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Comptroller General
of the United States

Washington, D.C. 20548

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Decision

Matter of: Acoustic Systems

File: B-256590

Date: June 29, 1994

L. Graeme Bell III, Esq., and Christopher M. Farris, Esq., Crowell & Moring, for the protester.
Samuel Stern for Industrial Acoustic Company, Inc., an interested party.
William E. Thomas, Esq., Philip Kaufman, Esq., and Dennis Foley, Esq., Department of Veterans Affairs, for the agency.
Paul E. Jordan, Esq., and Paul Lieberman Esq., Office of the General Counsel, GAO, participated in the preparation of the decision.

DIGEST

1. Requirement that audiometric booths have electromagnetic interference (EMI) shielding which will attenuate low frequencies of EMI at specified levels is reasonable and not unduly restrictive where the test equipment to be used in the booths is sensitive to EMI and the record suggests that the protester's booth is capable of meeting the specification.

2. Where solicitation requires tests of effectiveness of electromagnetic (EM) shielding of audiometric booths both prior to submission of bids and after installation of booths on agency premises, solicitation reasonably requires that post-installation tests be performed using the EMI source inside the booth because of space considerations and to ensure the safety of hospital patients, and that both tests be performed in the same manner to ensure consistency of results.

DECISION

Acoustic Systems protests as unduly restrictive certain specifications in invitation for bids No. 548-07094, issued by the Department of Veterans Affairs (VA), for the supply and installation of three audiometric booths with control rooms at the VA Medical Center, West Palm Beach, Florida. Acoustic contends that the specifications for electromagnetic interference (EMI) shielding and testing exceed the government's requirements.

We deny the protest.

The solicitation, issued in February 1994, is for audiometric examination booths (freestanding, prefabricated examination rooms) suitable for use in testing, calibration, and recording of hearing acuity. These procedures involve evaluation of a patient's hearing as related to various hearing disorders. The equipment used to conduct the tests, which is used inside the booth, includes audiometric earphones, audiometers,[1] tympanometry instruments, and auditory brainstem response equipment. Because the equipment tests and records a patient's sensitivity to precisely controlled and often very faint sounds (at the threshold of audibility), booths must be designed to isolate the patient from extraneous background noises and other vibrations. According to the VA, since audiometric equipment uses electrical signals which may be very small (e.g., a microvolt (one millionth of a volt)), booths must be designed to shield the instruments from EMI which could interfere with the operation of the audiometric equipment and consequently disrupt the test results produced.

The solicitation requires that all examination rooms be constructed to meet EMI shielding attenuation (SA) levels, at 17 specified frequencies, ranging from 1 kilohertz (kHz) to 1,000 megahertz (MHz), in three types of electromagnetic (EM) fields: magnetic, electric, and plane wave. To meet or exceed the specified SA values, measured in decibels (dB), a booth's test results must reflect a value equal to or greater than that specified.[2] The solicitation specifies two sets of SA values for each frequency: one for walls and one for other aspects of the booth (e.g., windows, doors, jack panels, cable pass-throughs, and other penetrations in the walls). The SA values for walls are generally higher than those for the other aspects of the booth. Thus, for example, in a 1 kHz magnetic field, the walls must provide an SA value of 10 dB, while the other aspects need only provide an SA value of 3 dB.

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[1]Audiometers include the controls and main instrument body to which earphones are connected and, though ordinarily in the control room, are sometimes located inside the booth.

[2]Thus, for an SA value of 50 dB at 10 kHz, a booth measured at 52 dB would exceed and thus satisfy the requirement, while a booth measured at 49 dB would not be technically acceptable.

The solicitation also requires each bidder to submit certified test reports and data on EMI shielding and other aspects of the proposed booth.[3] EMI shielding tests are to be conducted in accordance with National Security Agency (NSA) specification No. 65-6, with certain changes, including the following:

> "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."

The parties state that there are only two major manufacturers of audiometric booths in the United States, Acoustic and Industrial Acoustic Company (IAC). Only IAC submitted a bid by the March 2, 1994, bid opening date. Acoustic did not bid and instead filed this protest arguing that neither the low-level frequency specifications nor the acceptance test methods represented the VA's minimum needs.

