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Mobile Residential Support Unit

John W. Eden

MOBILE RESIDENTIAL SUPPORT UNIT • EDEN

B. A.

1969

MOBILE RESIDENTIAL SUPPORT UNIT

JOHN W. EDEN

In partial fulfillment of the
requirements for the degree of
Bachelor of Architecture at
The University of New Mexico,
Albuquerque

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STATEMENT OF PROBLEM

During an interview with a person connected with the Atomic Energy Commission we came across an architecture problem that they have neglected. He said, "We have a campsite at all our nuclear test sites and these campsites could be improved greatly. The major problems in these campsites are the ungodly amount of time it takes to build one and the cost involved is out of sight." He then said, "What we really need is a mobile campsite that can be set up very quickly at a minimal cost."

Taking this last statement in mind I began working with the research on mobile buildings as such, possibly mobile homes that could be converted into dormatory or living facilities for a number of men. After much research and study this system became unfeasible because the cost of transportation was no better than the cost of the old system. I then decided to try expandable buildings such as built by Potlatch Forests, Inc. However, many of the same problems came up including transportation costs.

It finally boiled down to the idea of prefabricated unit that could be assembled from small units on the job site.

These prefabricated units will be used by working men and their employers and will be of such a size as to house four men, sleeping arrangements only. There will be larger units available to accommodate the eating, recreation and office spaces. The dining areas will be able to accommodate twenty-five men as a base number and be able to be expanded up to 200 persons. The kitchen area will expand accordingly, depending on the amount of cooks needed to feed the required men. The recreation area will also be a separate unit, possibly containing small capacity recreation games and possibly a small theater.

These units will possibly be used by the Atomic Energy Commission for their test site camps. However, the possibility of using these units by private concerns has been considered.

The utility system will be of a unit design as communal bathing and toliet facilities will be used.

Due to the mobility of these sites the foundation needs to be of a light weight type and possibly demountable for continued use. These living units will be made up of smaller modules, which are disassembled for shipping and then errected on the job site. The doors and windows should be contained within the units and completed in the factory so there is little on site construction.

LIMITS

After considering many of the possible ways of approaching the design of this prefabricated system I have decided on a few limits to follow. These limits reduce the problems involved in designing the system to the point that a total concentration can be devoted to the prefabricated system itself. I will deal only with the design of a prefabricated system including economics, mechanical hookups, weather conditions, mobility, and construction. In these limits I feel that I can cover and design a system that can fill these requirements set forth by the Atomic Energy Commission.

The possibility of designing the whole camp was considered, but due to a lack of information, I reduced the scope to contain only the units and the prefabrication system. I will show how a unit can be built in a minimum amount of time and expense. I will deal with all the structure problems, the weather problems, construction systems, and utility systems. These include the problems involved to totally build a unit, including electrical wiring and plumbing.

The connectors and structure will be of a flexable type to be used possibly as a floor unit as well as a wall unit and even the possiblility of using the same unit as a roof module.

RESEARCH OF BASIC PROBLEMS

General Information:

Many of the pamphlets put out on prefabricated systems do not help because they do not meet many of the requirements. Therefore, I have resorted to design a totally new type of prefabricated unit. Possibly a unit that could be used as a wall, ceiling (roof), and floor unit as desired.

This unit could possibly be used as a throw away unit. This would be accomplished by making the cost of the unit low enough so after it has been transported to the site and used for 6 months to 1 year, that rather than transport it back it could be thrown away. The material used in this type of system would have a total life of approximately 1 to 2 years. Possibly made of cardboard and plastic or of many different types of materials.

