each jack panel system shall contain as a minimum the following connectors:

11.2.1 Ten each Switchcraft Type 12B 1/4" three conductor phone jacks with covers.

- 11.2.2 One each Cinch Jones Type S-304-AB four pin plug (male).
- 11.2.3 One each Cinch Jones Type S-303-AB three pin plug (male).
- 11.2.4 One each 1" diameter pass through hole with cover.

11.3 Additional Jack Panel Connectors: Additional or special jack panel connectors shall be provided as specified in the attachment (Section 1).

11.4 Jack Panel Wiring: All jack panel connections shall be made with minimum 22 gauge shielded cable. All connections shall be soldered and tested at the factory. Each jack connection shall be independently grounded and isolated from the jack panel face plate.

11.5 Jack Panel Face Plates: For shielded audiometric booths, jack panel face plates shall preserve the acoustical and EM -shielding integrity of the booth. Jack panel face plate on each side of booth shall be marked and numbered so as to allow easy identification of individual circuits from either side.

11.6 Computer Interface Connections: When indicated in the attachment (Section 1), 25 pin RS-232 interface and/or other interface connections shall be provided between control and examination rooms. Connectors shall be mounted in the cover plate for a recessed electrical box to be located under the patient viewing window. In addition, when specified in the attachment (Section 1), a 2" x 4" electrical box with a blank cover plate and conduit to the enclosure roof, shall be provided in the control room for use in connecting computerized test equipment to facility computer network or data systems.

11.7 Cable Pass-Through Ports: When specified in the attachment (Section 1), 2 1/2" diameter cable pass-through ports shall be provided from the control room to the examination room for use in passing connectors and cables that are not connected through the jack panel. Cable pass-through ports shall be constructed of minimum 2 1/2" diameter pipe, shall be capped on both sides and shall be supplied with acoustical putty to seal these ports when the cables are installed. These ports shall not compromise the acoustical and vibration isolation of all booths and the EM-shielding performance of shielded booths.

12 FINISHES

12.1 Finish Requirements: Unless specified otherwise in the attachment (Section 1), audiometric booths shall be finished in accordance with the requirements listed in this section.

12.2 Paint Finish: All interior and exterior exposed surfaces of the audiometric booth shall be factory pre-painted prior to installation and of the same color. Steel panel surfaces shall be properly cleaned, prepared and primed with a nitrocellulose modified-phenolic coating to a dry film thickness of 0.6-mil. minimum so as to accept the finish paint coat. Unless otherwise specified in the attachment (Section 1), panels shall be thoroughly coated with nitrocellulose alkyd modified lacquer, (or functionally

equivalent coating) to produce a flat or textured finish in colors specified in the attachment (Section 1).

12.3 Floor Carpet: Unless otherwise specified in the attachment (Section 1); the contractor shall provide carpeting for all inner floors. Carpeting shall meet the requirements of Federal Specification DDD-C-95 and the fire rating requirements of the Federal Flammability Standard FF-I-70 in section 15.1.2. Carpeting shall be cemented to the floor and shall be provided with rubber molding. The color shall be specified in the attachment (Section 1).

12.4 Closure Panels: The contractor shall provide closure panels that close off airspaces between booths as well as between the booth and the facility walls. Closure strips shall be finished similarly to the external finish of the booth and shall be installed in a manner so as to not compromise the acoustical and vibration isolation of the booths. Closures between the audiometric booth and the facility ceilings shall be provided by the Project General Contractor or VA Engineering Service, unless specified otherwise in the attachment (Section 1)

11. ACOUSTICAL PERFORMANCE REQUIREMENTS

13.1 Acoustical Performance: Audiometric booths and the components utilized to construct them shall meet the minimum acoustical requirements detailed in this section. Acoustical performance enhancements shall be specified in the attachment (Section 1).