In preparing a solicitation for supplies or services, a contracting agency must specify its needs and solicit offers in a manner designed to achieve full and open competition and to include restrictive provisions or conditions only to the extent necessary to satisfy the agency's needs. McNamara-Lunz Vans and Warehouses, Inc., B-250426, Jan. 22, 1993, 93-1 CPD ¶ 57. The contracting agency, which is most familiar with its needs and how best to fulfill them, must make the determination as to what its minimum needs are in the first instance, and we will not question that determination unless it has no reasonable basis. Corbin Superior Composites, Inc., B-242394, Apr. 19, 1991, 91-1 CPD ¶ 389. Here, the record establishes that both the frequency and the test specifications represent a reasonable statement of the VA's minimum needs.

Acoustic recognizes the need for EMI shielding at some higher frequencies, but challenges the specifications for shielding at the lower frequencies (1 kHz, 10 kHz, and 100 kHz), contending that these requirements reflected VA's arbitrary adoption of NSA standards without any scientific justification or demonstrated need for such low-level protection. Acoustic also contends that using an NSA standard instead of an industry standard provides IAC with an unfair competitive advantage. We disagree.

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[3]These other aspects include electrical components, fire testing, sound absorption and transmission, and various certifications.

The challenged low frequency requirements and other provisions of the specifications were the result of the VA's efforts over more than 2 years to revise its prior specification for audiometric booths (VA X-1438a, dated April 28, 1972). The revised specification is based upon the VA's experience with the former specification and VA facilities, review of public comments from vendors, including the protester and IAC, review of technical literature, tests of a shielded booth already in use in a VA medical center, and consultations with 13 experts and manufacturer representatives both inside and outside the government. These experts included several scientists from the National Institute of Standards and Technology (NIST) with expertise in electroacoustical measurements, domestic and international standards, EMI, and EM susceptibility.

EMI is caused by unwanted electromagnetic fields that can occur at frequencies from below 60 hertz (Hz) (cycles per second), the typical powerline frequency in the United States, to frequencies greater than 1,000 MHz. EMI can cause both incorrect readings and equipment malfunctions. Typical sources of EMI which could be present in a hospital include emergency vehicle dispatch centers, elevators, electric motors, generators, machine tools, electrical components of heating and air conditioning equipment, lighting system components (e.g., fluorescent light ballasts), magnetic resonance imaging (MRI) equipment, cellular telephones, pagers, walkie-talkies, computer video display terminals, and electronic instruments. Since a number of these items typically represent sources of EMI near audiometric booths, the VA concluded that audiometric booths required EMI shielding to protect audiometric equipment used inside the booths.

The VA found little available information concerning what levels of EMI would affect audiometric equipment. According to the VA, instead of studying field strengths and susceptibility, researchers generally test to ensure that EMI is not affecting results or to determine the presence of EMI so that the source can be eliminated. According to the VA, another aspect of this problem is that many if not most sources of EMI are intermittent, making them difficult and expensive to control.

The VA primarily utilized tests performed on audiometers, including a number of U.S. made units, by the German equivalent of NIST. In a frequency range of 0.5 megahertz (MHz) to 1,000 MHz, with a field intensity of 1 to 3 volts per meter (V/m), all 34 audiometers tested failed the test for susceptibility to EMI, which requires that the item under test revert to a condition that will not endanger the patient's hearing nor yield invalid results. The earphones of these audiometers were found even more susceptible to

EMI; all failed the test even though they were not placed directly in the test fields. Since all tested equipment failed, and such testing is expensive, additional tests at lower frequencies were not conducted. These tests did not include all brands of audiometers and some have been improved although they still produce EMI-induced sounds during testing, above the audiometric threshold of hearing. According to the VA, such sounds would prevent or severely interfere with audiological testing of patients.

In interpreting this data, the VA considered that the mechanisms by which EMI affects complicated electroacoustical and electronic instruments are frequently unpredictable. Consequently, the VA was unable to extrapolate the German data to reliably predict field strength levels that would not affect an audiometer. Noting that the test field strength used in these tests was well within the range of those produced near cordless phones, long distance cellular phones, and walkie-talkies, the VA concluded that audiometric equipment, especially earphones, needed to be shielded from EMI at low, medium, and high frequencies.

In view of the number and various types of existing sources of EMI in a hospital setting and the VA's belief that these sources will increase in number and intensity over the potential 30 to 40 years useful life for an audiometric booth, the VA determined to specify shielded booths using a broad range of frequencies in order to ensure adequate protection for both the audiometric instruments and the patients on whom they are used. Since sources, intensity, and susceptibility of instruments are subject to change, the VA intends to continue its assessment of shielding requirements and will modify them as necessary. For example, hearing aids which use computers are in limited use today, but will likely be in greater use in the future. Such devices are a source of EM fields and could pose special EMI problems when patients using them are tested in the audiometric booths.