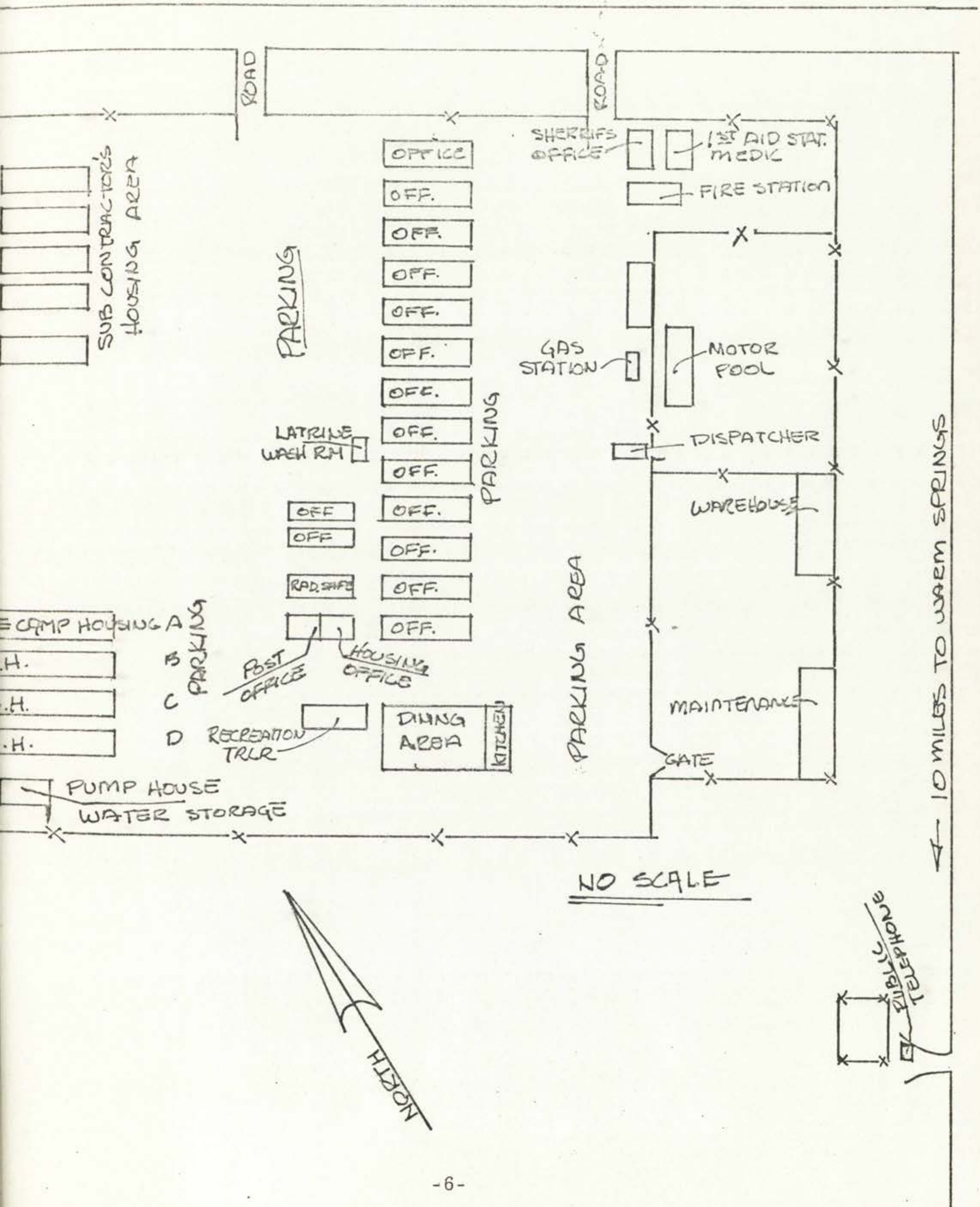
The campsites are located over the Western Hemisphere and are sometimes in out of the way locations where sea transportation is the only feasible mode of transportation. The sites range from Amchitka, Alaska to Guatamala, the South Pacific Islands and all over the United States. The campsites last from 6 months to 2 years in length and house from 25 to 500 persons. A totally self-contained site will be needed. From sleeping, eating and sanitary facilities to recreation and service such as offices, gas stations, fire stations, and communication stations, etcetera, are needed.

Some campsites will need to be mobile during the duration of testing such as the site in Guatamala. The canal that they are building stretchs across the whole country so the camp will need to be as close as possible to the actual work area because of the conditions in this country.

Being that these campsites are so remote, a self-contained utility system must be introduced. Possibly of a nuclear background.

Attached is a layout of the project Fautless at the Central Nevada Test Site. As you can see the sub-contractors had to have their own housing made in order to build the rest of the buildings. The system in present use is the use of barracks and some old mobile homes converted into offices and monitoring stations. These buildings will have to be of a substance to withstand the climate and environmental changes that occur at the different sites.

OPERATION - FAULTLESS



SYSTEMS

In designing a prefabricated system there are many problems to deal with, such as; method of connecting units together, type of roof to use, type of floor unit to use, material, and so on. These major questions will not be answered until the final design is finished.

The result and answers to these questions will have to be answered to to fully qualify this system to be classified as a successful prefabricated system. Many companies have come out with various prefabricated systems and methods of construction. Some of these systems may be combined to create a better and easier design.

If I had the answer to these questions now it would take only a few weeks to present the design but due to the fact that these answers can't be answered until later, I will present a final broucher on the system to be used in my design. This broucher will include all pertinent information about the requirements needed and met.

Finally I will combine all the requirements into sets and see how the miss-fit varables effect the sites as a whole.