13.2 Enclosure Noise Reduction: Audiometric booths shall meet the airborne noise reduction requirements specified in Table 2, when measured in accordance with ASTM E596-90:

Table 2: Minimum Noise Reduction for Audiometric Booths/Rooms/Suites

Octave Band	Single Wall Control Room	Double Wall Booths/Rooms/Suites
Center Frequency (Hz)	Noise Reduction (dB)	Noise Reduction (dB)
125	27	44
250	36	62
500	44	63
1000	53	90
2000	58	95
4000	60	95
8000	57	>91

Noise reduction measurements shall be made in 1/3 octave bands and converted to octave band results using a calculation method appropriate to the source spectrum (e.g. pink noise). Audiometric booth must meet at least the minimum specified octave band noise reduction in each octave band.

13.3 Transmission Loss of Door and Frame Assembly: The audiometric booth acoustical door and frame assembly shall have a minimum STC rating of 47 when tested in a laboratory environment in accordance with ASTM E90-90 and calculated in accordance with ASTM E413-87.

13.4 Panel Sound Absorption Coefficients: The sound absorption coefficients of the wall and ceiling panels (Reference ANSI S3.6-1989, revised to ANSI S3.6-2004) used to construct the audiometric booth shall have the minimum sound absorption coefficients specified in Table 3, when measured in a laboratory environment in accordance with ASTM C423-90a using a sample size of at least 72 square feet.

Table 3 Minimum Sound Absorption Coefficients for Audiometric Booth Panels

Octave Band Center Frequency	Sound Absorption Coefficient
125	0.40
250	0.70
500	0.70
1000	0.70
2000	0.70
4000	0.70
8000	0.70

14. ELECTROMAGNETIC SHIELDING ATTENUATION REQUIREMENTS

14.1 EM SA (Electromagnetic Shielding Attenuation) General Requirements: All examination rooms shall be shielded. Control rooms shall be shielded if specified in the attachment (Section 1).

14.2 Specific Requirements: At a minimum, shielded audiometric booths shall be constructed to meet the requirements for EM -shielding attenuation specified in Tables 4A and 4B. These requirements are applicable to shielded audiometric booths located to avoid potential interference from electromagnetic fields. Measurement methods shall be in accordance with paragraphs d. (U) Acceptance Tests, e. (U) Electric and Magnetic Fields, and f (U) Reference Level of B16. (U) Quality Assurance Provisions of Specification NSA No. 65-6, 30 October 1964, with the following exceptions, additions, and clarifications:

14.2.1 In addition to the requirements in the cited paragraphs of NSA 656, leakage checks must also be made at all windows, jack panels, computer interface interconnection panels, cable pass-through ports, penetrations for lighting and ventilation systems, and at representative accessible panel seams.

14.2.2 Measurements shall be made with the source (signal source and transmitting antenna) inside the booth and the receiver (receiving antenna, preamplifier, if used, and spectrum analyzer) outside.

14.2.3 Magnetic fields shall be measured with 12-inch diameter loop transmitting and receiving antennas (Section 1, Figure 1). This and subsequent figures show a wall panel, but other panels, e.g., the ceiling, as well as doors and windows, shall also be examined. Transmitting and receiving antennas are separated by 24 inches plus the thickness of the shield panel(s).

14.2.4 Test antennas for the electric field measurements shall be 41-inch monopole rods, as shown in Section 1, Figure 2. Transmitting and receiving antennas shall be separated by 24 inches plus the thickness of the shield panel(s).

14.2.5 For the plane wave measurements, biconical rod antennas shall be used (Section 1, Figure 3) at the frequencies 50 MHz, 100 MHz, and 200 MHz, and log periodic antennas (Section 1, Figure 4) at the frequencies 400 MHz and 1000 MHz. The transmitting antenna shall be placed at a distance of 72 inches from the inner shield surface, and the receiving antenna shall be kept at a minimum distance of 2 inches, and a maximum distance of 6 inches, from the outer shield surface.