Acoustic challenges the agency's conclusion because the German test data are not available in any published report and do not cover the lower frequencies it is protesting in the specifications. However, the protester has not produced any relevant, quantitative data itself which establishes that audiometric equipment is not susceptible to low frequency EMI. Instead, Acoustic relies on its own experience and that of respondents to a letter survey which were submitted to the VA.

The respondents were firms experienced in sales, installation, and service of audiometric equipment and booths, manufacturers and users of evoked potential equipment, and an otologist.[1] The respondents generally opined that the proposed specifications were excessive, based upon their general lack of experience with any problems due to EMI. Based on the respondents' experience, Acoustic maintains that the low frequency specifications are unjustified. The VA specifically considered these comments while drafting the specification, but concluded that they were not persuasive. The VA based this conclusion on the absence of any quantitative statements by these respondents regarding EM field strengths at which interference was or was not observed and the absence of any quantitative information regarding the susceptibility of the audiometric instruments used by the respondents. Further, most of the firms acknowledged that they had encountered EMI problems and that when encountered they were intermittent. Since the protection from intermittent interference is an important consideration to the VA in shielding, the VA found that the letter survey was insufficient to warrant eliminating the lower frequencies from the specification.

Based on our review of the record, we believe the VA's determination of its minimum need for EMI shielding is reasonable. There is evidence of EM fields in the hospital setting and of susceptibility of audiometric instruments to high, and inferably to low, frequencies of EMI. Based on the VA's survey of existing booths, shielding apparently is effective since the VA found problems with EMI only with respect to unshielded booths; no problems were reported with shielded booths. Given the proliferation of electronic items and attendant EM fields of varying strengths and the inability to accurately predict how adequate today's shielding measures will be decades later, there is a significant risk of adverse effects on equipment and patient safety, either through inaccurate test results or direct harm from a malfunctioning audiometric item. The VA's requirement for shielding represents a reasonable minimum need to reduce, if not eliminate, that risk. In this regard, where, as here, human safety is involved an agency has the discretion to set its minimum needs so as to achieve not just reasonable results but the highest possible reliability and effectiveness. See California Inflatables Co., Inc., B-249348, Nov. 9, 1992, 92-2 CPD ¶ 331. Since the protester has not produced any quantitative data to refute the agency's position, we have no basis for overturning the VA's determination.

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[1]The otologist who submitted comments apparently is a corporate officer of Acoustic.

Acoustic also contends that use of the NSA standard instead of an industry standard provides an unfair competitive advantage to IAC due to IAC's contract history of supplying shielded enclosures to NSA. Acoustic would prefer the VA to use the standard issued by the Institute of Electrical and Electronics Engineers, Inc. (IEEE Std 299-1991) because it calls out general test frequencies that are higher than those specified by the VA.

According to the VA, it rejected the IEEE standard for various reasons including its relatively recent promulgation and test methods.[5] The VA explains that the NSA 65-6 measurement methods are best suited for acceptance testing at VA facilities since they were written for panelized shielding systems like those in the audiometric booths; most of the work on evaluating the performance of EMI shielded rooms in the last few decades has been for national security applications; and NSA standards are unclassified, widely recognized, and can be performed by a number of independent testing companies. The IEEE standard uses an averaging method which is less likely to reveal shielding weaknesses, specifies test equipment positions which are inappropriate for the booth acceptance tests, and for some tests requires more source power which could be detrimental to critical hospital equipment. While the NSA standard requires testing at low frequency levels, the VA explains that its specification of low frequencies was based on the VA's determination of its minimum needs, and not on the fact that the NSA standard specified them.

The IEEE standard itself acknowledges that the existence of that standard does not imply that there are no other ways to test goods related to the scope of the IEEE standard. Further, although this standard prescribes frequency ranges which are higher than those in the NSA No. 65-6/VA specifications, we note that Appendix A of IEEE Std 299-1991 provides for additional measurements in the frequency range of 14 kHz to 20 MHz, "extendable down to 50 Hz." Since this range statement includes the 1, 10, and 100 kHz frequencies specified by the VA, we find no practical difference in, or basis to object to, the VA's choice of standards.