The requirements are as follows:

A. Must meet Atomic Energy Commission Approval
   1. 1 hour fire rating
   2. Moisture resistant
   3. Insulating factor = R-10
   4. Light weight
   5. Pre-finished
   6. Structure to meet wind and snow loads
   7. Fungus resistant
   8. Dimensional stability
   9. Durability to scuffs
   10. Termite proof
   11. Weather resistant

B. Construction
   1. Rapid assembly
   2. Light Weight
   3. Little on site finishing
   4. Self supporting during construction
   5. Easily handled by workmen
   6. No heavy equipment needed for assembly
   7. No special tools needed
   8. No foundations to be poured

C. Transportation
   1. Compact into small size
      a. maximum 200 cubic feet
   2. Light Weight
      a. maximum 25 pounds per square foot
   3. Movable, even when assembled
   4. Easily moved and transported from ship because of lack of equipment at some sites

D. Economics
   1. As inexpensive as possible
      a. inexpensive materials
      b. light weight
      c. readily available products
      d. materials with short life span
      e. easily assembled at factory

E. Utilities
   1. Programed for electricity
   2. Separate units for ketchen and restrooms
   3. Self-contained utility system
   4. Adequate water storage system

To consider these questions properly, we have to look at all the requirements and figure out which ones are the most important. Then we have to interact these requirements into groups and then into larger groups and work from there.

Expense is the strongest requirement. This system has to be better and cheaper than the conventional method used. For instance, the price to move a 10' x 40' x 11' mobile home from Los Angeles to Guatamala would cost the sender approximately $7,000.00 plus the cost of the Home itself. This is broken down as follows:

Quoted by Bekins World Wide Movers

1. 10' x 40' trailer = 4,400 cubic feet at $1.34 per cubic foot
2. Overlength charge for over 20' at $4.00 per 40 cubic foot
3. Heavy lift charge at $4.60 per 40 cubic foot
4. $25.00 service charge
5. $20.00 dock charge

equals $6,842.45 Plus unloading

They would not quote an unloading charge because they don't know what equipment they have at the particular port.

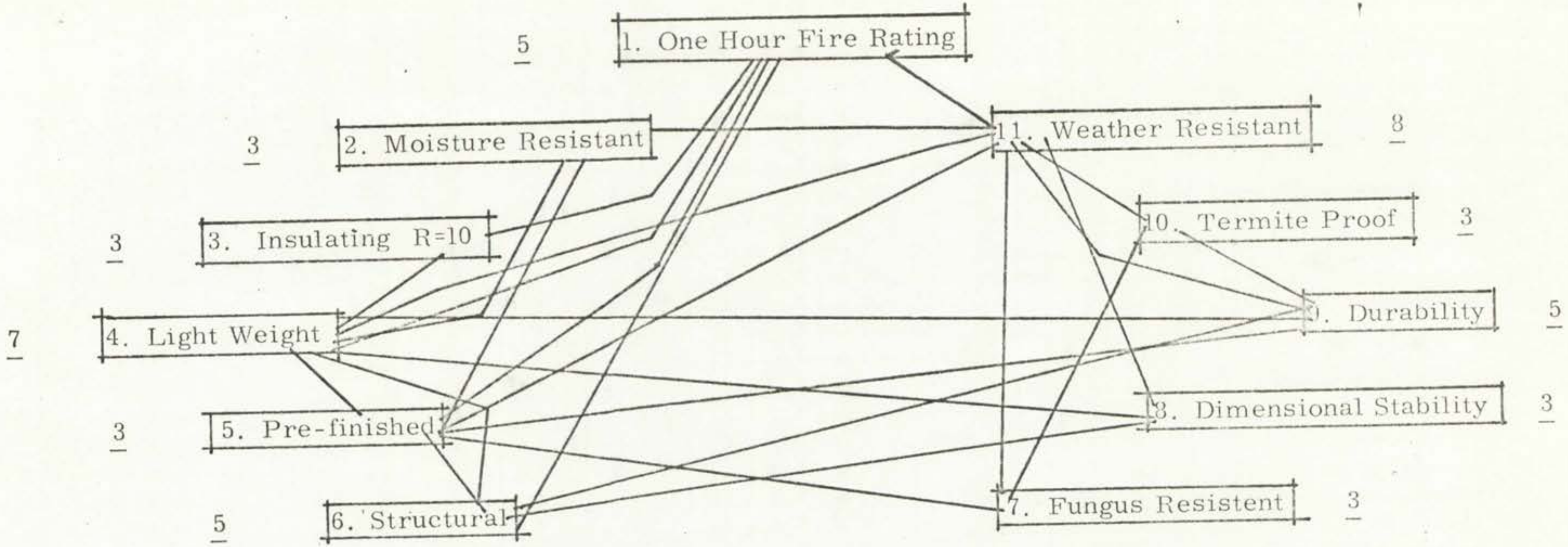
Requirements and Relationship to each other

As you can see this figure will be easy to beat because they ship on a cubic foot basis and a trailerhouse is void in the middle. By having something that folds into a compact area the price is automatically reduced.