14.2.6 Each test report shall include measured attenuation values at all specified test locations, frequencies, and field types, and a diagram of the enclosure showing all doors, windows, jack panels, penetrations including computer interface connections and cable pass-through ports, filters, electrical service, lighting, ground connections, air vents for self-contained HVAC or connections for building HVAC. This diagram does not have to be to scale.

15. FIRE RATING REQUIREMENTS

15.1 Fire Protection Requirements: As a minimum, audiometric booths shall be constructed of fire rated components, as specified below, to obviate the need for a fire sprinkler system and the associated roof panel penetration necessary for installation.

15.1.1 Wall and ceiling panels and liner materials used in ventilation system, silencers and fan housings, tested in accordance with ASTM E84-87, shall not exceed a rating of 25 for Flame Spread and 50 Smoke Developed.

15.1.2 Carpeting shall meet the requirements of the Federal Flammability Standard FF-I-70, Standard for the Surface Flammability of Concepts and Rugs (Pill Test).

15.1.3 Wall and ceiling panels, tested in accordance with ASTM E119-88 (or equivalent industry standard test method), shall be rated for a minimum of 60 minutes. Test data for both solid and perforated surfaces exposed to fire shall be provided.

15.1.4 Door assemblies, tested in accordance with ASTM E152-81 (or equivalent industry standard test method) shall be rated for a minimum of 45 minutes.

15.1.5 Windows installed in fire-rated wall assemblies, tested in accordance with NFPA 257, Standard for Fire Tests of Window Assemblies (or equivalent industry test method), shall be rated for a minimum of 45 minutes.

15.1.6 For double wall examination booths (not suites), windows installed in fire-rated wall assemblies shall be of wired safely glass or shall be glazed with a material that has been tested in accordance with NFPA 257, Standard for Fire Test of Window Assemblies (or equivalent industry test method). Glazing material shall be installed in a metal frame in accordance with manufacturer's standard window framing details.

SECTION 1

REFERENCE DOCUMENTS

The following documents, of the issues in effect on the date of this solicitation, form a part of this specification to the extent applicable and to the extent specified herein:

- a. American Society for Testing and Materials standards numbered:
- b. ASTM E596-90 Laboratory Measurement of the Noise Reduction of Sound-Isolating Enclosures.
- c. ASTM C423-90a Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- d. ASTM E90-90 Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

- e. ASTM E413-87 Determination of Sound Transmission Class (also NIC)
- f. ASTM E84-87 Test Method for Surface Burning Characteristics of Building Materials (or equivalent UL or NITA test standards).
- g. ASTM E119-88 Fire Tests of Building Construction and Materials (or equivalent UL or NFPA test standards)
- h. ASTM E152-81 Fire Tests of Door Assemblies (or equivalent UL or NFPA test standards)
- i. ASTM E336-90 Standard Test Method for Measurement of Airborne Sound Insulation in Buildings.
- j. American National Standards Institute standards numbered:
- k. ANSI S3.1-1991 Criteria for Permissible Ambient Noise during Audiometric Testing. Revised to ANSI S3.1-1999 [R2008].
- l. ANSI S3.6-1989 Specifications for Audiometers. Revised to ANSI S3.6-2004.
- m. Federal Specification DDD-C-95, Carpets and rugs, wool, nylon, acrylic, modacrylic.
- n. Federal Flammability Standard FF-1-70, Standard for the Surface Flammability of Carpets and Rugs (Pill Test).
- o. National Electric Code (NEC) Article 545 on Manufactured Buildings.
- p. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Guide Data Book, 1982, Chapter 3, Systems and Equipment Duct Manual.
- q. American Concrete Institute Standard Tolerances for Concrete Construction and Materials, Standard, ACI 117-81.
- r. IEEE Std. 299-1991, IEEE Standard for Measuring the Effectiveness of Electromagnetic Shielding Enclosures.
- s. Specification NSA No. 65-6, 30 October 1964, National Security Agency Specification for RF Shielded for Communications Equipment: General Specification.
- t. NFPA 257,1990, Standard for Fire Tests of Window Assemblies (or equivalent industry test method).