Further, an agency is not required to construct its procurements in a manner that neutralizes the competitive advantages some potential offerors may have over others by virtue of their own particular circumstances. Cardiometrix, B-234620, May 1, 1989, 89-1 CPD ¶ 415. Here, while IAC's experience with NSA procurements may have better prepared it

[5]In fact, the VA chose the NSA standard not for its frequency levels but rather for its test methods (see infra).

to meet the VA's specifications, there is no evidence that the VA chose the NSA standard in order to provide an advantage to IAC. To the contrary, the VA has taken steps to ensure that both IAC and Acoustic can compete for its requirements. First, NSA No. 65-6 contains the lowest values for EMI attenuation of any NSA standard. Second, the VA specified values are set lower not only than the NSA values but also than the values derived from testing information submitted by the manufacturers and the test of an IAC booth at a VA facility.[6] Third, unlike earlier VA specifications, this specification recognizes the difficulty involved in shielding windows, doors, and other "penetrations" in the booth walls and thus sets lower values for these aspects of the booths. Finally, the VA is continuing the study of EMI effects on audiometric equipment to ensure that its statement of minimum needs remains accurate.

While the protester argues that the specifications are unduly restrictive of competition, where a specification reflects an agency's minimum needs, the fact that not every potential competitor is able to meet that specification does not demonstrate an impropriety. John F. Kenefick Photogrammetric Consultant, Inc., B-238384, May 4, 1990, 90-1 CPD ¶ 452. Moreover, Acoustic itself has submitted information which indicates that its booth will meet the specifications. While Acoustic's booth was tested using methods different from those specified, and did not include tests of the challenged frequencies, an independent testing laboratory has opined that "it would be reasonable to assume that the enclosure tested . . . would either meet or exceed the requirements at all of the test frequencies when tested in accordance with the procedures specified in NSA 65-6." Under these circumstances, the protester was not prejudiced by the agency's requirements; rather, it simply appears to have elected not to conduct additional tests using the specified test methods necessary to demonstrate compliance.

In this regard, Acoustic also has challenged the requirement that the booths be tested using the source of EM energy inside the booth. Since the booths are designed to shield instruments inside the booth from EM energy generated outside the booth, Acoustic argues that the testing methods should be consistent with the design, i.e., source outside and receiver inside.

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[6]For example, an earlier VA specification for the 1 kHz, 10 kHz, and 100 kHz magnetic field required EM attenuation values of 40 dB, 45 dB, and 53 dB, respectively. The final specification calls for minimum values of 3 dB, 5 dB, and 9 dB for "penetrations" and 10 dB, 20 dB, and 30 dB for walls.

Procuring agencies have the primary responsibility for establishing the testing procedures necessary to determine product acceptability and the determination of particular testing is within the expertise of the cognizant technical activity. We will not question an agency's determination of its needs unless the record shows that the determination is unreasonable. Orbital Sciences Corp., B-254698, Jan. 5, 1994, 94-1 CPD ¶ 2; Ingersoll-Rand Co., B-224706; B-224489, Dec. 22, 1986, 86-2 CPD ¶ 701.

The VA requires that the source be placed inside the booth for acceptance testing for three reasons. First, test antenna placement considerations are dictated by the restricted exterior clearances at VA audiometric booth installations. Second, the VA must protect critical, possibly life-sustaining equipment (e.g., cardiac pacemakers) which are susceptible to EMI. While the strength of the test fields are designed to be small, the VA is unwilling to risk a mistake in the test process. With the source inside the booth, even if a full power field is produced, the booth is expected to sufficiently attenuate it to prevent any harm. Third, when the test signal is beamed into the booth, it creates standing waves inside the room. The signal is then reflected around the shield, which makes it difficult to locate the leak, and may affect measurement accuracy.[7]

Both the VA and Acoustic agree that either arrangement of source and receiver yield equivalent results. Thus, the protester argues that the VA should allow bidders to submit test results using either method. However, while the tests which must be conducted by the manufacturers are not bound by considerations identified by the VA, the VA believes that, for consistency, the submittal test should be performed in the same manner as the acceptance test. The VA's rationale for this consistency is to avoid potential disputes should a booth fail the acceptance tests. If both tests are performed consistently, discrepancies due to test methodology could be ruled out. While the protester

[7]Antonio L. Cardenas, The Examination of Standards for Testing RF Shielded Enclosures, EMC Technology & Interference Control News, Jan.-Feb. 1988, at 26, 34.

disagrees with the agency's choice, it has not shown that the VA's rationale fails to support the VA's determination of its minimum need. Accordingly, we have no basis to conclude that the VA's determination is unreasonable.

The protest is denied.

for Ronald Berger
Robert P. Murphy
Acting General Counsel