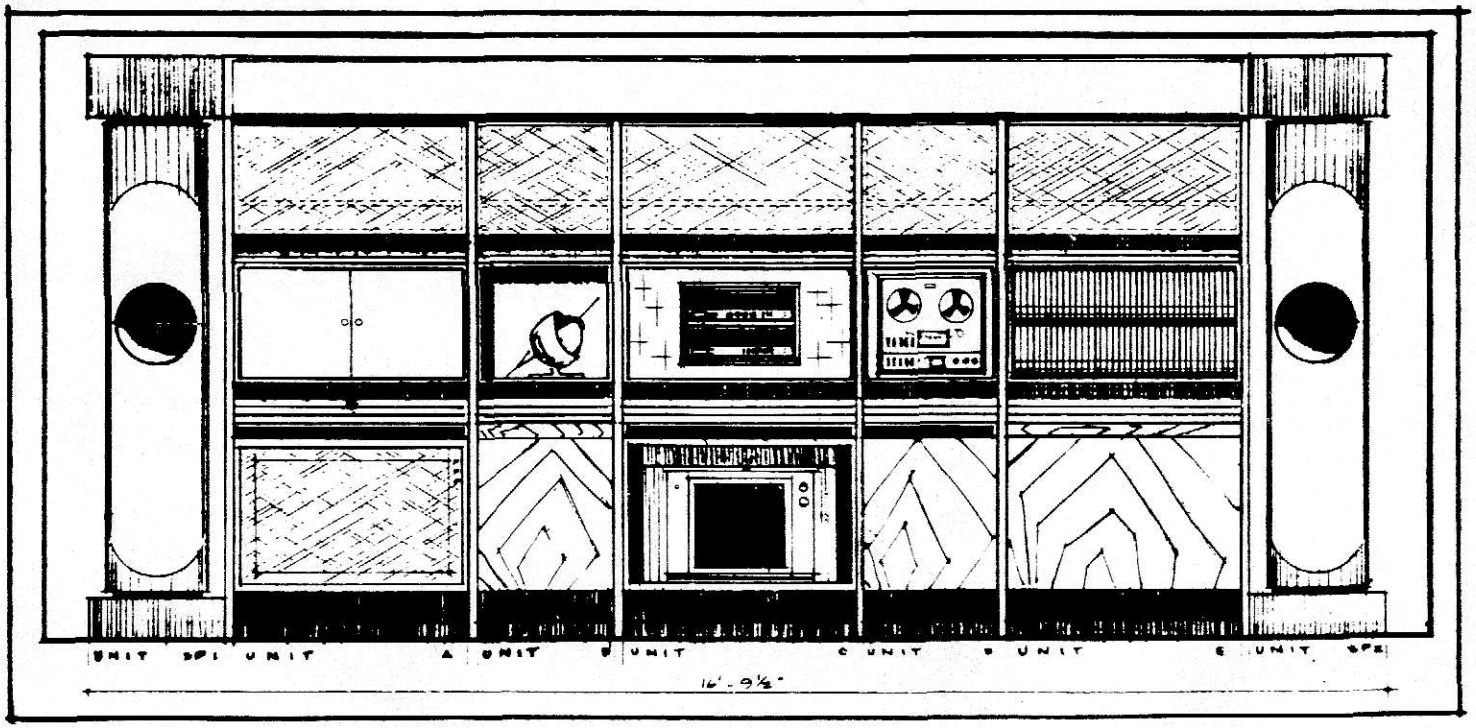
systemo 5

ENTERTAINMENT CENTER



SYSTEMO 5
AN ENTERTAINMENT CENTER

by

CLAUDE A. KEITHLEY

B. Architecture, Kansas State University, 1965
M. Regional and Community Planning, Kansas State University, 1973

A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF ARCHITECTURE

Department of Interior Architecture
College of Architecture and Design

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1973

Approved by:

ACKNOWLEDGMENTS

The sincere appreciation is gratefully acknowledged to all persons who contributed to the completion of this project, and especially my wife who has reluctantly dedicated one room of her house to totally contemporary design.

TABLE OF CONTENTS

INTRODUCTION

THE NEED

Housing is a complex system which provides a comprehensive solution for many of our every day environmental needs. The predominant focus in housing has emphasized the enclosure forming the space for living. When housing is approached as a total system, however, it is necessary to address the need for other essential aspects, including furniture.

The home environment affects our sense of well being, dignity and identity. Without appropriate furniture it is impossible to create a home in which personalities can develop and prosper. Space within a home must reach out to the needs of different peer groups in respect to privacy, interaction and function. When space is limited, this is difficult to accomplish and many problems may develop. The situation can be alleviated to some degree, however, if certain kinds of furnishings are used and the space is utilized to its best advantage.

One such concept of efficient space utilization which has considerable merrit is the complete storage wall system. University dormitories, contemporary apartment dwelling units, and major showrooms and shops frequently use similar modular storage units which are designed for flexible arrangements. Many such systems have space allocated for beds, desks, hanging and flat storage, and many are built on casters for flexibility. These wall systems are in essence "living centers" and provide for the needs of the rooms occupants and, in addition, leave free space in the center of the room.

Nearly all of the major furniture manufacturers have recently been publicizing modular, flexible furniture systems for commercial usage in their "open-landscaped" system. The same concept is, in fact, applicable

to the residential market.

The majority of current housing stock in the country is designed and built by contractors rather than progessionally trained architects. This housing stock is designed with two basic rules in mind:

(1) Provide minimum square footage of living space.

(2) Provide little, if any, amenities in order to keep the cost low and profit high.

This means, essentially, that very little space in the new home is thus devoted to storage of various kinds, and interior furnishings represent the only recourse to providing storage capability.

The impetus for the modular storage and entertainment center described in this report thus arose out of the lack of storage space in a contractor built house. Functionally, many components were needed in the system, however, due to the nature of the electronic components, flexibility was not of prime importance. The system was, however, designed to provide initial flexibility in the assembly stage which could afford anyone the opportunity to arrange the units as desired. Another consideration was that of expansion using the same design motif.

DESIGN CONCEPT

DESIGN CONCEPT

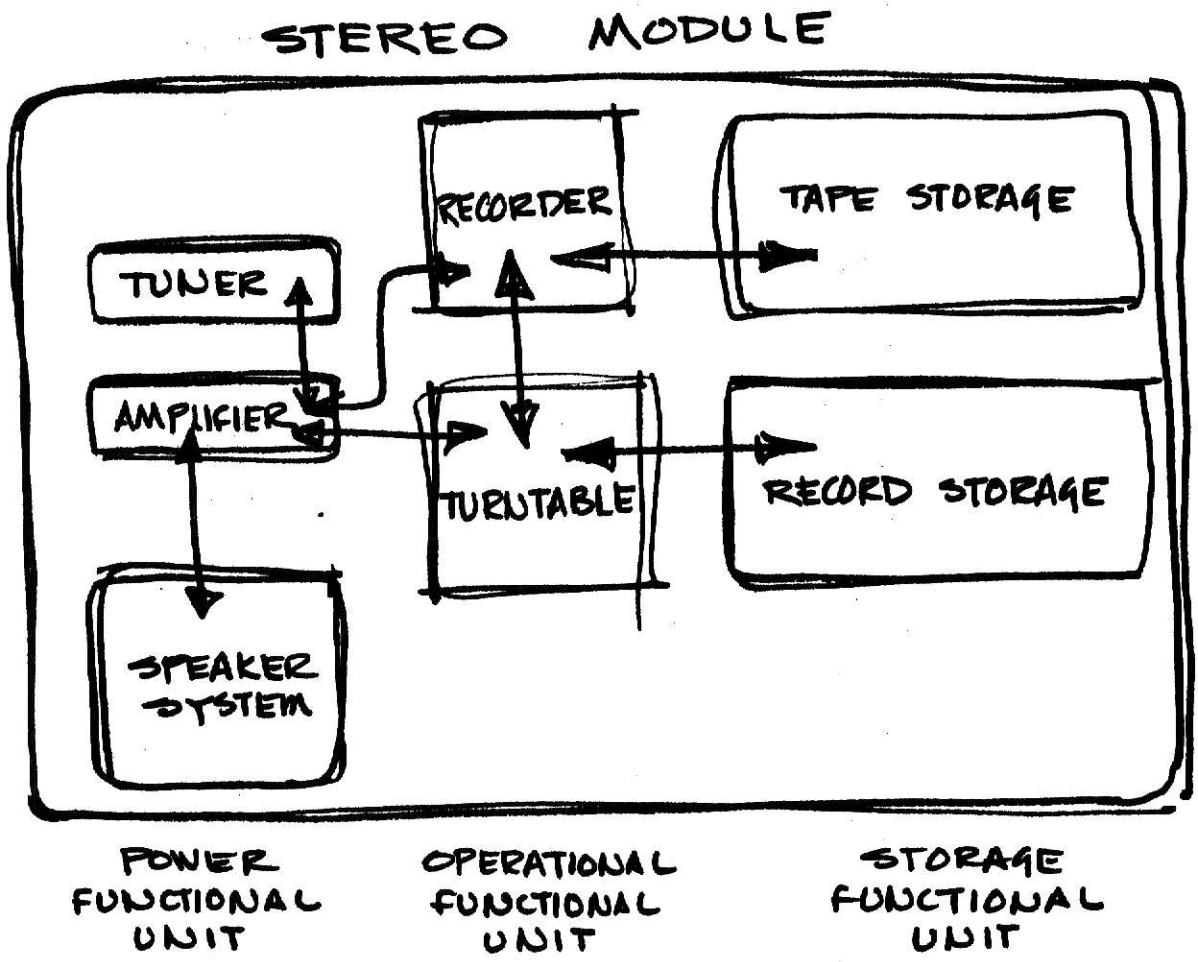
The initial idea for the design of an entertainment center arose from the personal need for a system which would replace an existing stereo component cabinet and provide needed ancillary storage capability for related items. A modular approach was selected as the most appropriate means of fitting that need and still be capable of expansion and remain flexible, since the ultimate location of such a unit could not be determined at the time of its inception and completion.

A system of the magnitude necessary would logically be the focal point of the room due to its very nature. The system was conceived as a free-standing system thus necessitating vertical supports. The electronic components required an integrated connection system which would allow assembly and connection from the front of the system. Thus, horizontal wire chases were a necessity to the final design.

Obviously, certain inter-relationships existed between the electronic components which dictated specific physical locations within the system. The tape recorder should be located near the library tape storage system; the record storage should be located near the turntable; the physical dependency and connection to the stereo amplifier and tuner required a close proximity to the other components. In order to accomplish the transference of disc recorded material to tape storage, a functional physical link between the turntable and recorder was necessary. These relationships are shown in the following diagram of a potential stereo module:

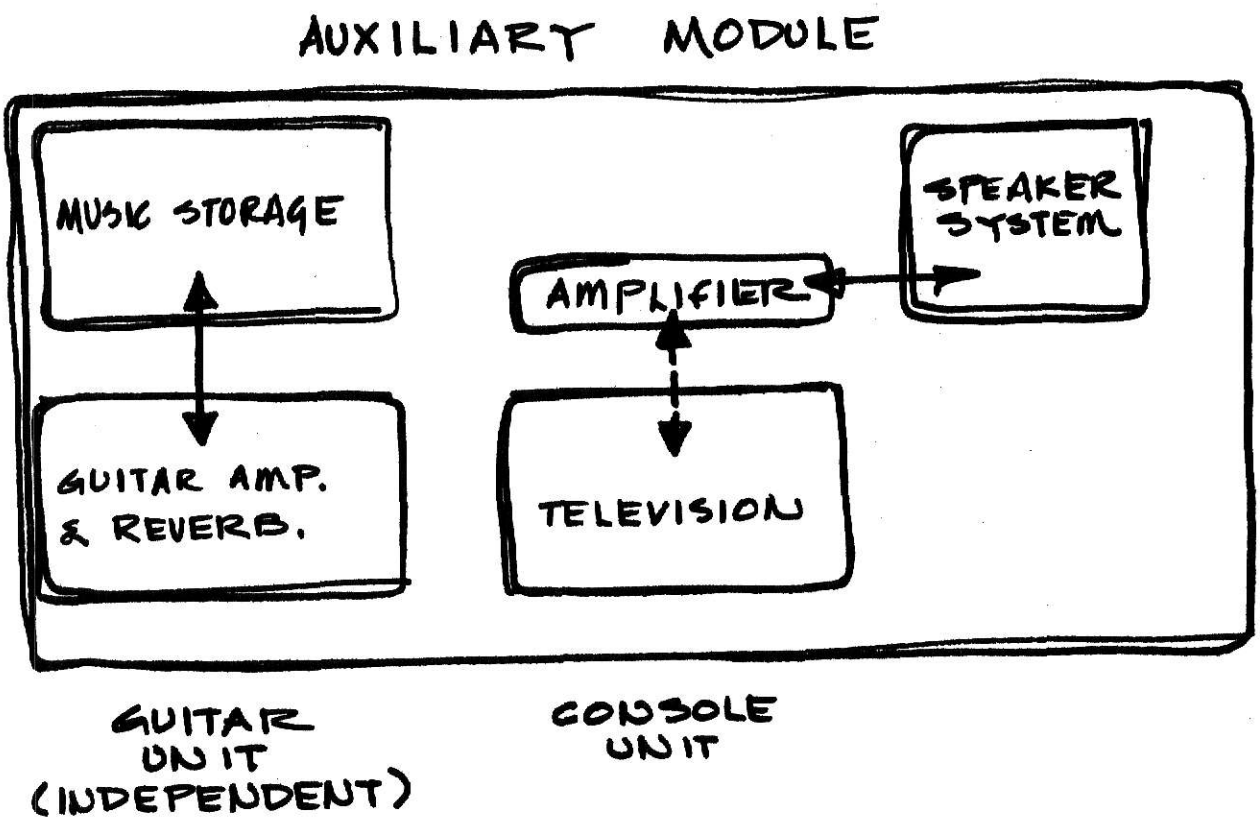
THIS BOOK CONTAINS NUMEROUS PAGES WITH DIAGRAMS THAT ARE CROOKED COMPARED TO THE REST OF THE INFORMATION ON THE PAGE.

THIS IS AS RECEIVED FROM CUSTOMER.



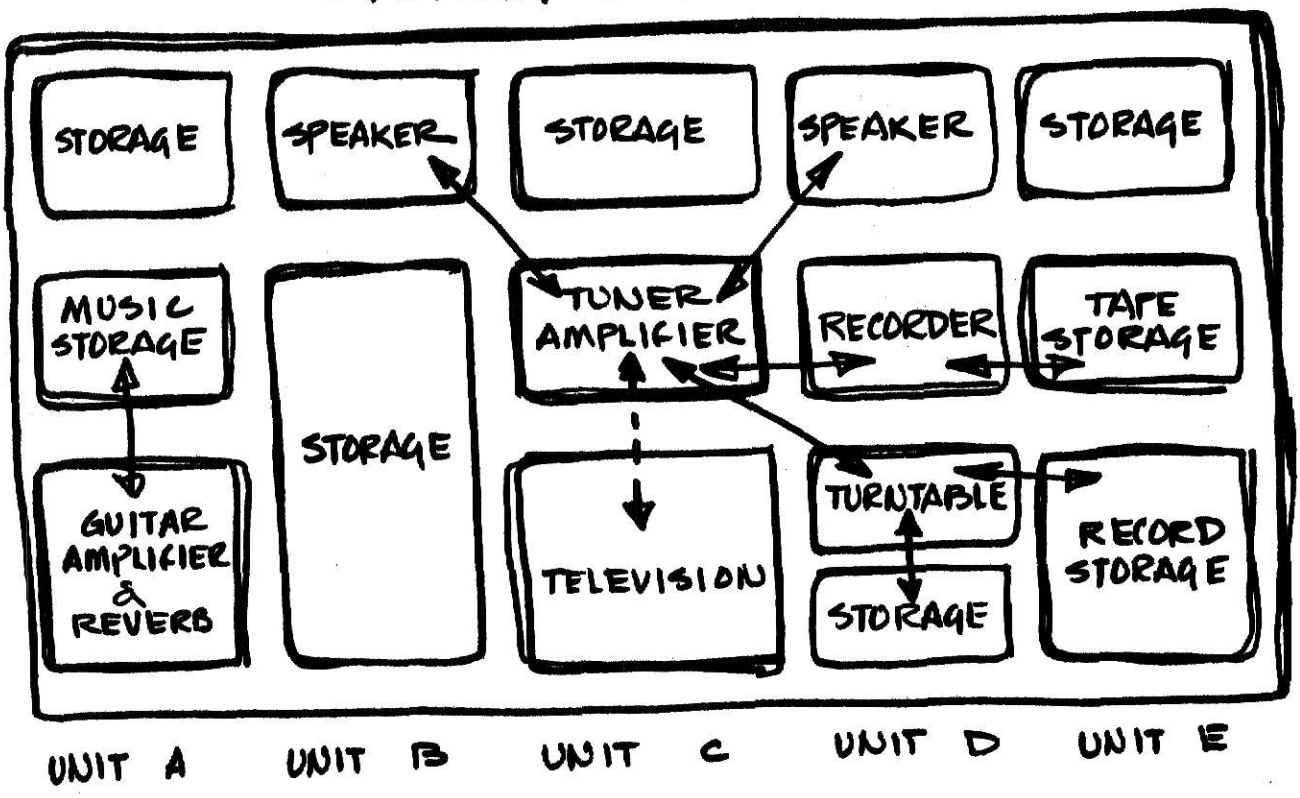
Due to the amounts of storage needed and human factor considerations in the placement of controls for a right-handed person, the stereo function seemed to indicate three distinct modules.

At this stage, an inventory was taken concerning ancillary capabilities of this proposed system. As such, television capability was desirable. Electric guitar amplifiers, music storage and reververation units for the guitar were also desirable, speaker systems were a must and ultimately a piano module was anticipated. These functions had relatively little relationships to the stereo module with the possible exception of the television, which could be modified to utilize the stereo sound system.



Thus the basic system was devised using the illustrated relationships and accepted design standards for placement of speakers. The total relationships for the system, which was designed for a right-handed person is shown in the following figure.

SYSTEM RELATIONSHIPS



The expansion of the system was effected to use as efficiently as possible the total wall area of a tentative location, and provide some related storage of various household good as necessary. The following section lists the important physical design considerations in the form of dimensional needs for each component.

DESIGN CONSIDERATIONS

FUNCTIONAL CONSTRAINTS

	DESIGN DIMENSIONS
UNIT A	
FENDER VIBRASONIC AMPLIFIER	21 x 27 x 12
DANDELECTRIC REVERBERATION UNIT	6½ x 6 x 18.5
SHEET MUSIC STORAGE	9 x 12 x CUSTOM
UNIT B	
PIONEER CS-33 SPEAKER	11 x 21 x 8
UNIT C	
HEATHKIT AR-15 STEREO AMPLIFIER	6¼ x18½ x 12½
HEATHKIT AJ-15 FM TUNER	6¼ x18¼ x 12½
ZENITH COLOR TELEVISION	18 x 25 x 20
EXHAUST FANS (2)	
THREE CHANNEL COLOR ORGAN (2)	CUSTOM
KOSS PRO-4A STEREO HEADPHONES	STORAGE
CONTROL PANEL	
REALISTIC 4 CHANNEL SYNTHESIZER (QUATRAVOX)	2 3/4 x 7¼ x 5 3/8
DIGITAL CLOCK	
SCIENCE FAIR COLOR ORGAN/LIGHT CONTROL (2)	7 x 10 x 6
MASTER POWER SWITCH	
LIGHT DIMMER SWITCHES	
MULTIPLE SPEAKER SELECTOR SWITCHES (2 OF 6 EA)	
ELECTRICAL OUTLETS (10)	
TIMED EXTENSION CORD	
UNIT D	
TEAC A-1500-W TAPE DECK	17 x15½ x 9 3/4
DUAL 1019 AUTOMATIC TURNTABLE	16 x 16 x 7½
PIONEER CS-33 SPEAKER	11 x 21 x 8
EXHAUST FAN (1)	
UNIT E	
RECORD STORAGE	12½ x 12½ x 72
BASF TAPE STORAGE BOXES (80)	7 7/8 x 29/32 x 7 3/8
SONY BULK TAPE ERASER	5 x 7 x 3
MICROPHONES & TAPING SUPPLIES	VARIABLE
UNIT SP 1 & 2	
NIVICO SPECTRUM SOUND SPEAKER (1 PER UNIT)	13½ DIA.
THREE CHANNEL COLOR ORGAN (2 PER UNIT)	CUSTOM

MODULE 7a
DETERMINANT

MODULE DETERMINANT

Given the expressed inter-relationships of the components and the functional constraints of the previous sections, the physical design process began to evolve. A recapitulation of the steps in the process is not deemed as necessary, however the evolution of the module size is worthy of note. Comparisons of cubic space needs were made and the result were two basic module widths for efficient utilization of the space. Tape storage and record storage requirements (Unit E) exceeded the requirements of the Television module (Unit C) and guitar amplifier module (Unit A) in terms of width, and, thus set the first module width at 38½ inches. The second module width was essentially determined by the speaker component width, which exceeded the widths required by both the turntable and recorder thus setting the module width for Unit B and Unit D at 22½ inches.

Unit heights were derived using tables and graphics presented by Henry Drefus in his book entitled The Measure of Man and is graphically illustrated in the vertical support design section. It was impossible as well as undesirable to separate the design of the total entertainment system from the concept of design with human factors.


MATERIAL

MATERIAL SELECTION

The wall system as envisioned is a massing of thirty-six individual components (excluding end speaker columns) into a horizontal system of five vertical units (lettered A thru E) each containing six vertically stacked units for the various components and functions.

As a horizontal unit, it was deemed desirable to utilize "Zebrano" wood for the wood front planes due to its vertically striped grain. It was felt that the grain would set up a rhythm that would complement the horizontality of the entire system. Zebrano would also be used for the top planes to maintain the continuity of the design.

To refrain from creating the "too much wood" look, and to integrate the materials of the electronic components, black plexiglas and brushed aluminum was selected as complementary materials. After a three month search for a fabric which would blend with the colors of Zebrano and plexiglas, an undulating patterned fabric was found which matched perfectly the colors and created within the pattern the feeling of moving music and maintained the verticality of the rhythm established with the Zebrano front panels. The interplay of the wood, plexiglas, aluminum and fabric adds a strong dynamic unity to the total composition.

Bronzed facia metal (extruded aluminum shapes) were utilized for the horizontal wire chases, a black slate formica kick plate and white formica (over particleboard) vertical support members finished the composition. In all cases, the colors and materials of the electronic components integrated into the total design.

LIGHTING

LIGHTING

Recessed in the upper storage units and speaker enclosures are Blue GE floodlights encased in while plastic sewer pipe to illuminate the equipment and controls located in the lower storage units. All lights (in two circuits) are controlled from the master control panel and are connected to a series of light dimmer switches which offer controlled light patterns within the interior environment.

In that moving light has the ability to create visual illusions, color organs were included in the design to stimulate the observer and bridge the gap between pure sound and pure light. The design incorporated several color organs located at strategic positions to motivate the observer to movement between the components. This objective requires a custom installation which is a part of the long range installation plan.