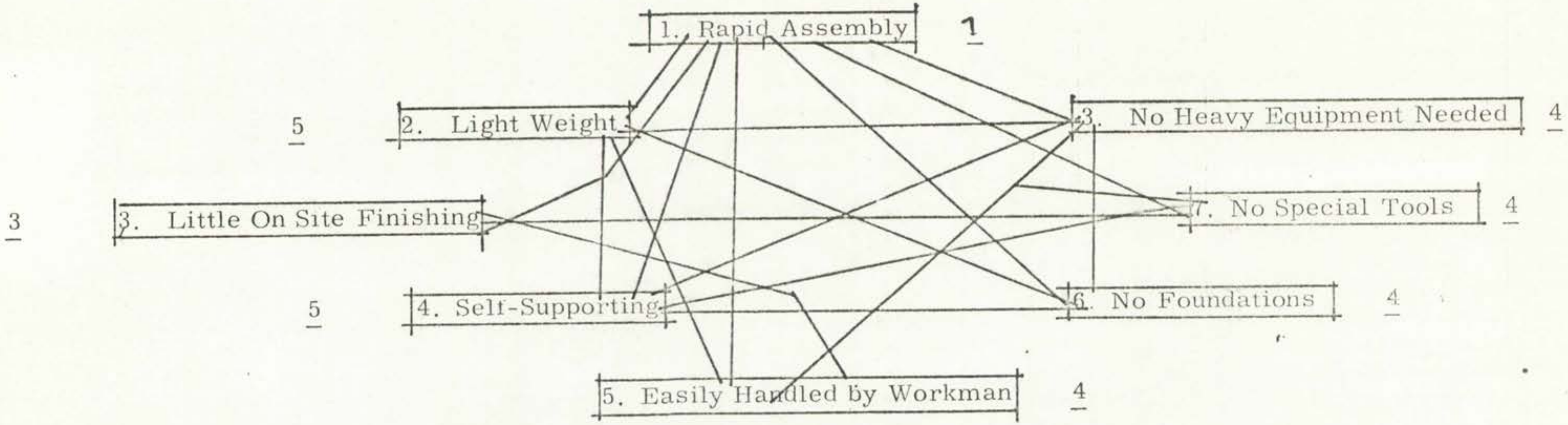
This leads us to a second strong requirement which is weight. A material that meets most of the requirements set up by the Atomic Energy Commission usually comes out pretty heavy. There are of course many other systems in which could be put together in order to form a sandwich panel to meet these requirements. One system would be possibly from a foam and asbestas.

The diagrams that follow can best illustrate how these requirements work.

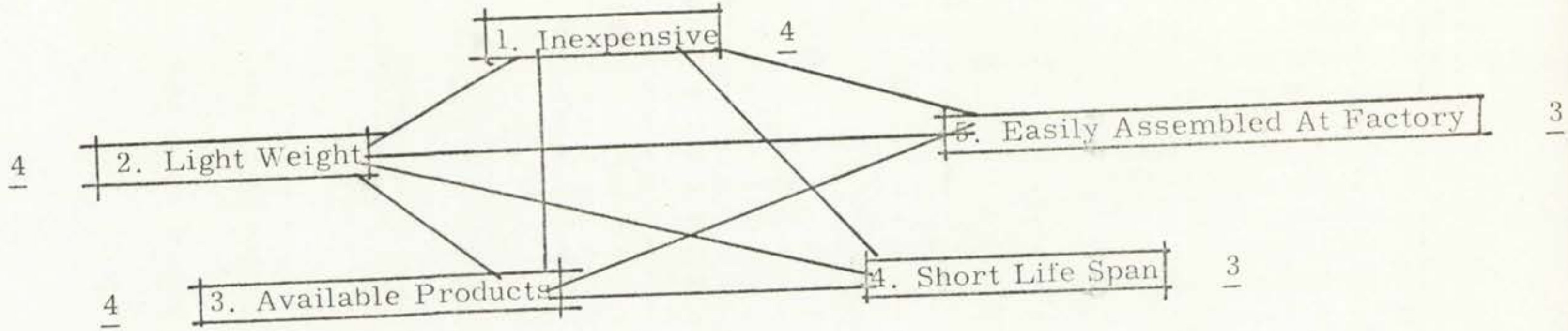
MATERIAL


5
1. One Hour Fire Rating
3
2. Moisture Resistant
3
3. Insulating R=10
7
4. Light Weight
3
5. Pre-finished
5
6. Structural
11. Weather Resistant
8
10. Termite Proof
3
9. Durability
5
8. Dimensional Stability
3
7. Fungus Resistent
3