Table 4A
Minimum values of Electromagnetic Shielding
Attenuation (SA), in dB, at Doors, Windows,
Jack Panels, Computer Interface Connection Panels,
Cable Pass-Through Ports, and Penetrations
for Lighting and Ventilation Systems

Type of Field	Frequency	SE
Magnetic	1 kHz	3
	10 kHz	5
	100 kHz	9
	500 kHz	20
	1 MHz	15
Electric	1 kHz*	45
	10 kHz*	50
	100 kHz*	50
	500 kHz	50
	1 MHz	50
	10 MHz	50
	18 MHz	32
Plane Wave	50 MHz	45
	100 MHz	7
	200 MHz	15
	400 MHz	5
	1000 MHz	6

*For the quality assurance inspection testing of section 17.5, electric field measurements of SA are not required at frequencies 1 kHz, 10 kHz, and 100 kHz; measurements at the remaining frequencies for electric field measurement, and measurements at all indicated frequencies for other field types, are required. For the test report requirements of sections 13.6 and 14.2.6, measurements shall be performed for all field types at all indicated frequencies.

Table 4B
Minimum Values of Electromagnetic
Shielding Attenuation (SA), in dB,
At All Positions Other Than
Those of Table 4A.

Type of Field	Frequency	SE
Magnetic	1 kHz	10
	10 kHz	20
	100 kHz	30
	500 kHz	37
	1 MHz	40
Electric	1 kHz*	45
	10 kHz*	50
	100 kHz*	50
	500 kHz	50
	1 MHz	50
	10 MHz	50
	18 MHz	42
Plane Wave	50 MHz	45
	100 MHz	7
	200 MHz	25
	400 MHz	5
	1000 MHz	10

*For the quality assurance inspection testing of section 17.5, electric field measurements of SA are not required at frequencies 1 kHz, and 10 kHz, and 100 kHz; measurements at the remaining frequencies for electric field measurement, and measurements at all indicated frequencies for other field types, are required. For the test report requirements of sections 13.6 and 14.2.6, measurements shall be performed for all field types at all indicated frequencies.