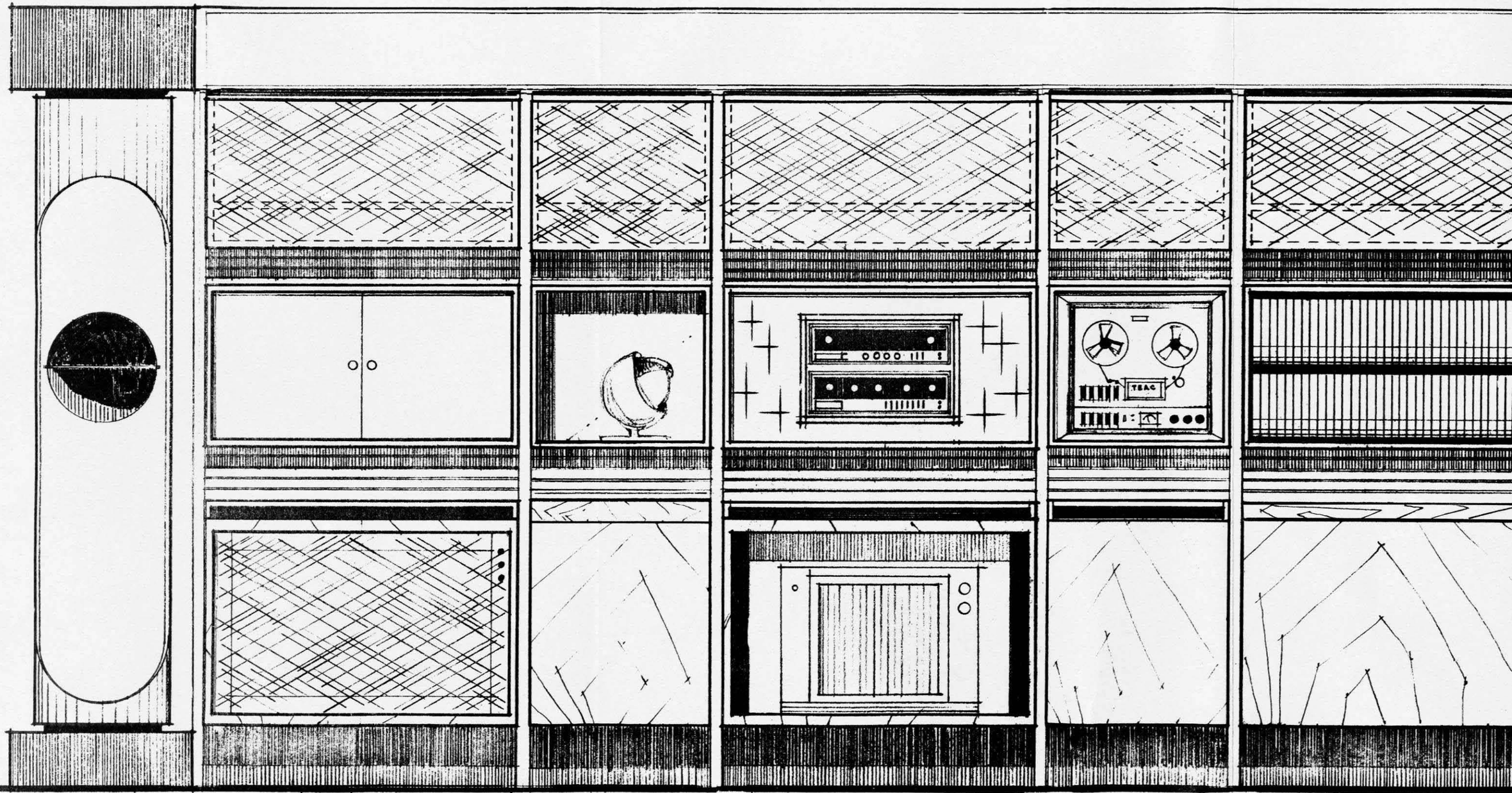
VENTILATION

VENTILATION

Since heat is a definite problem with tube and solid state electronic equipment, various exhaust fans are located at strategic points within the modules to circulate air around the components. For the most part, small six inch fans are used. However, due to the heat problems around a television, a 20 inch exhaust fan is mounted at the rear of that component.

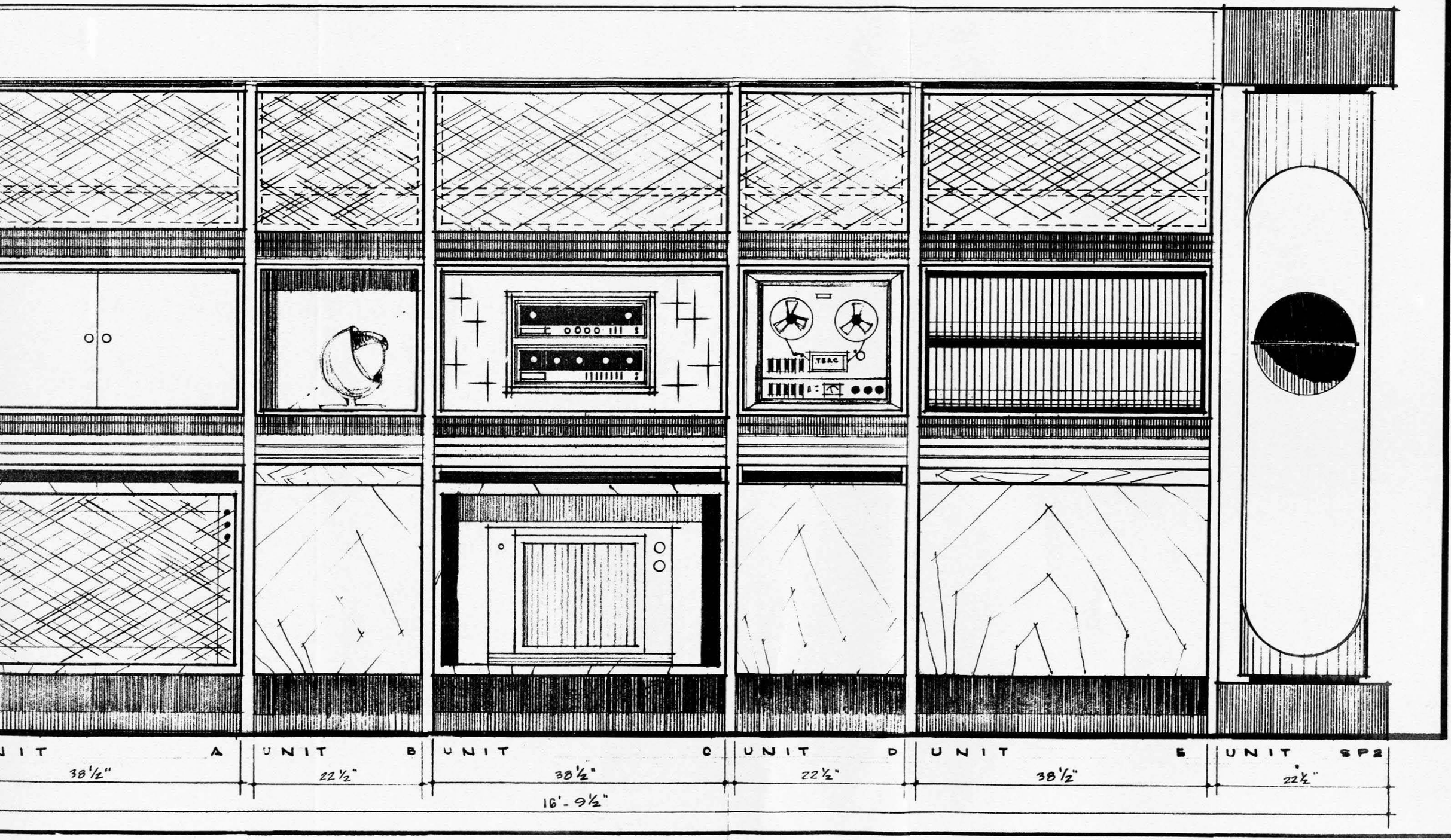
This also indicates that certain precautions are necessary in the placement of the system next to an existing wall. It is suggested that a minimum of six inches be allowed between the wall and units to facilitate the air flow created by the exhaust fans.

