

1978

Design and Construction of an Inexpensive Anechoic Chamber

Charles E. Hughes Jr.
University of Central Arkansas

Follow this and additional works at: <https://scholarworks.uark.edu/jaas>



Part of the [Quantum Physics Commons](#)

Recommended Citation

Hughes, Charles E. Jr. (1978) "Design and Construction of an Inexpensive Anechoic Chamber," *Journal of the Arkansas Academy of Science*: Vol. 32, Article 32.

Available at: <https://scholarworks.uark.edu/jaas/vol32/iss1/32>

This article is available for use under the Creative Commons license: Attribution-NoDerivatives 4.0 International (CC BY-ND 4.0). Users are able to read, download, copy, print, distribute, search, link to the full texts of these articles, or use them for any other lawful purpose, without asking prior permission from the publisher or the author.

This General Note is brought to you for free and open access by ScholarWorks@UARK. It has been accepted for inclusion in *Journal of the Arkansas Academy of Science* by an authorized editor of ScholarWorks@UARK. For more information, please contact scholar@uark.edu, uarepos@uark.edu.

General Notes

- GRAHAM, R. E. 1966. Observations on the roosting habits of the big-eared bat, *Plecotus townsendii*, in California limestone caves. *Cave Notes* 8:17-22.
- HANDLEY, C. O., JR. 1959. A revision of American bats of the genera *Euderma* and *Plecotus*. *Proc. U. S. Nat. Mus.* 110:95-246.
- HARVEY, M. J. 1975. Endangered Chiroptera of the southeastern United States. *Proc. 29th Annu. Conf. S. E. Assoc. Game and Fish Comm.* 29:429-433.
- HARVEY, M. J. 1976. Status of endangered bats in the eastern United States. *Proc. 1976 Nat. Speleol. Soc. Annu. Convention* 1976:21-24.
- HARVEY, M. J. 1978. Ozark big-eared bat. In H. O. Hillestad, ed. *Endangered and threatened vertebrates of the southeast*. Tall Timbers Res. Sta. Bull. In press.
- HUMPHREY, S. R. 1969. Disturbances and bats. *Oklahoma Underground* 2:42-44.
- HUMPHREY, S. R., and T. H. KUNZ. 1976. Ecology of a Pleistocene relict, the western big-eared bat (*Plecotus townsendii*), in the southern Great Plains. *J. Mammal.* 57:470-494.
- McDANIEL, V. R., and J. E. GARDNER. 1977. Cave fauna of Arkansas: vertebrate taxa. *Arkansas Acad. Sci. Proc.* 31:68-71.
- PEARSON, O. P., M. R. KOFORD, and A. K. PEARSON. 1952. Reproduction of the lump-nosed bat (*Corynorhinus rafinesquii*) in California. *J. Mammal.* 33:273-320.
- SEALANDER, J. A., JR. 1951. Lump-nosed bat in Arkansas. *J. Mammal.* 32:465.
- SEALANDER, J. A., JR., and H. YOUNG. 1955. Preliminary observations on the cave bats of Arkansas. *Arkansas Acad. Sci. Proc.* 7:21-31.
- SEALANDER, J. A., JR. 1956. A provisional check-list and key to the mammals of Arkansas (with annotations). *Amer. Midl. Natur.* 56:257-296.
- TWENTE, J. W. 1955. Aspects of a population study of cavern-dwelling bats. *J. Mammal.* 36:379-390.
- U. S. DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. 1973. *Threatened wildlife of the United States*. U. S. Dep. Interior. Resource Pub. 114. 280 p.