TEST SET-UP AND EQUIPMENT FOR EM SHIELDING ATTENUATION MEASUREMENTS

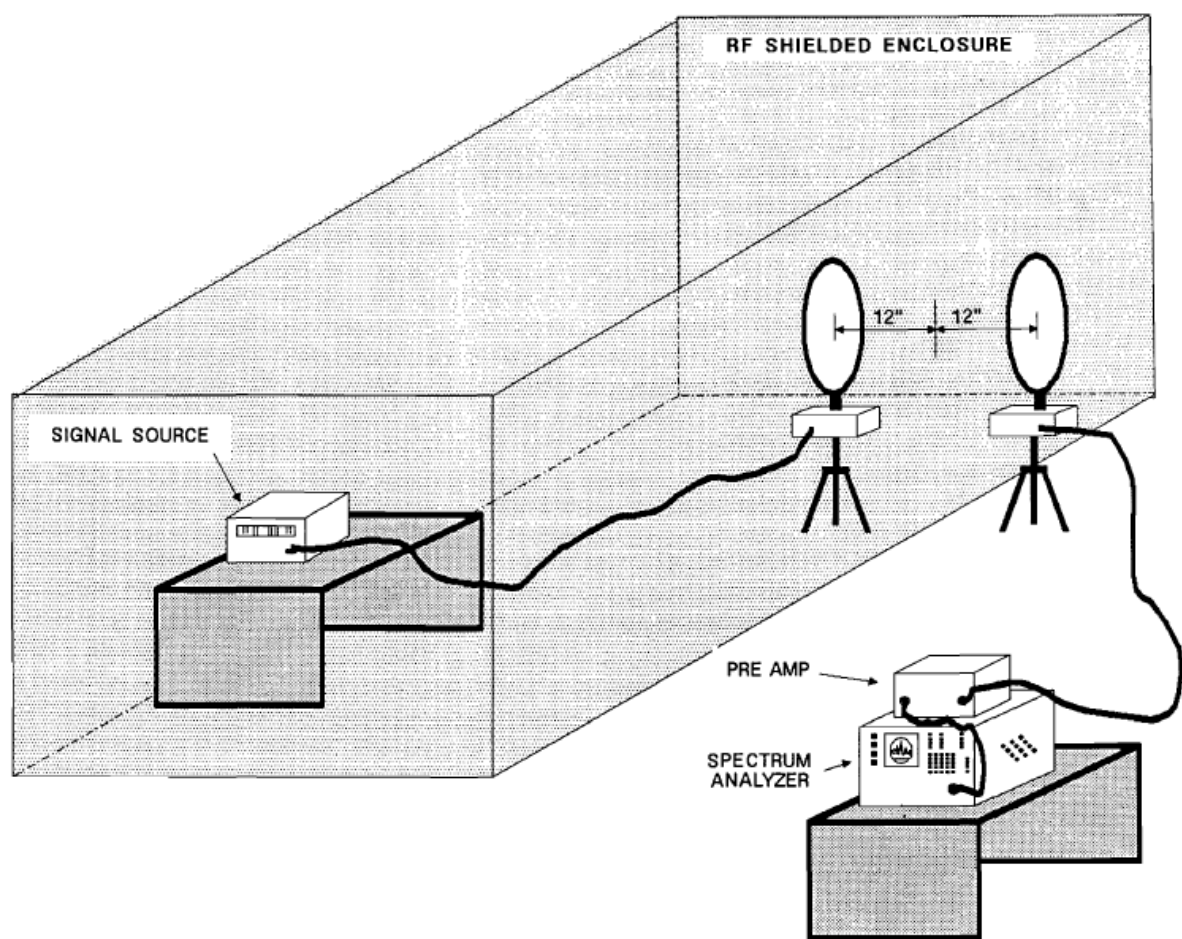


FIGURE 1: TEST SET UP FOR COAXIAL MAGNETIC FIELD MEASUREMENTS