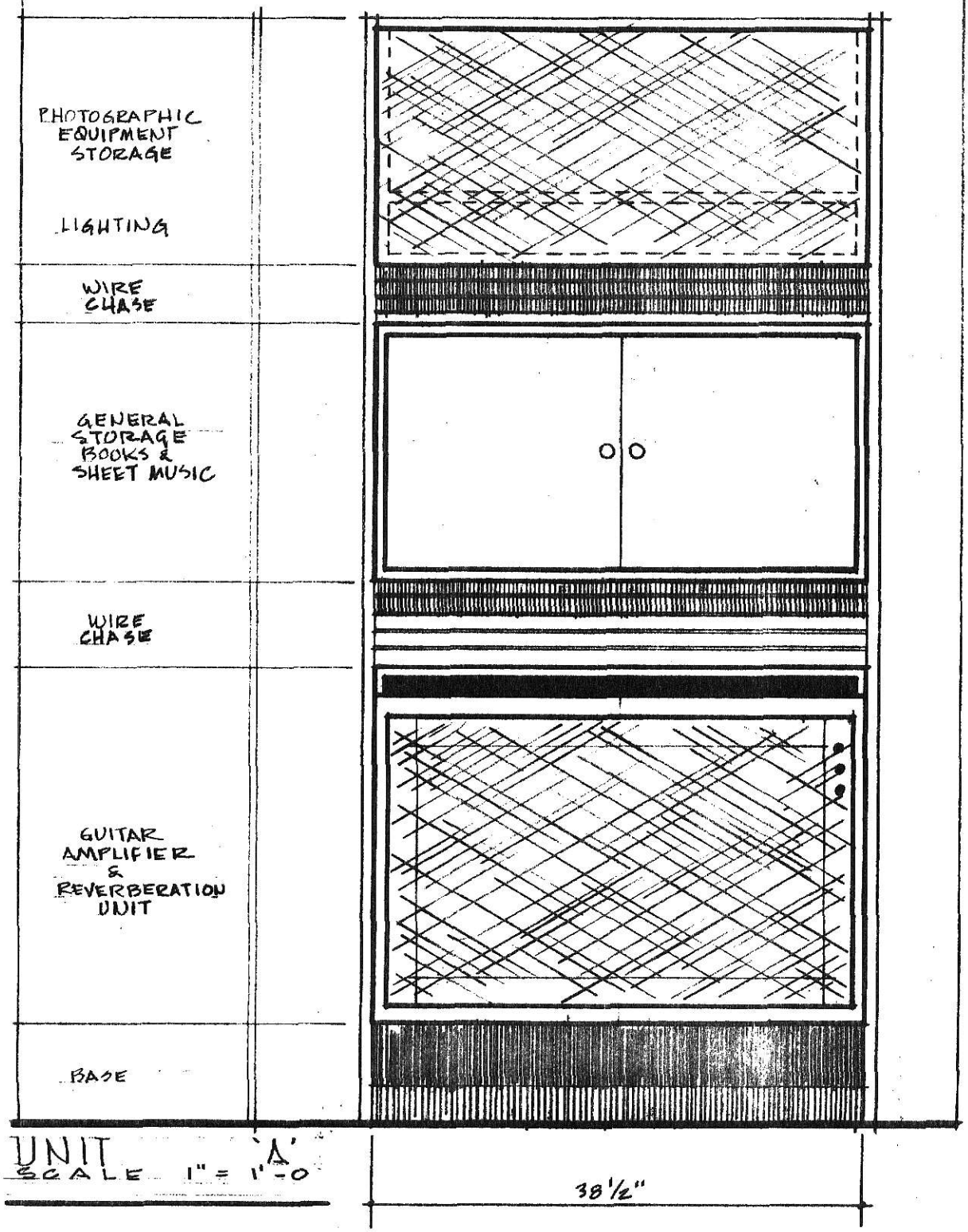
SYSTEM DESIGN



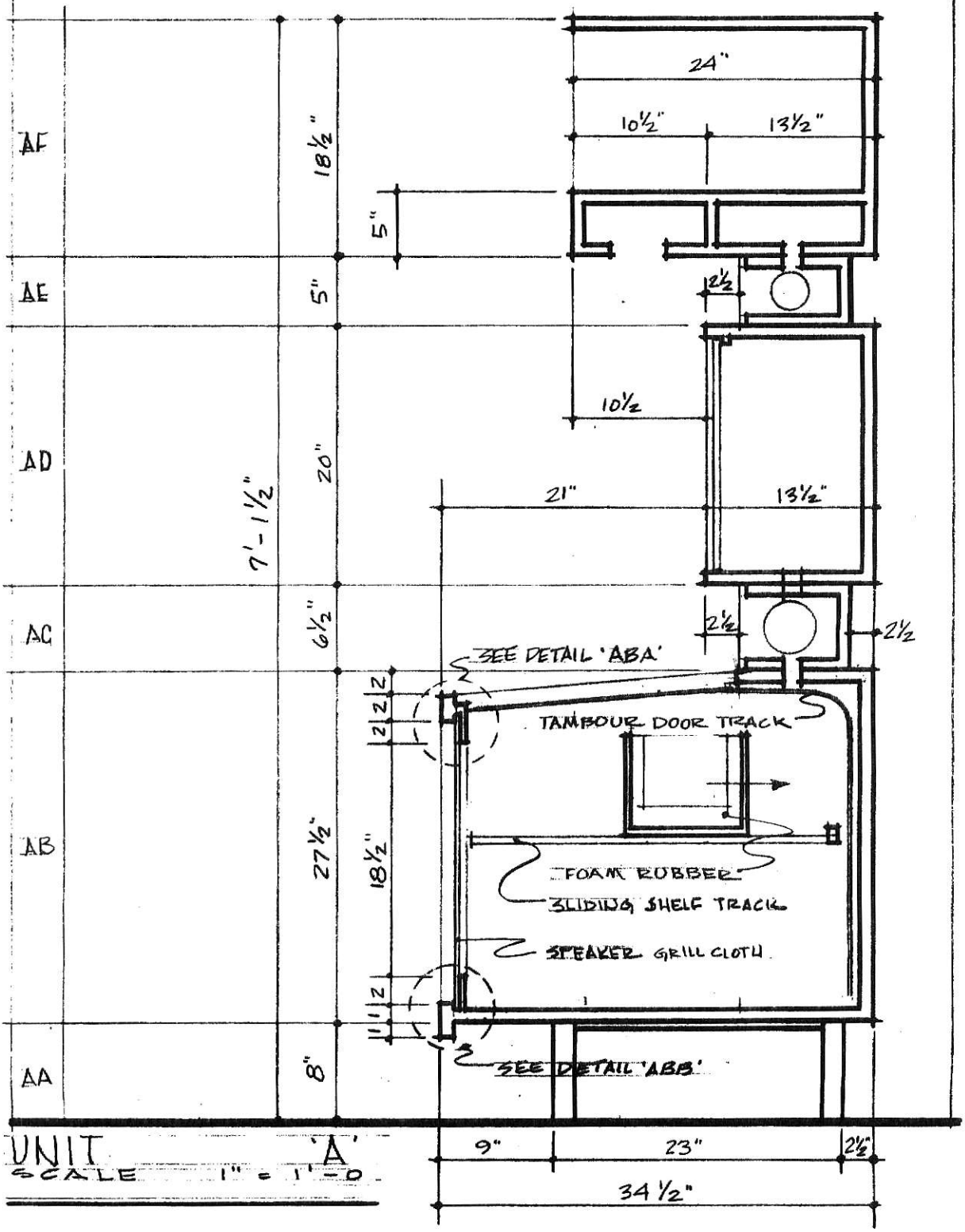
UNIT SP1	UNIT A	UNIT B	UNIT C	UNIT D	UNIT
22½"	38½"	22½"	38½"	22½"	38½"

16'-9½"


TEAC
UNIT A
38½"
UNIT B
22½"
UNIT C
38½"
UNIT D
22½"
UNIT E
38½"
UNIT SP2
22½"
16'-9½"



UNIT 'A'
SCALE 1" = 1'-0



UNIT 'A'
SCALE 1" = 1'-0"

PIONEER CS-33 SPEAKER ENCLOSURE

LIGHTING

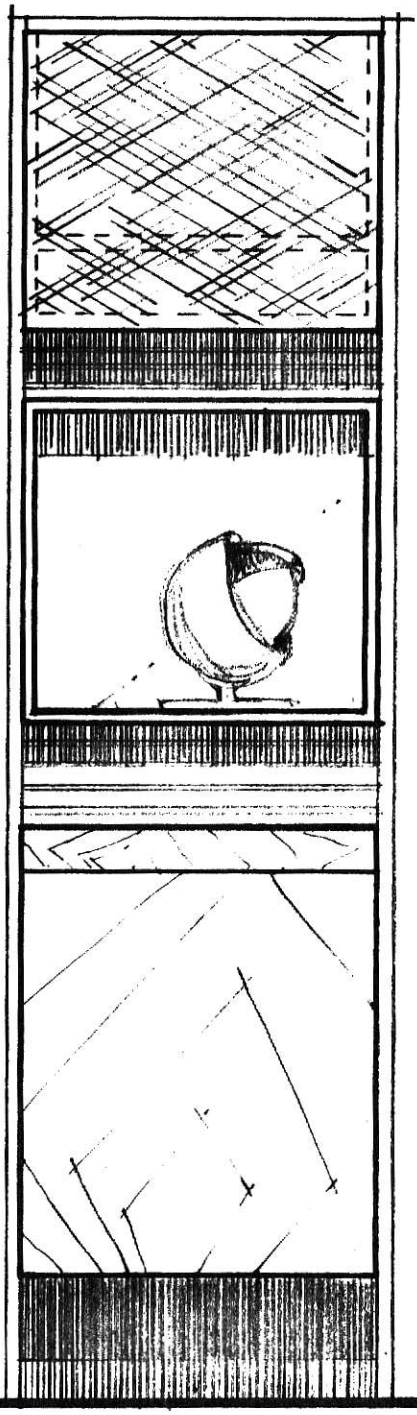
WIRE CHASE

SCULPTURE. (FUTURE STEREO SYSTEM EXPANSION)

WIRE CHASE

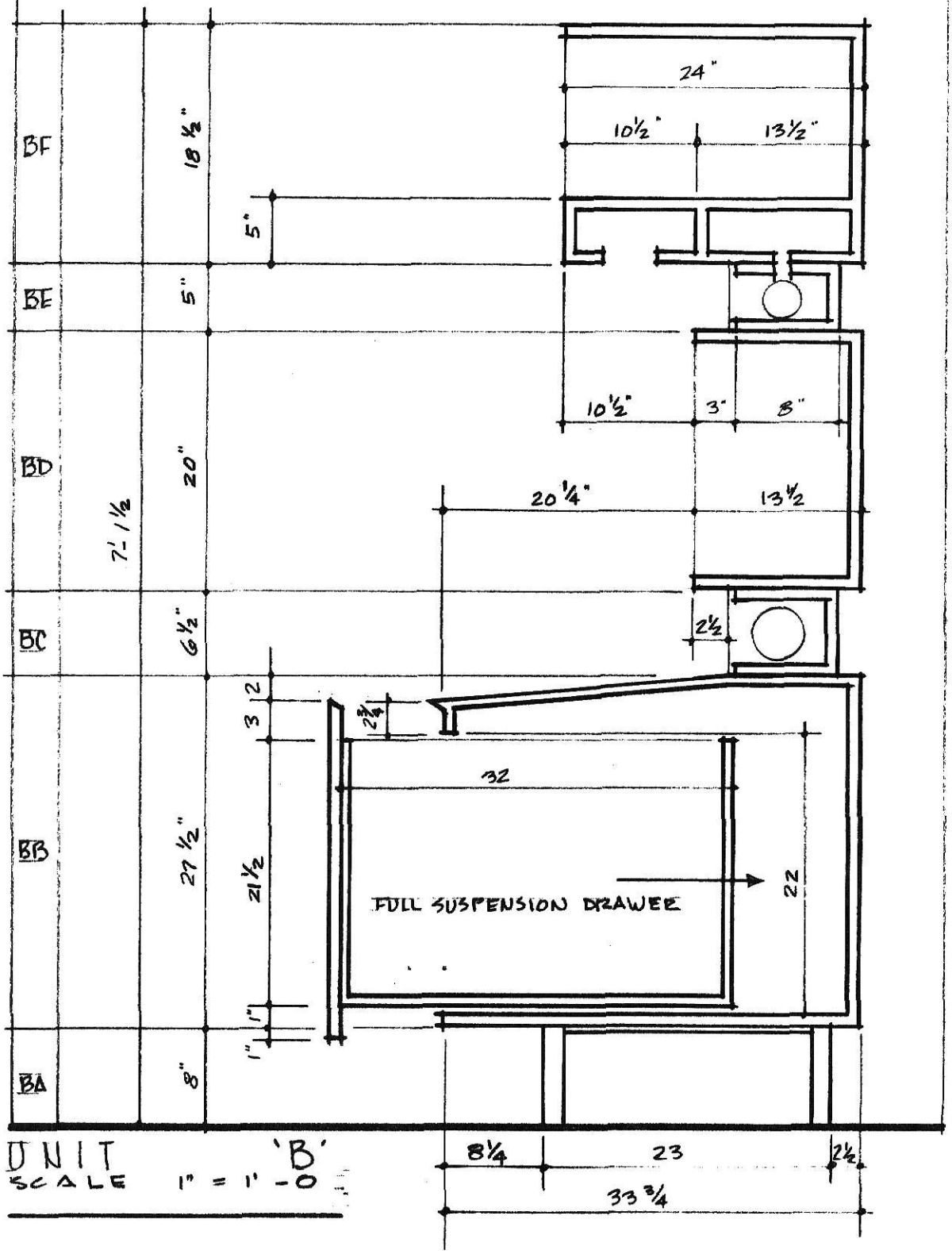
TAPE RECORDER

BASE

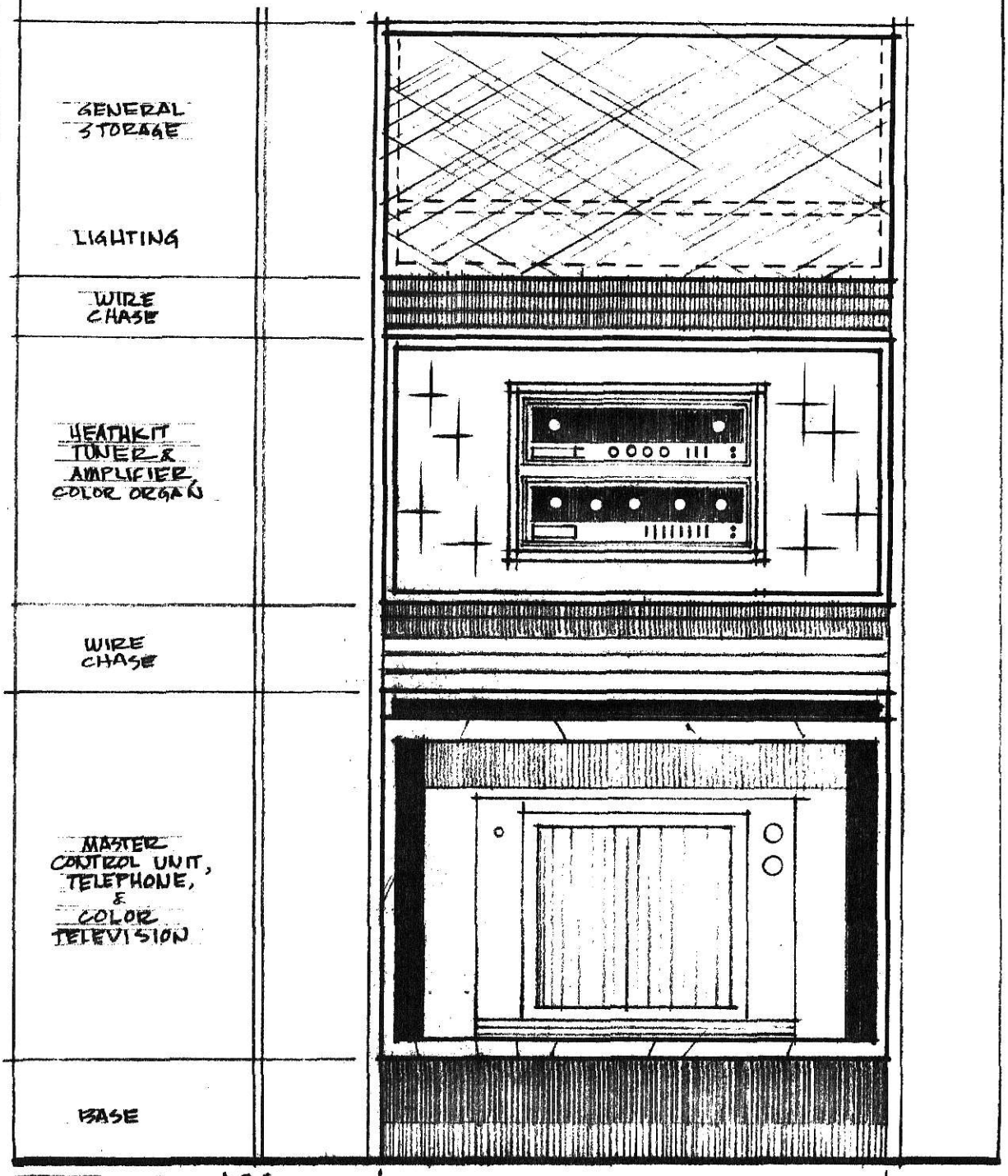


22 1/2"