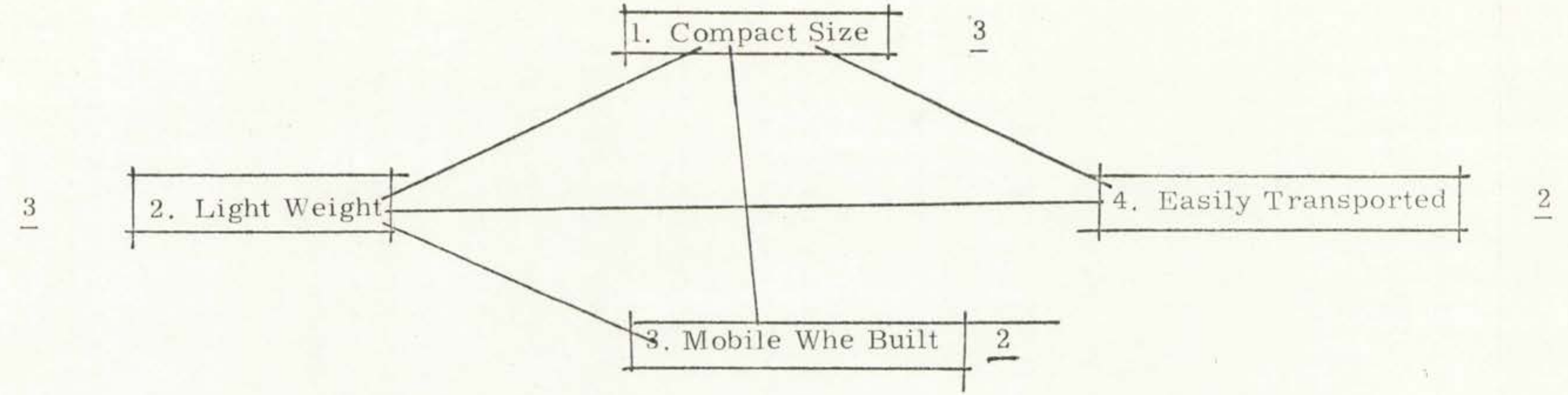
CONSTRUCTION



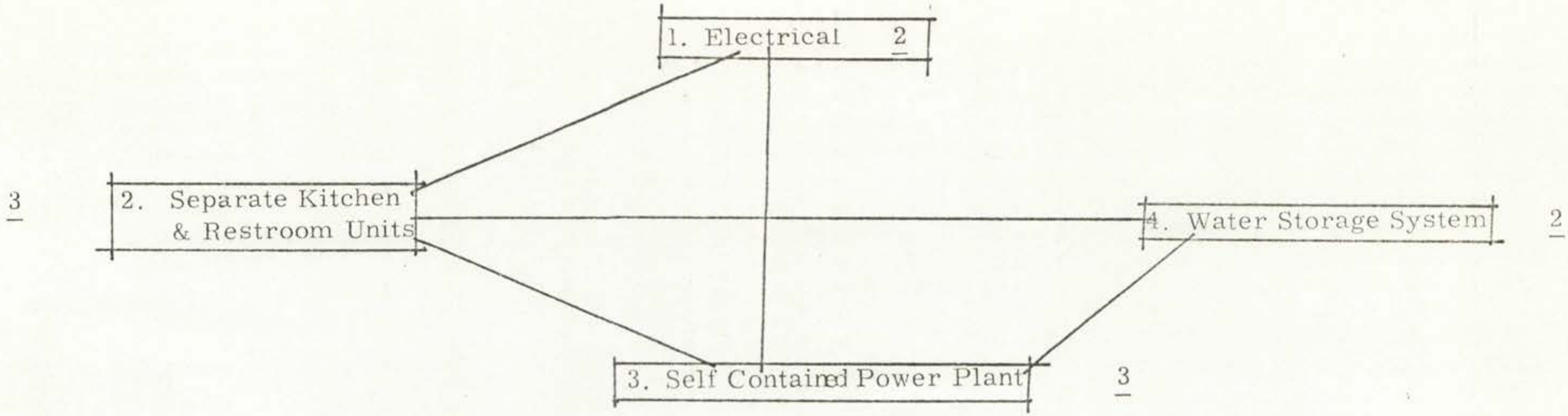
ECONOMICS


1. Inexpensive
4
2. Light Weight
4
3. Available Products
4
4. Short Life Span
3
5. Easily Assembled At Factory
3

TRANSPORTATION



UTILITIES



3
2. Separate Kitchen & Restroom Units
1. Electrical 2
3. Self Contained Power Plant 3
4. Water Storage System 2