TEST SET-UP AND EQUIPMENT FOR EM SHIELDING ATTENUATION MEASUREMENTS

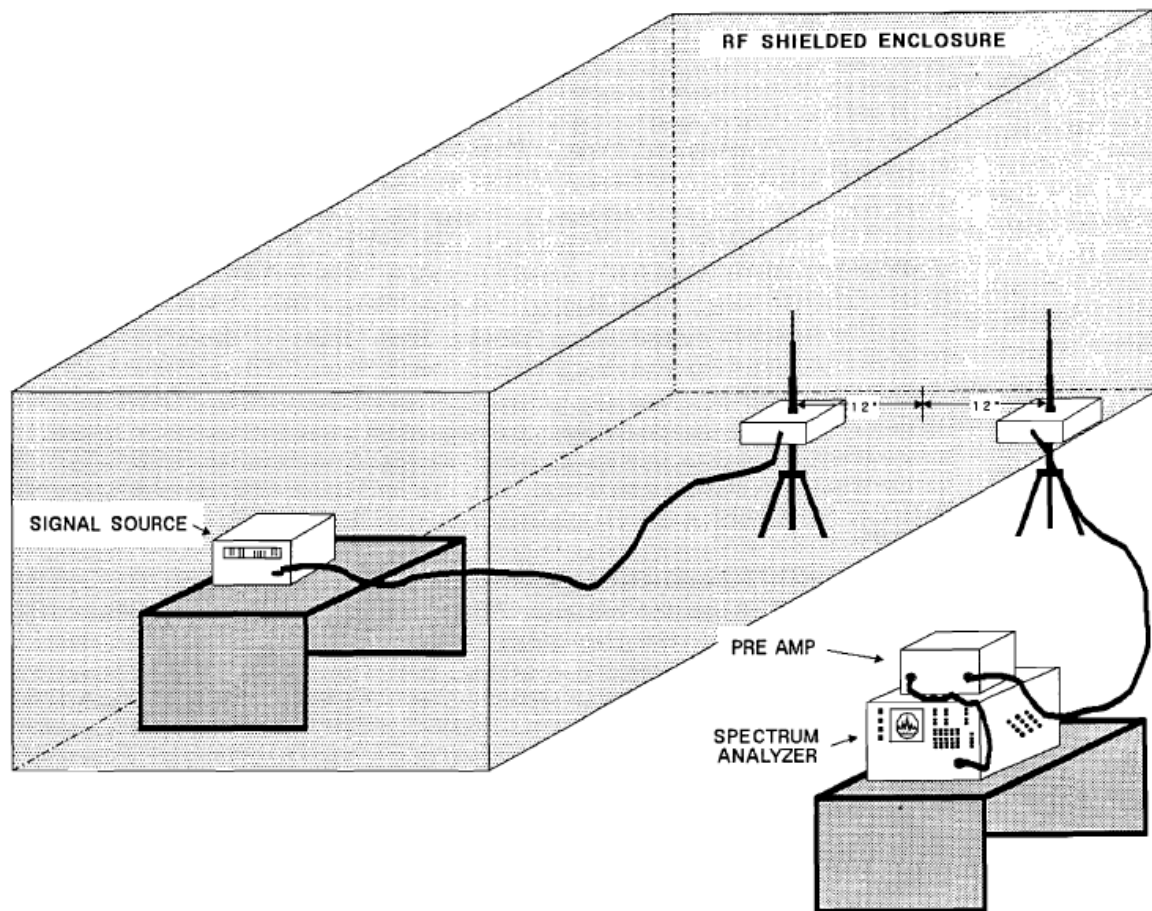


FIGURE 2: TEST SET UP FOR ELECTRIC FIELD