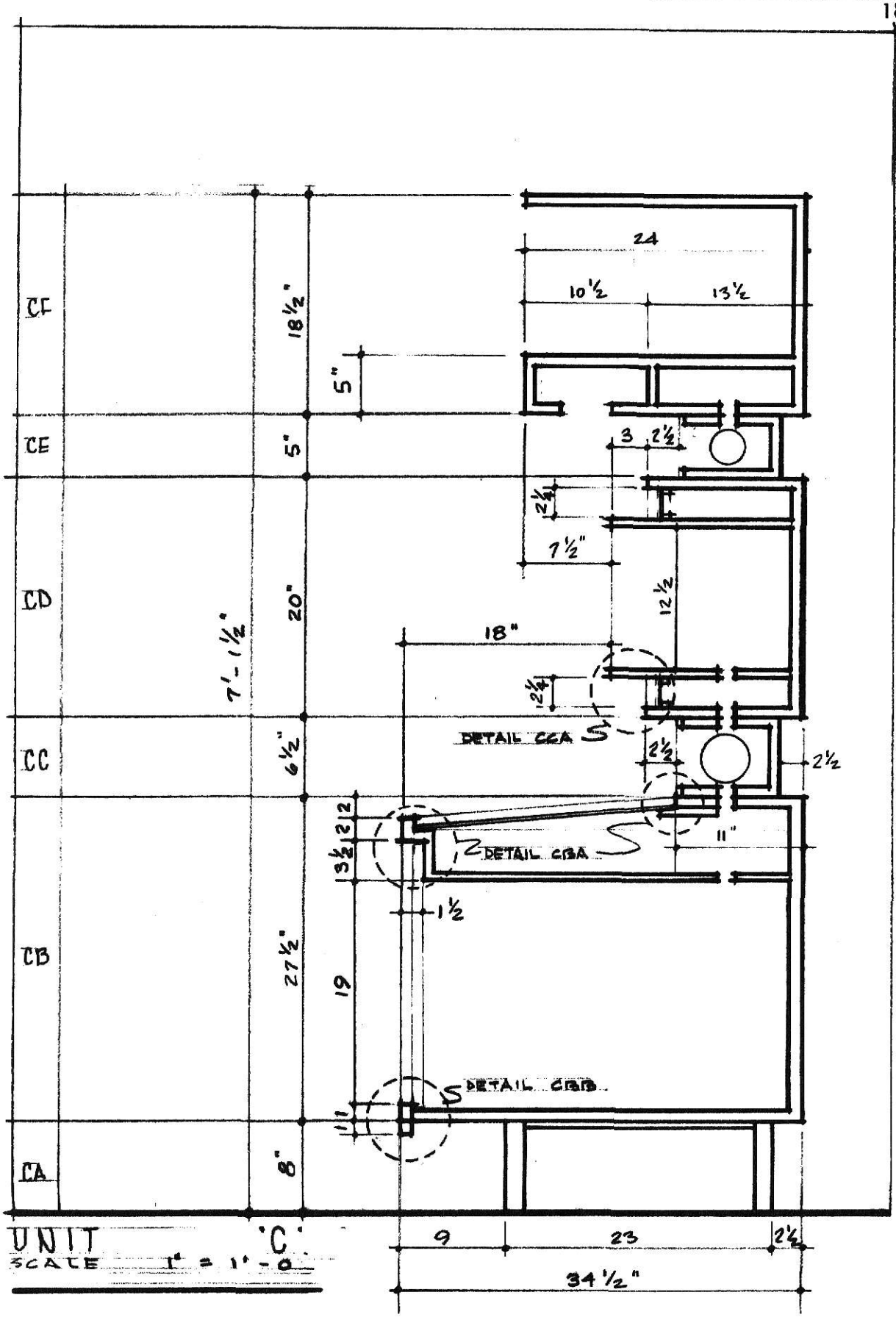
UNIT 'B'
SCALE 1" - 1'-0



UNIT 'B'
SCALE 1" = 1'-0"

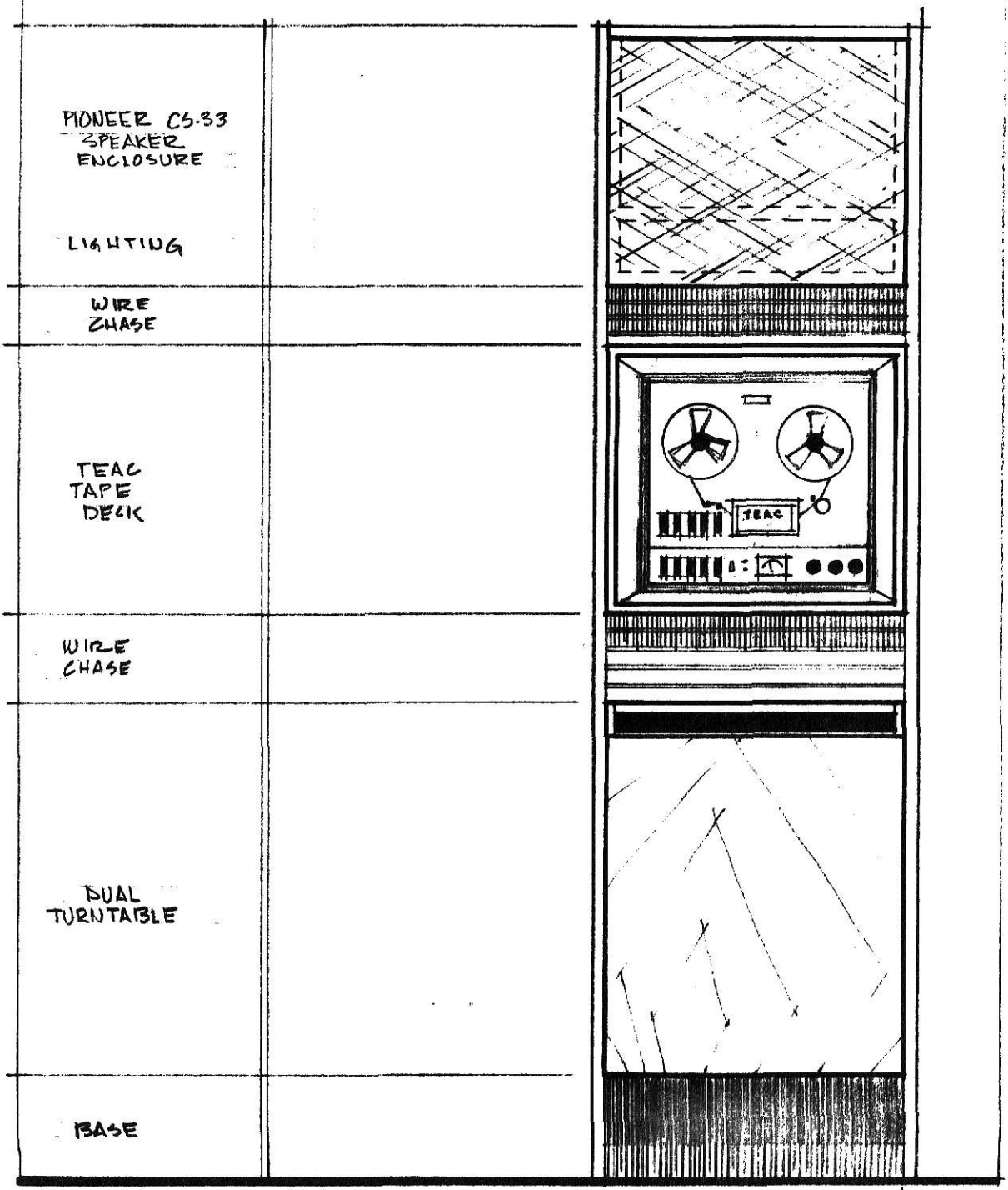


UNIT 'C'
SCALE 1" = 1'-0"

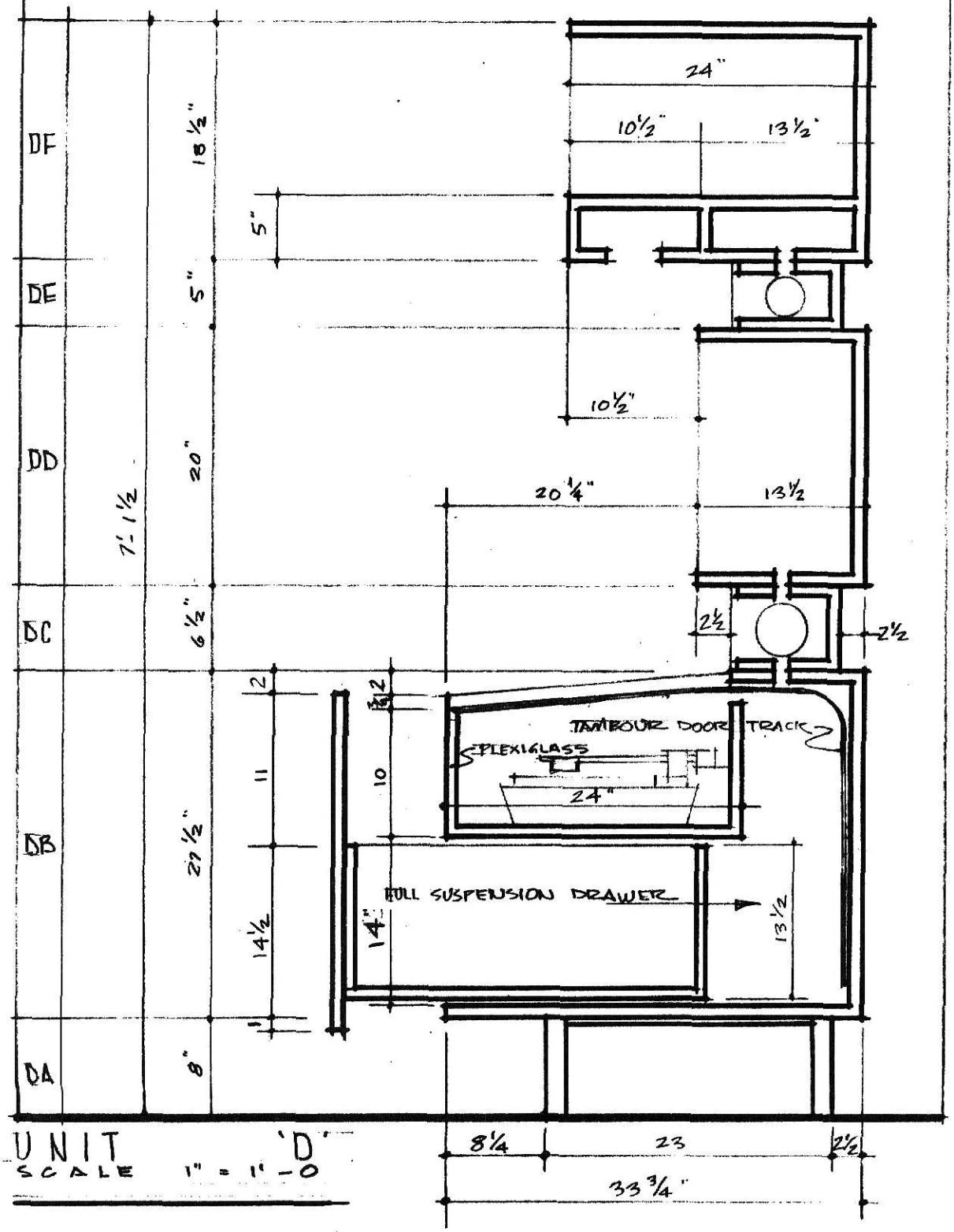


UNIT 'C'