MICHAEL J. HARVEY, MICHAEL L. KENNEDY, and V. RICK McDANIEL. *Ecological Research Center, Department of Biology, Memphis State University, Memphis, Tennessee 38152, and Division of Biological Science, Arkansas State University, State University, Arkansas 72467.*

THE DESIGN AND CONSTRUCTION OF AN INEXPENSIVE ANECHOIC CHAMBER

When any degree of precision is needed in obtaining data on the radiation properties of an acoustical device such as a loudspeaker or musical instrument, measurements are usually taken under free space conditions without the presence of complicating stationary wave patterns. Indoor free space measurements require an anechoic room, a room with completely sound absorbing walls. However, a specially designed chamber can be used as a good approximation of an anechoic room.

A portable chamber, as detailed in Figures 1 and 2, can be utilized as an anechoic chamber. In never having any opposite wall face parallel to another, stationary wave patterns will be prevented from establishing themselves. This, combined with the greatly increased surface area due to approximately thirty-five hundred polyurethane wedges, will give the central area of the chamber an anechoic effect. Transmitted noise from outside the chamber is prevented by insulating the chamber with rock wool fiberglass and acoustical ceiling tile.

The walls of the chamber consist of four layers. The outer external layer consisting of three-quarter inch plywood, and, although its primary purpose is that of the skeleton of the chamber, it also serves as the first barrier against external noise. The second layer consist of two inches of rock wool fiberglass insulation, acting as an acoustical absorber of any noise which is able to penetrate the external layer. The third layer, three-quarter inch acoustical ceiling tile, provides three functions: acting as a final barrier to incident noise from the outside, providing a base from which the polyurethane foam can be attached, and absorbing sound generated from the inside of the chamber. The inner layer is a polyurethane foam forming a mosaic of alternating vertical and horizontal wedges projected normally from each surface. Each foam wedge is four square inches at its base and projects four inches toward the central area of the chamber.

The chamber is constructed in two equal parts, allowing for greater mobility, and joined with a latched tongue and groove joint. Steel mesh serves to support equipment placed in the chamber. Quarter-inch holes packed with insulation are placed on either end of the chamber giving access for microphone leads or any other test equipment leads.

While this chamber will not replace a complete full size anechoic room, it will allow for acceptable measurements of acoustical radiation. However, certain limitations are inherent in the dimensions of the chamber. Frequencies lower than 1000 Hz are of sufficient wavelength to cause concern. Any application of the chamber should be restricted to making measurements of radiation above the 1000 Hz limit. Measurements of high frequency resonance response characteristics of string instruments, frequency response of loudspeakers, or frequency characteristics of microphones are but a few of the applications of the chamber.

This chamber was constructed using funds from a grant made possible by the Bendix Corporation through the Society of Physics Students.

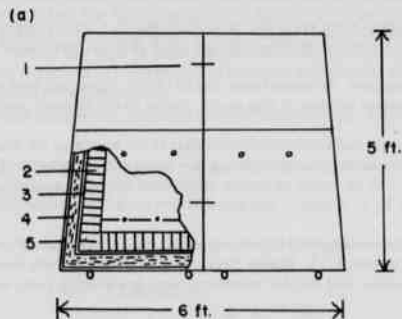


Figure 1(a). End view of chamber showing cut out view of the inside and the locations of: (1) - latches, (2) - polyurethane foam wedges, (3) - $\frac{3}{4}$ inch acoustical ceiling tile, (4) - 2 inches rock wool insulation, (5) - $\frac{3}{4}$ inch plywood.

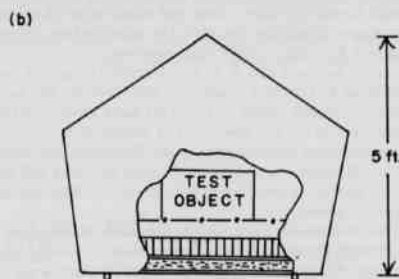


Figure 1(b). Side view of chamber showing placement of a test object supported by wire mesh.