Results of Relationships

The results drawn from these diagrams gives us the breakdown of the most important requirements to be considered in the design of a prefabricated system. For example:

In the materials the requirements are ranged in this importance

1. light weight
   weather
2. 1 hour fire rating
   structure
   durability
3. Moisture resistant
   insulating factor
   prefinished
   dimensional stability
   termite proof
4. Fungus Proof

In Construction

1. Rapid assembly
2. Light weight
   self supporting
3. Easily handled by workman
   no foundation
   no special tools
   no heavy equipment for assembly
4. Little on site finishing

Economics

1. Inexpensive
   light weight
   available products
2. Short life span of products
   easily assembled in plant

Transportation

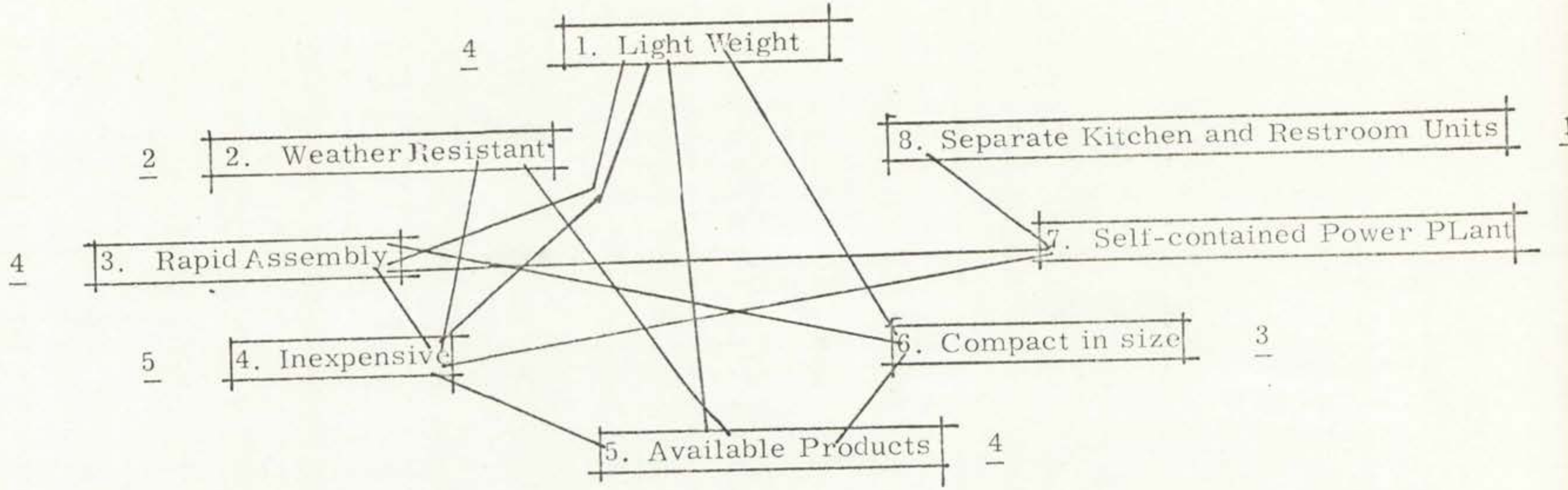
1. Light weight
   compact size
2. Mobile when built
   easily transported

Utilities

1. Self-contained power plant
   separate kitchen and restroom units
2. Electrical hookup
   water storage

Taking the first bracket of requirements in each category and then applying the same relationship values may be diagramed as follows:

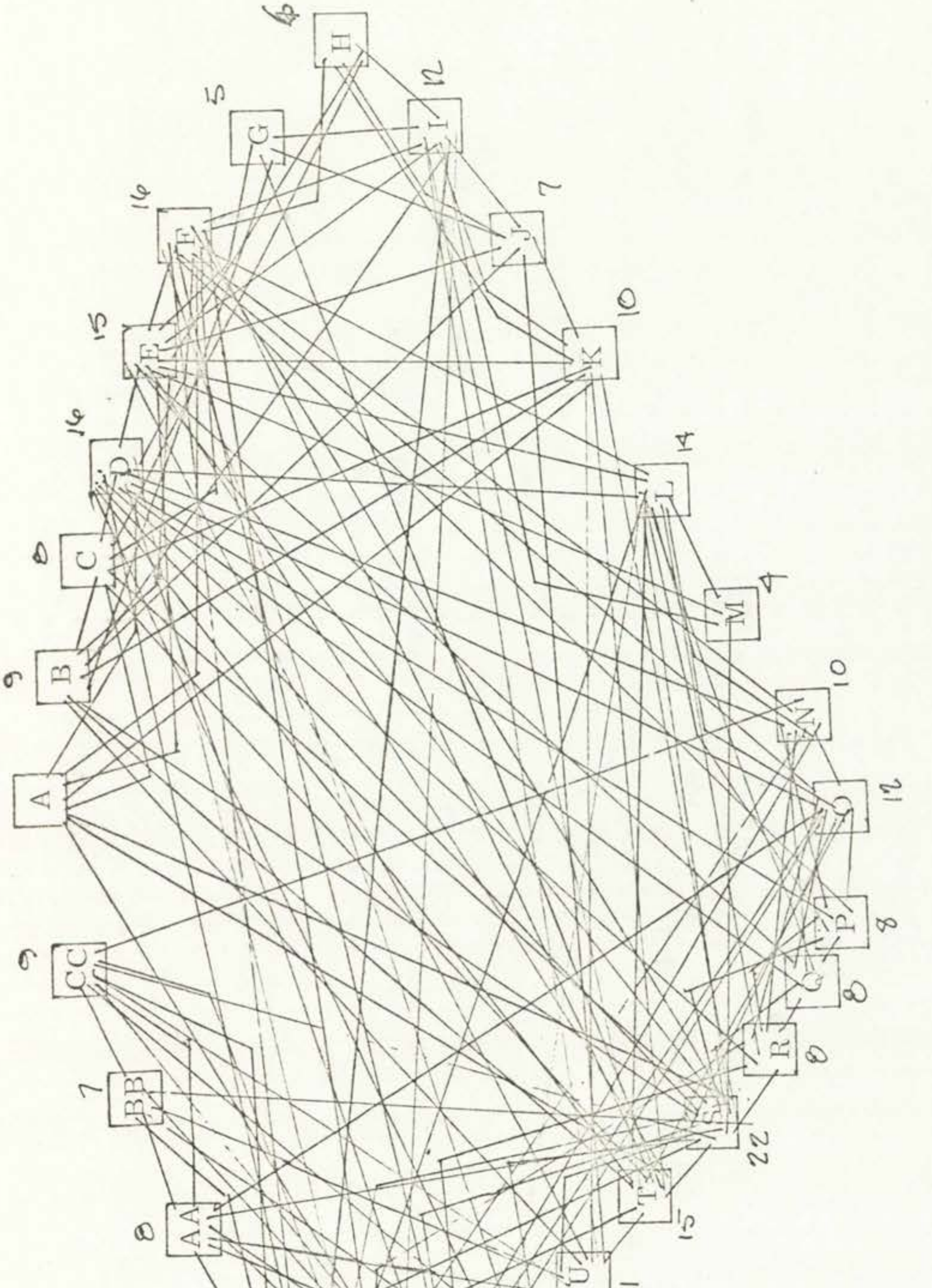
COMBINED



4
1. Light Weight
2
2. Weather Resistant
8. Separate Kitchen and Restroom Units
1
4
3. Rapid Assembly
7. Self-contained Power PLant
5
4. Inexpensive
6. Compact in size
3
5. Available Products
4

The mis-fit varaibles could possibly have a great importance over the design of this system. The chart on page 18B shows how the requirements proceed in importance.

18- A 1 hour fire rating
14- B Moisture Resistant
19- C Insulating R=10
2- D Light Weight
4- E Pre-Finished
3- F Structural
28- G Fungus Resistant
27- H Dimensional Stability
8- I Durability
25- J Termite Proof
13- K Weather Resistant
6- L Rapid Assembly
29- M Little On-Site Finishing
12- N Self-Supporting
9- O Easily Handled by Workmen
20- P No Foundations
21- Q No Special Tools
22- R No Heavy Equipment Needed
1- S Inexpensive
5- T Available Products
10- U Short Life Span
15- V Easily Assembled at Factory
7- W Compact size
11- X Mobile When Built
23 Y Easily Transported
16- Z Electrical
24- AA Separate Utilities
26- BB Self Contained Power Plant
17- CC Water Storage System


A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z
AA
BB
CC

Looking at the combined reactions we notice that they fall into this breakdown in importance

1. Inexpensive
2. Rapid assembly
   light weight
   available products
3. Compact in size
   self-contained power plant
4. Weather Resistant
5. Separate kitchen and restroom units

This breakdown shos that the most important factor to consider is expense in economics. Which will have to be the chief consideration in designing the prefabricated units

Possible Site Requirements

Climate:

As the sites change so do the weather conditions. The fact that these campsites are subject to large site variations they will have to be designed to meet the conditions set forth by each site. For example in Anchitka, Alaska the mean temperature is 32° F. The Summers are long and cool and the Winters are much the same.