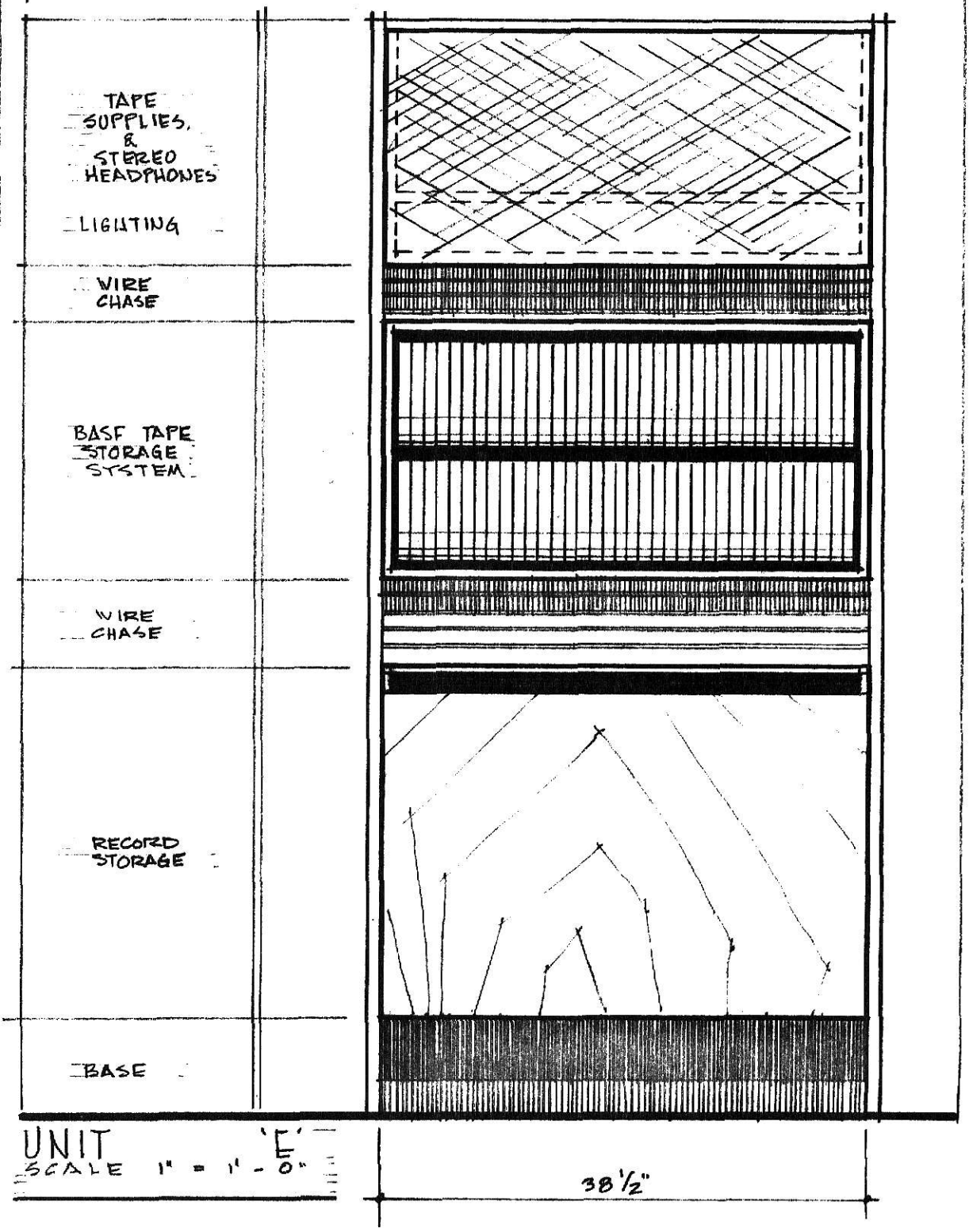
SCALE 1" = 1'-0"