TEST SET-UP AND EQUIPMENT FOR EM SHIELDING ATTENUATION MEASUREMENTS

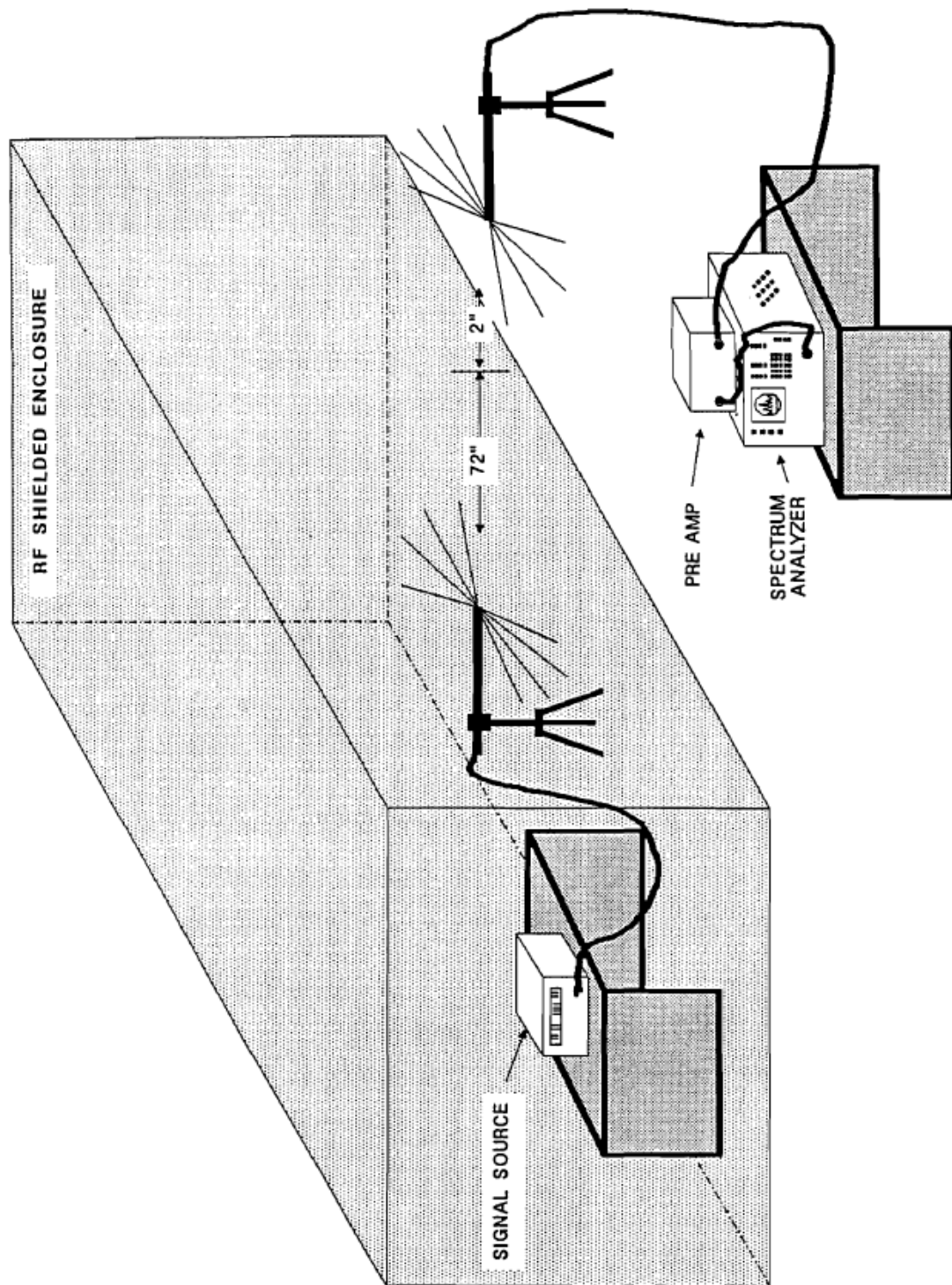


FIGURE 3 : TEST SET UP FOR PLANEWAVE (50 MHz-200 MHz)