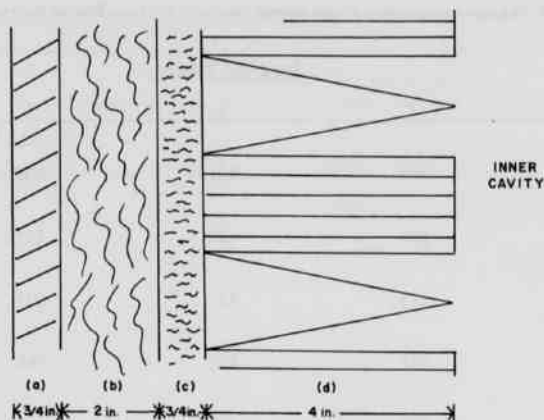


Figure 2. Cross section of the construction of a wall segment, (a)-ply-wood, (b)-rock wool insulation, (c)-acoustical ceiling tile, (d)-foam wedges.

CHARLES E. HUGHES, JR., Dept. of Physics, University of Central Arkansas, Conway, Arkansas 72032.

AGE AND GROWTH OF CARP FROM BEAVER RESERVOIR, ARKANSAS

The common carp, *Cyprinus carpio* Linnaeus, originally Asiatic, has been introduced into the United States as early as 1876 (Carlander, 1969; Pflieger, 1975). There has been no published information on the growth of carp from Arkansas reservoirs. This paper describes the age and growth of carp from Beaver Reservoir, an impoundment on the White River.

Beaver Reservoir (36°05' to 36°27'N and 93°47' to 94°06'W) located in northwest Arkansas, is a multipurpose impoundment on the White River for flood control and hydroelectric power. Dam construction was completed in 1963, became operational in 1966, and attained the designated surface area of 11,400 ha in 1968.

Of the 127 carp used in this study, 49 were collected in 1968 by rotenone, and 58 and 20 fish in 1969 and 1970, respectively, by 2.5, 3.8, 5.0, and 7.5 cm³ gill nets. Upon capture, total length in millimeters and total weight in grams were recorded, and a scale sample was taken from the body at the tip of the pectoral fin above the lateral line. Scale impressions on plastic strips were studied at 40X magnification. Scale radius and distances to each annulus were measured in the anterior field. Age determinations were made by counting the scale annuli.

The length (330 - 668 mm) - weight (454 - 3,500 g) relationship was $\log W = 3.07 \log L - 4.88985$. The regression coefficient of 3.07 was not significantly different from 3.0 ($t_{125} = 0.46$), indicating that the weight of carp increased as the cube of length.

The coefficient of condition, K, was calculated for each of the carp from the expression, $K = \frac{W}{L^3} \times 100$. The coefficient for the individual fish ranged from 0.94 to 2.16 with an average value of 1.31. The average coefficient of the Beaver Reservoir carp was similar to that of carp from Smoky Hill River (1.34) but higher than the Cedar Bluff Reservoir carp (0.94) (Stucky and Klassen, 1971). The condition coefficient did not change significantly with fish length ($t_{125} = 0.77$). English (1952), and Stucky and Klassen (1971) found the condition coefficient to decrease with increase in length. Average condition coefficients for the year classes are given in Table 1. Comparison of the year classes 1965 through 1968 resulted in a significant difference in the coefficients ($F_{3, 120} = 5.41$), and this was due to high condition coefficient for the 1968 year class.

The total length (L)-scale radius (S) relationship for the Beaver Reservoir carp was $L = 81.55 + 0.82S$ with a correlation coefficient of 0.76. The average calculated lengths at the time of annuli formation are given in Table 2. Comparison of lengths of age-groups I, II, and III revealed no difference at the 0.01 level between the year classes 1965 through 1968. Therefore, the postimpoundment growth was the same for all the year classes.

Year Class	Average K_{TL}	Number of Fish
1963	1.15	1
1964	1.30	2
1965	1.31	15
1966	1.28	54
1967	1.29	41
1968	1.48	14

Table 1. Average coefficient of condition (K_{TL}) for year classes 1963 through 1968.