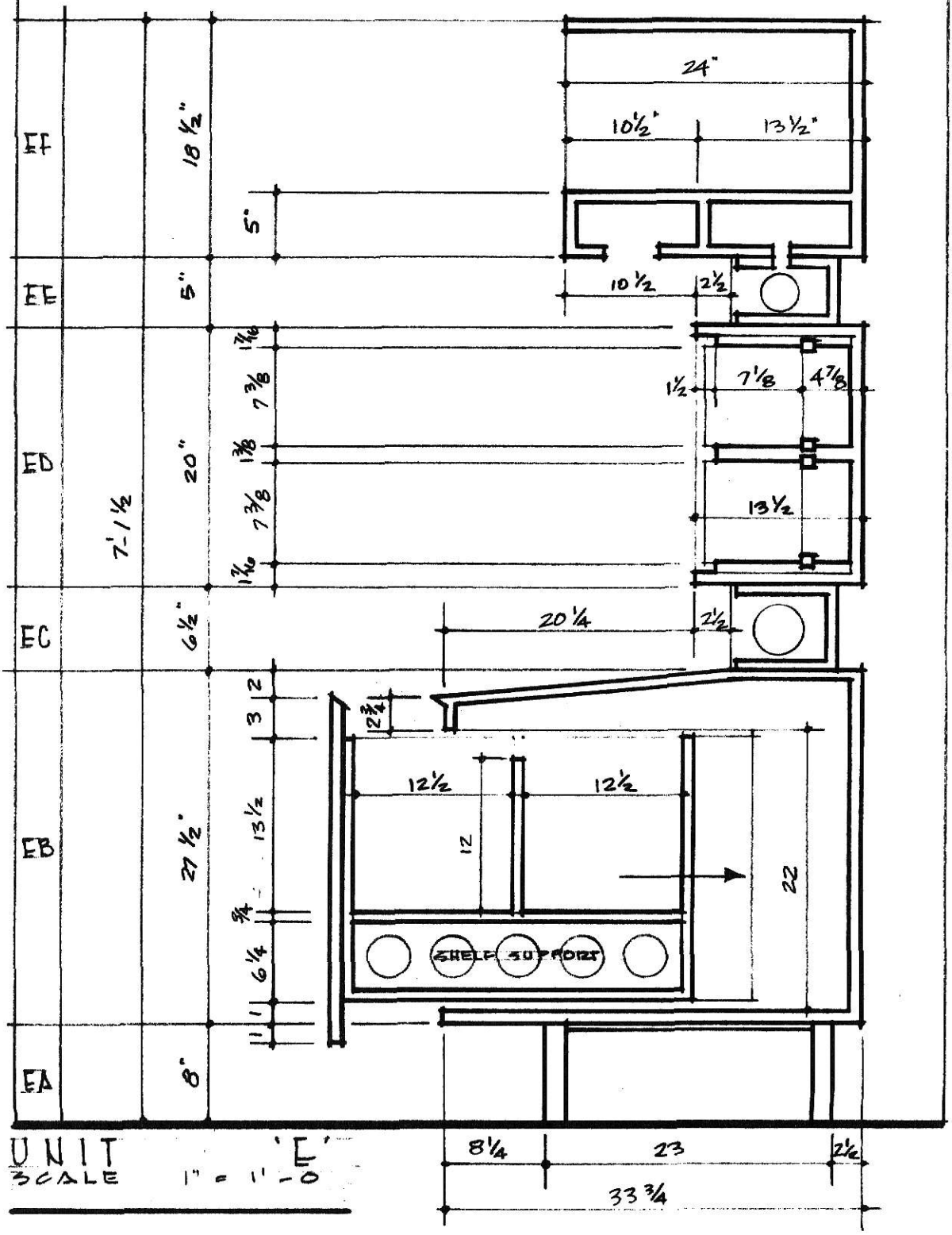
UNIT 'D'
SCALE 1" = 1'-0



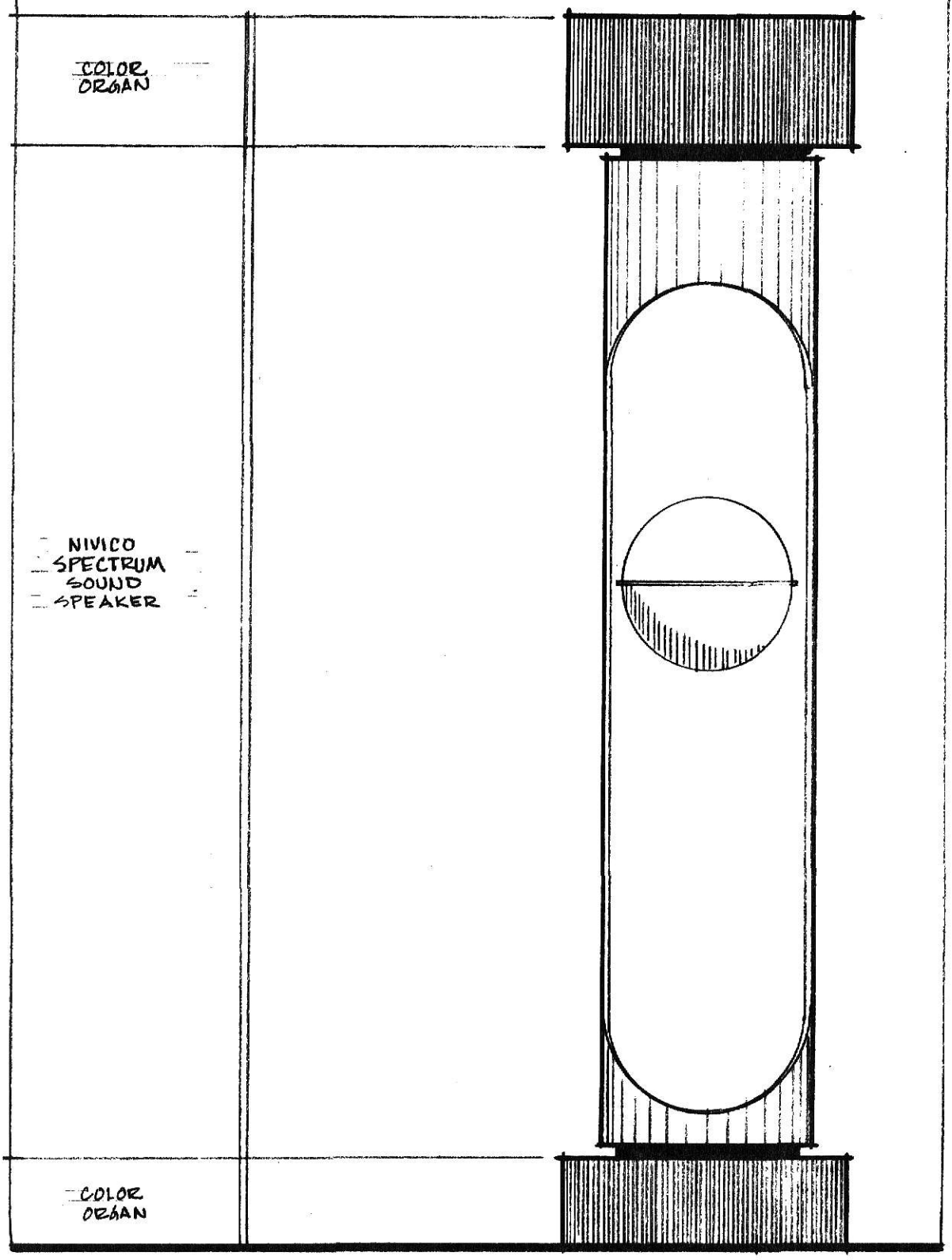
UNIT 'D'
SCALE 1" = 1'-0



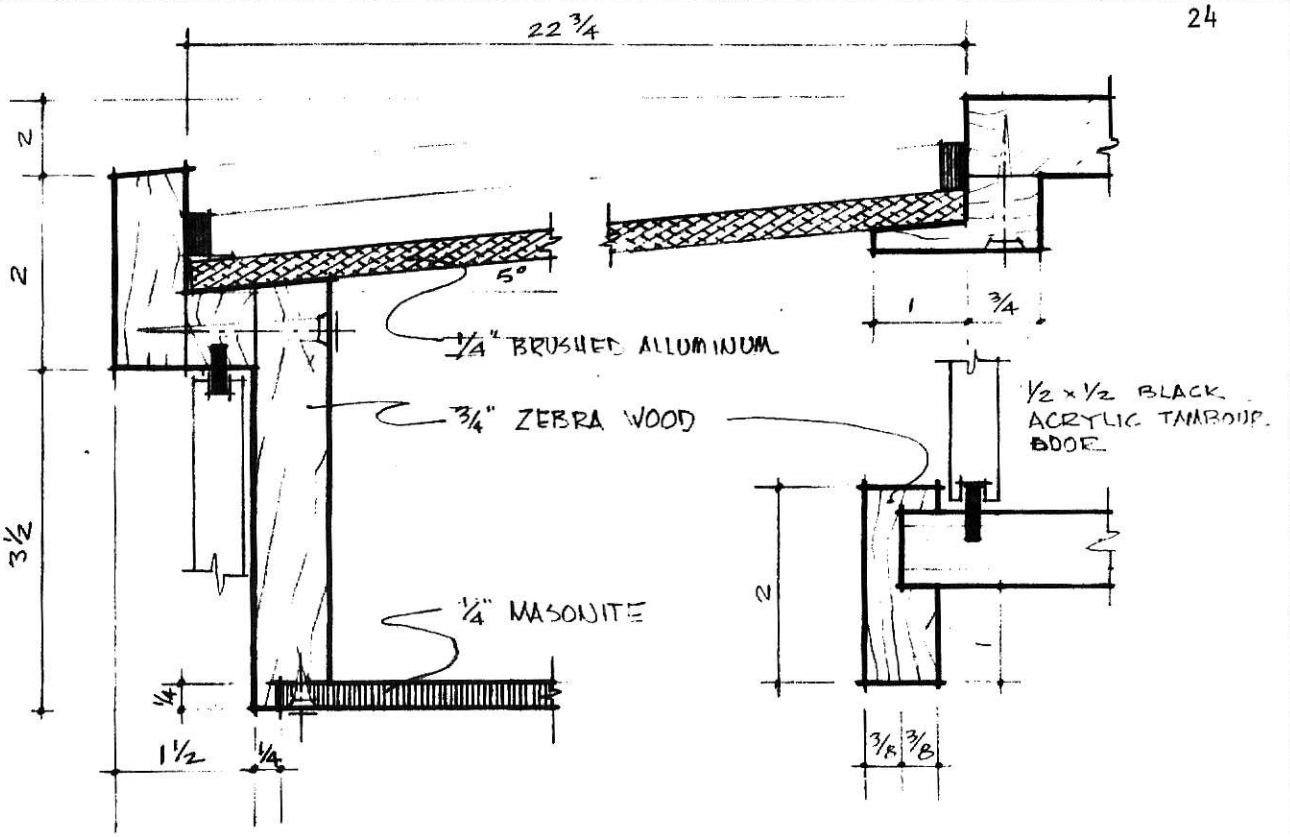
UNIT 'E'
SCALE 1" = 1'-0"



UNIT 'E'
SCALE 1" = 1'-0

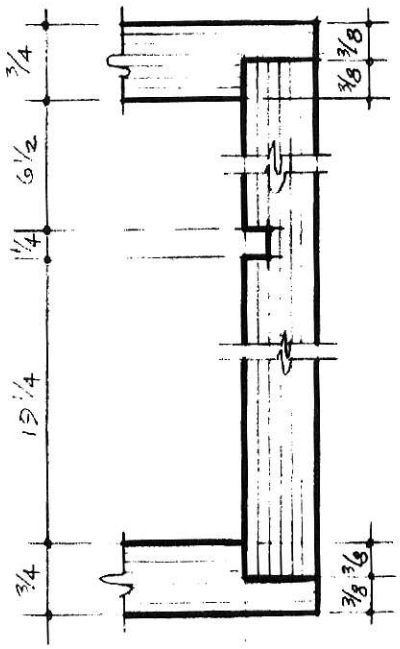


SPEAKER UNIT
SCALE 1" = 1'-0

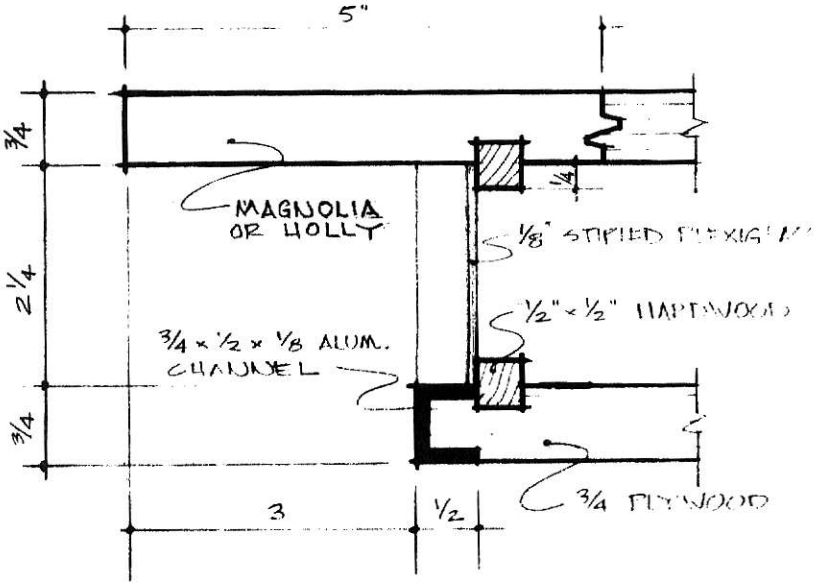


DETAIL 'CBA'
SCALE HALF SIZE

DETAIL 'CBB'
SCALE HALF SIZE



SECTION 'CB BACK
SCALE HALF SIZE



DETAIL 'CCA'
SCALE HALF SIZE

COMPUTER DESIGN OF VERTICAL SUPPORT MEMBERS

In the design process relating to the vertical support members, the emerging necessity of using a curved support became apparent to the total design composition. It was, thus, desirable to derive a mathematical equation for this curve in order to effect the layout of the uniform curve on the particleboard.

The BEST Computer terminal and a RASS program for determining a least squares polynomial regression curve equation for an estimated curve of degree 2 was used to approximate the curve of the vertical support member. Having the mathematical equation, a program was written in WATFIV (FORTRAN BASE) to calculate the horizontal co-ordinates of the curve at a one inch interval. This greatly facilitated the accomplishment of the construction of the vertical support members. The calculations, program and design elevation of the vertical support member follows.

DETERMINATION OF MATHEMATICAL ESTIMATING EQUATION FOR VERTICAL SUPPORT MEMBERS

POLYNOMIAL REGRESSION OF DEGREE 2

INTERCEPT 0.4210730E 02 ——— $a_0 = 42.10730$

REGRESSION COEFFICIENTS

1 -0.1186401E 01 ——— $a_1 = -1.18640$

2 0.1206707E-01 ——— $a_2 = 0.01206$

STANDARD ERROR OF ESTIMATE 0.45933

ANALYSIS OF VARIANCE FOR 2 DEGREE POLYNOMIAL

SOURCE OF VARIATION	D.F.	SUM OF SQ.	MEAN SQ.
ATTRIBUTABLE TO REGRESSION	2	632.035	316.017
DEVIATION FROM REGRESSION	11	2.321	0.211
TOTAL	13	634.355	

REDUCTION OF SUM OF SQUARES OVER THE PREVIOUS DEGREE... 549.534

TABLE OF RESIDUALS

CASE NO	Y OBSERVED	Y ESTIMATED	RESIDUAL	STD.RESID.
6.000	36.000	35.423	0.577	1.256
12.000	30.000	29.608	0.392	0.853
18.000	24.000	24.662	-0.662	-1.441
24.000	20.000	20.584	-0.584	-1.272
30.000	17.000	17.376	-0.376	-0.818
36.000	15.000	15.036	-0.036	-0.078
42.000	13.500	13.565	-0.065	-0.141
48.000	13.000	12.963	0.037	0.082
54.000	13.500	13.229	0.271	0.590
60.000	15.000	14.365	0.635	1.383
66.000	16.500	16.369	0.131	0.285
72.000	19.500	19.242	0.258	0.562
78.000	23.000	22.984	0.016	0.035
84.000	27.000	27.595	-0.595	-1.295

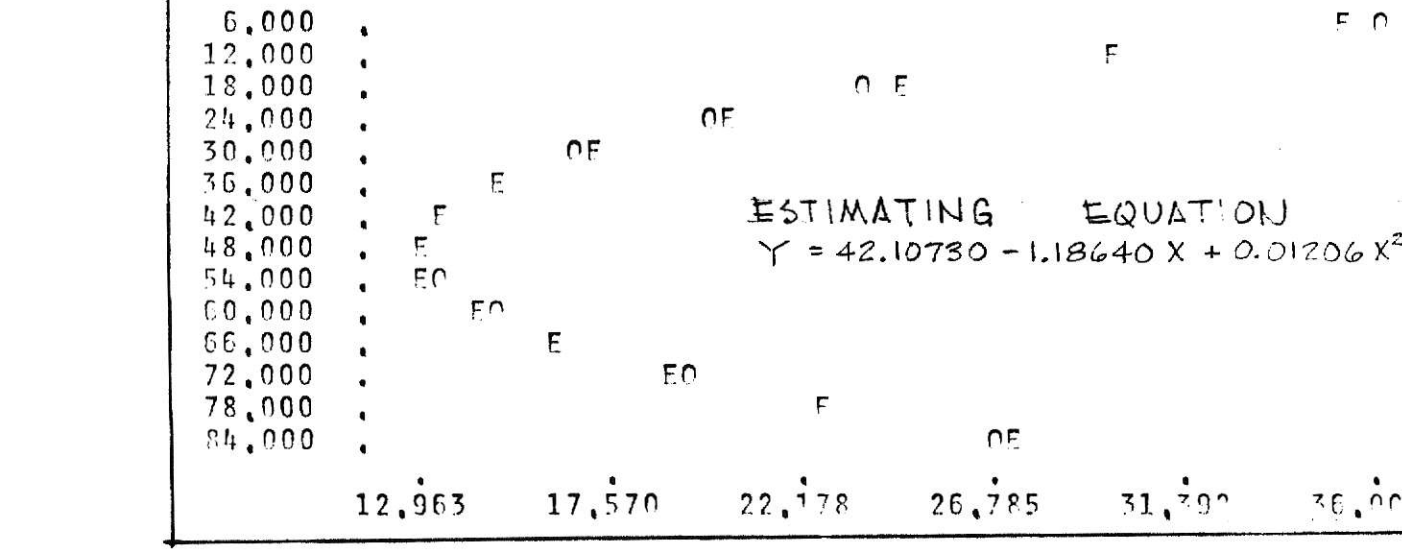
TEST OF EXTREME RESIDUALS

RATIO OF RANGES FOR THE SMALLEST RESIDUAL..... 0.074

RATIO OF RANGES FOR THE LARGEST RESIDUAL..... 0.200

CRITICAL VALUE OF THE RATIO AT ALPHA = .10 ... 0.402

PLOT Y OBSERVED AND Y ESTIMATED



WAIF IV PROGRAM FOR VERTICAL SUPPORT CALCULATIONS IN INCREMENTS OF ONE INCH.