TEST SET-UP AND EQUIPMENT FOR EM SHIELDING ATTENUATION MEASUREMENTS

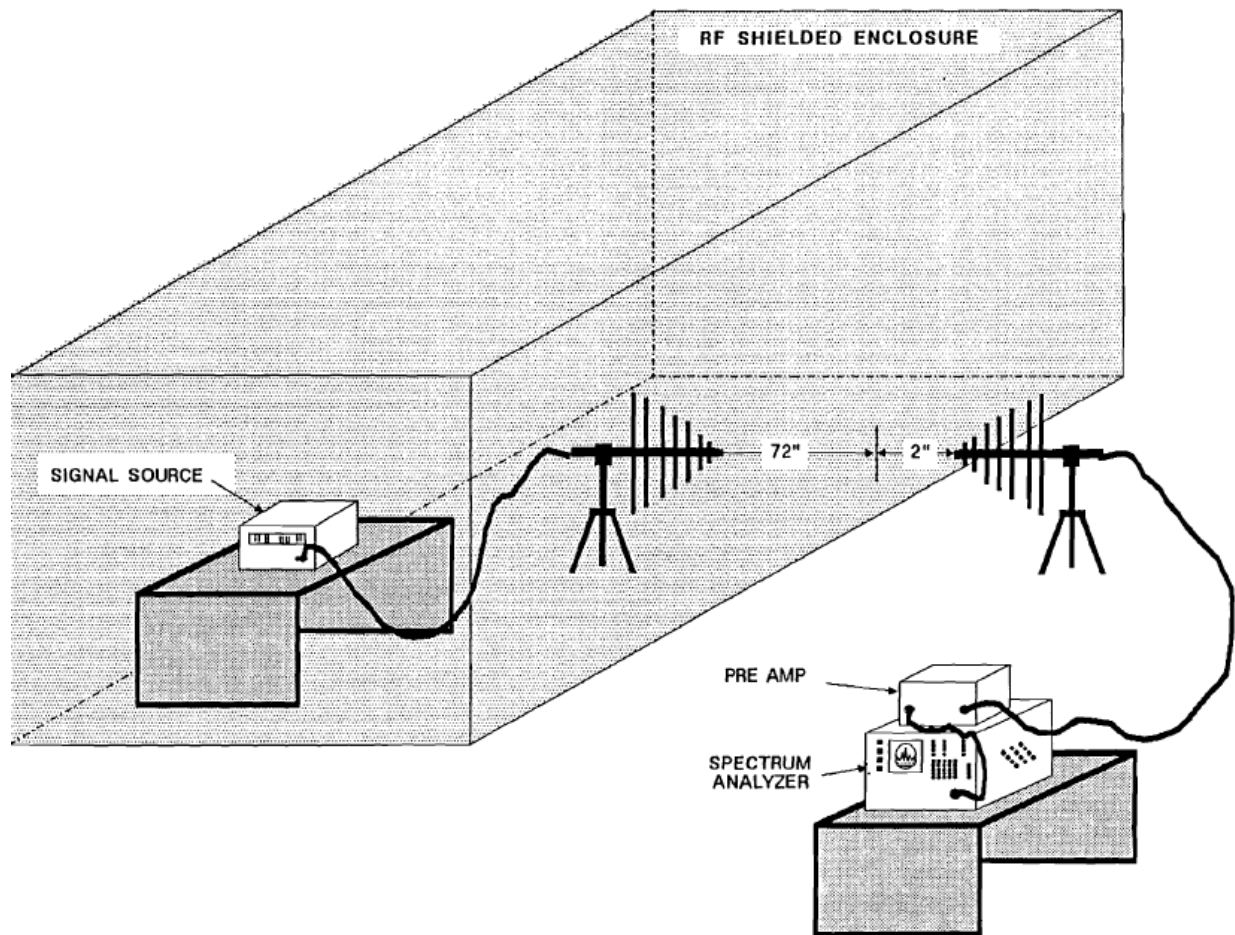


FIGURE 4: TEST SET UP FOR PLANEWAVE (400 MHz–1000 MHz)

EQUIPMENT USED FOR TESTING SHALL CONSIST OF THE FOLLOWING. OR OTHER EQUIVALENT:*

FIELD FREQUENCY RANGE MANUFACTURER & DESCRIPTION MODEL

ANTENNAS: (X) for Transmitter. (R) for Receiver	1 kHz-1 MHz	(X) Electro-Mechanics Co.	6509
Magnetic passive loop			
Magnetic active loop	1 kHz-1 MHz	(R) Electro-Mechanics Co.	6507
Electric	1 kHz	(X) Accel coil whip	140001
Electric	10 kHz-18 MHz	(X) Electro-Mechanics Co.	3303
41" passive whip			
Electric	1 kHz-18 MHz	(R) Electro-Mechanics Co.	3301B
41" active whip			
Plane Wave	50 MHz-200 MHz	(X,R) Electro-Mechanics Co.	3104
biconical			
Plane Wave	400 MHz-1000 MHz	(X,R) AH Systems	SAS200510
log periodic			
RECEIVERS			
All	1 kHz-1000 MHz	Hewlett Packard spectrum analyzer	8562A
SIGNAL SOURCES			
Electric, magnetic	1 kHz	Wavetek signal generator	188
All	10 kHz-1000 MHz	Marconi single generator	2022
SIGNAL MODIFIERS			
Plane Wave	50 MHz-1000 MHz	Electro-Metrics preamplifier	BPA-1000

*Instruments are identified only in order to specify adequately apparatus and procedures. The presence of an instrument on this list should not be interpreted to imply that this instrument is the best or the only device available and suitable for its intended purpose.