PROGRAM : IBM 360 : LANGUAGE, FORTRAN

```
// WATFIV      JOB (ACCOUNT), NAME, CLASS=8
$JOB
      DO  10  I=1,84
      Y=42.10730-1.18640*I+0.01206*(I*I)
  10  PRINT, I,Y
      STOP
      END

$ENTRY
```

PROGRAM RESULTS (REVISED TO INDICATE END SLOPE)*

X	Y EST.	X	Y EST.
*0	32.50000	45	13.14078
6	35.42305	46	13.05183
7	34.39342	47	12.98701
8	33.38792	48	12.94632
9	32.40654	49	12.92975
10	31.44928	50	12.93729
11	30.51614	51	12.96895
12	29.60712	52	13.02472
13	28.72221	53	13.10463
14	27.86145	54	13.20865
15	27.02478	55	13.33678
16	26.21225	56	13.48904
17	25.42384	57	13.66542
18	24.65955	58	13.86592
19	23.91936	59	14.09053
20	23.20329	60	14.33928
21	22.51135	61	14.61214
22	21.84354	62	14.90912
23	21.19983	63	15.23021
24	20.58025	64	15.57544
25	19.98479	65	15.94478
26	19.41345	66	16.33824
27	18.86623	67	16.75583
28	18.34312	68	17.19753
29	17.84415	69	17.66335
30	17.36928	70	18.15327
31	16.91185	71	18.66734
32	16.49193	72	19.20553
33	16.08943	73	19.76787
34	15.71106	74	20.35423
35	15.35680	75	20.96477
36	15.02666	76	21.59947
37	14.72063	77	22.25821
38	14.43872	78	22.94113
39	14.18095	79	23.64813
40	13.94728	80	24.37927
41	13.73775	81	25.13454
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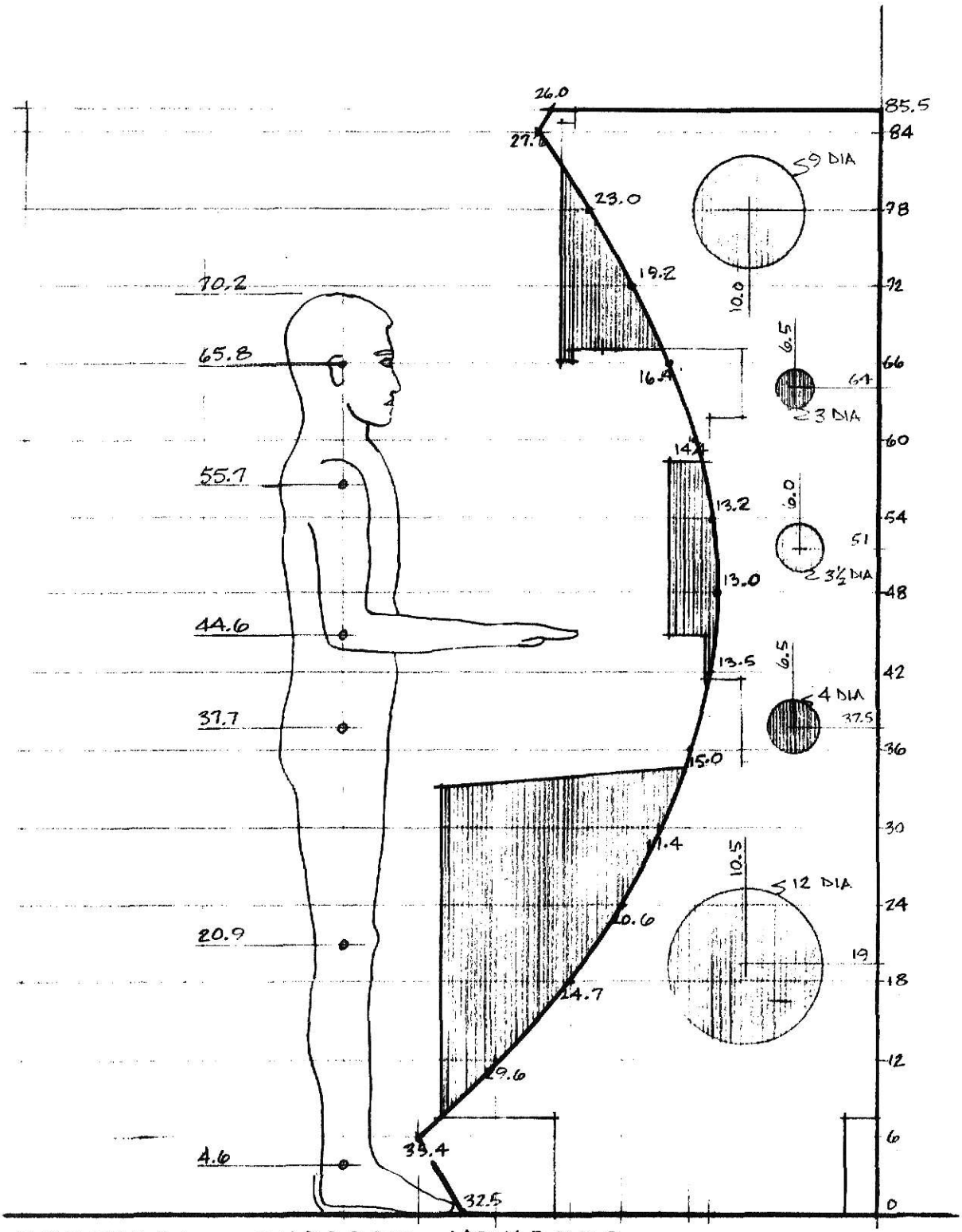
44	13.25385	84	27.54504
		*85.5	26.00000



VERTICAL SUPPORT MEMBERS
SCALE 1" = 1'-0

PHOTOGRAPHS

PROJECT COST

SYSTEMO 5: PROJECT COST

LAB. FEES		$ 22.50
WOOD		$ 618.67
Zebrano (50 bd ft)	$ 80.00	
Zebrano Veneer (120 sq ft)	$ 62.50	
3/4 Hardboard on Fir (21 sheets)	$ 181.10	
3/4 Fir Plywood (10 sheets)	$ 120.00	
3/4 Particleboard (13 sheets)	$ 114.59	
2 x 10 Fir (50 lin ft)	$ 33.04	
Masonite	$ 27.44	
FORMICA (12 sq ft slate)		$ 9.36
PLEXIGLAS		$ 109.01
METAL		$ 85.26
Snap-on Aluminum Trim (48 lin ft)	$ 18.00	
Bronzed Facia Metal (26 lin ft)	$ 56.00	
Aluminum Drawer Pulls (13 lin ft)	$ 2.90	
1 x 1 Angle Iron	$ 8.36	
HARDWARE & MISCELLANEOUS FASTENERS		$ 118.32
Contact Glue	$ 9.37	
Paint	$ 60.57	
Fasteners & Catches	$ 17.34	
Hydraulic Hinges	$ 21.25	
Fabric	$ 9.79	
ELECTRICAL SUPPLIES		$ 166.88
MISCELLANEOUS EXPENSES (estimated)		$ 70.00
TOTAL COST		$ 1200.00

ABSTRACT

SYSTEMO 5
AN ENTERTAINMENT CENTER

by

CLAUDE A. KEITHLEY

B. Architecture, Kansas State University, 1965
M. Regional and Community Planning, Kansas State University, 1973

AN ABSTRACT OF
A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF ARCHITECTURE

Department of Interior Architecture
College of Architecture and Design

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1973

Problem: It is universally accepted that man possesses five senses which enable him to evaluate the relationships between himself and the environment. Those five elements are enumerated as follows: (1) sight; (2) hearing; (3) touch; (4) smell; & (5) taste. The fields of art and architecture have for the most part dealt mainly with the creation of visual elements (buildings, sculpture, complexes) to exploit the sense of "sight", with little, if any, consideration given to the remaining four senses other than what occurs naturally within the environment, i.e. hearing noise, & smelling pollution.

Interior Architecture, on the other hand has the potential of uniting and controlling the two senses of sight and hearing within the confines of environmental architecture. By so doing, man can be exposed to a unique experience. With the addition of computerized controls, man can be subjected to a series of unique experiences within the same environment.

Objectives: It is the basic objective of this research to study the coupling of the visual and the auditory senses within the context of the enhancement of the interior environment. It is a contention that a dynamic environment which conducts man in, around, and through space, related to the function of the space can be a useful tool for the alleviation of monotony fostered by static architecture.

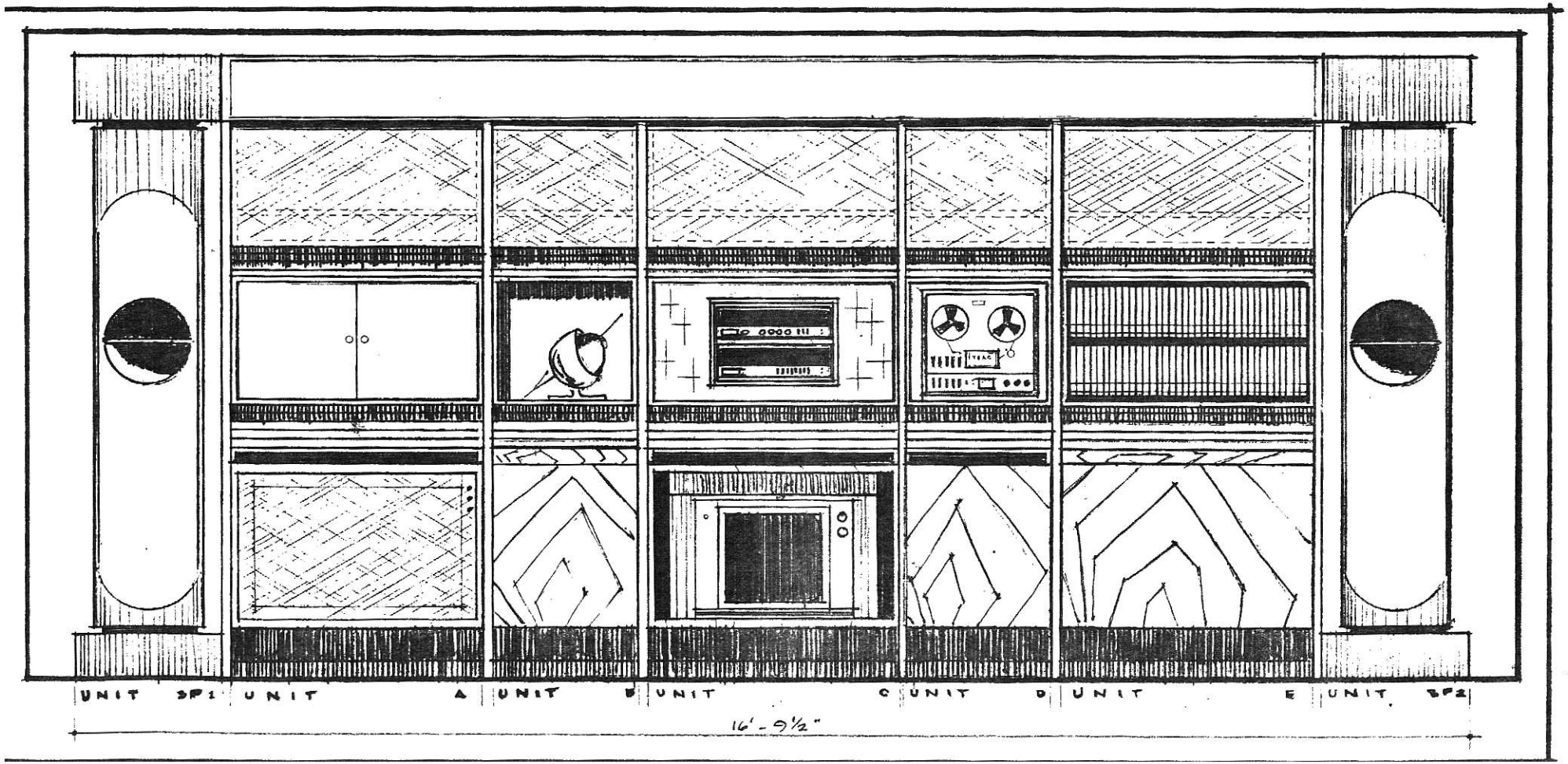
Methodology: There are varied extremes to this type of solution for dynamic architecture ranging from expensive computer controlled light displays (noted as a design competition winner for a Boston subway tunnel co-sponsered by The Institute of Contemporary Arts, The

Massachusetts Bay Transit Authority, and The Rockefeller Family Fund, and reported in Progressive Architecture, October, 1972) to the simplest form of light control utilizing multi-colored lighting with simple controls. The latter, of course, is static, and the former is far to expensive to become of common use in all situations.

The methodology to be employed in this research assumes that in order to be effective and within the range of financial feasibility for all, a vehicle must be made available which can be utilized in virtually all situations. That vehicle, for all practical purposes, could logically be of the interior furnishing type ranging from singular pieces to integrated systems.

The initial phase of the research dealt with the design and manufacture of an audio-visual light table to domonstrate the integration of form, material, mass, light and sound. The prototype was subsequently entered in a student design competition sponsered by the International Woodworking, Machinery and Furniture Supply Fair, and placed first in its category and fourth in the overall competition. The coupling of mans senses into functional components designed to stimulate those senses is currently an untapped resource within the interior environment, and as indicated by the attention the prototype received at the Fair, has prompted the second stage of the research.

Current research has been devoted to the design of a more sophiscated system aimed at integrating the visual and auditory stimulants to enhance the interior environment and to promote the dynamic interplay of form, materials, texture, light, and sound. It is through research of this type that interior systems manufactures are able to provide a wealth of components which will enable man to cope with his internal and external environment.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