In contrast, a site in Guatamala, for instance, has a hot and humid climate with temperatures averaging 80°F. Tropical rains are prevalent averaging 80 inches annually. The moisture involved creates the need for many of the preceeding requirements such as: Moisture resistant, weather resistant, fungus proof, termite proof and the insulating factor.

Utilities

As most of the sites are remote and utilities are not available, as system for the facilities must be provided within the units.

Contours

The contours involved are generally flat areas and, therefore, need not be much consideration to leveling or contour cutting. The only requirement needed here is that the units come equiped with their own foundation system.

Traffic

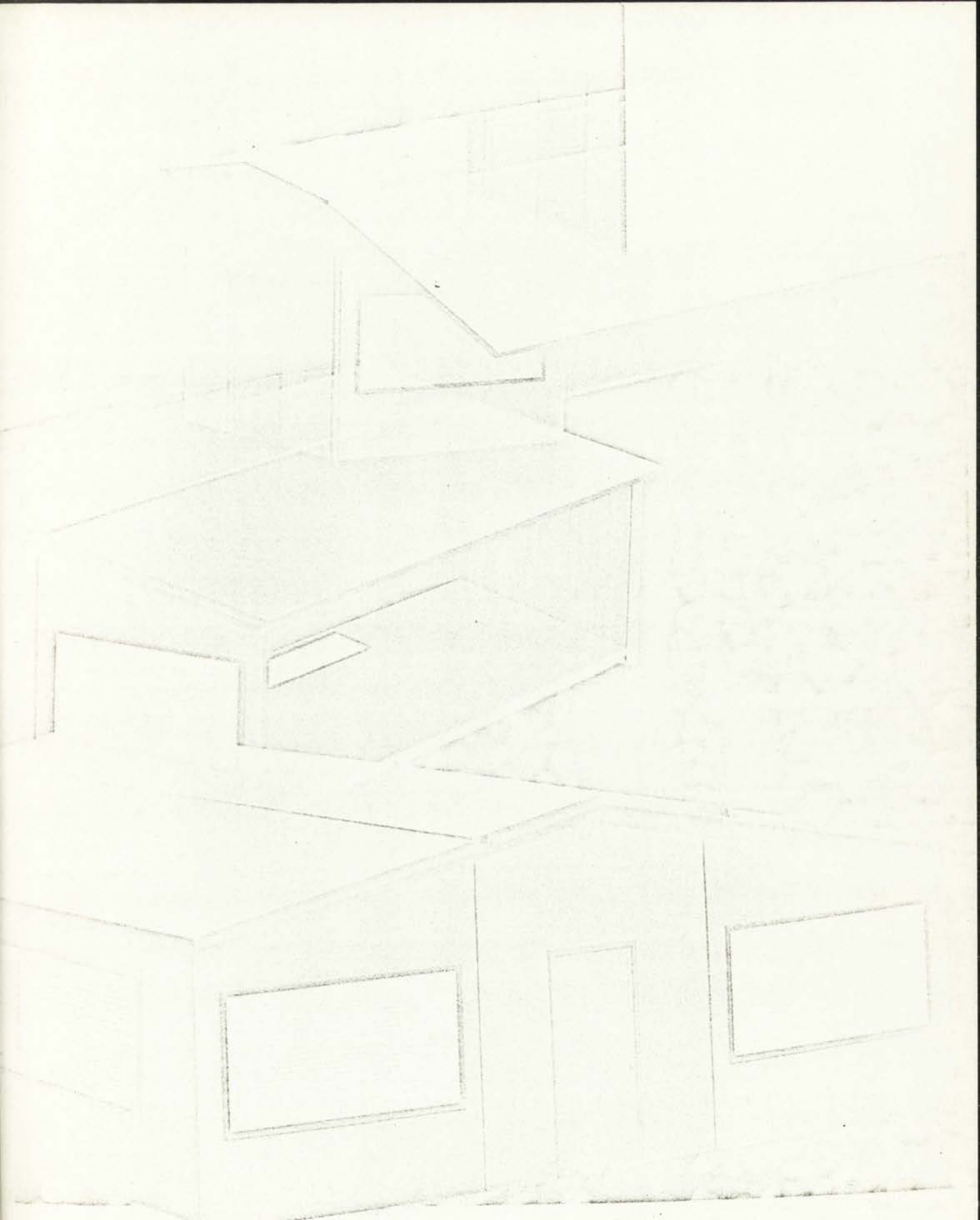
Parking is to be provided within the campsite.

Space Requirements

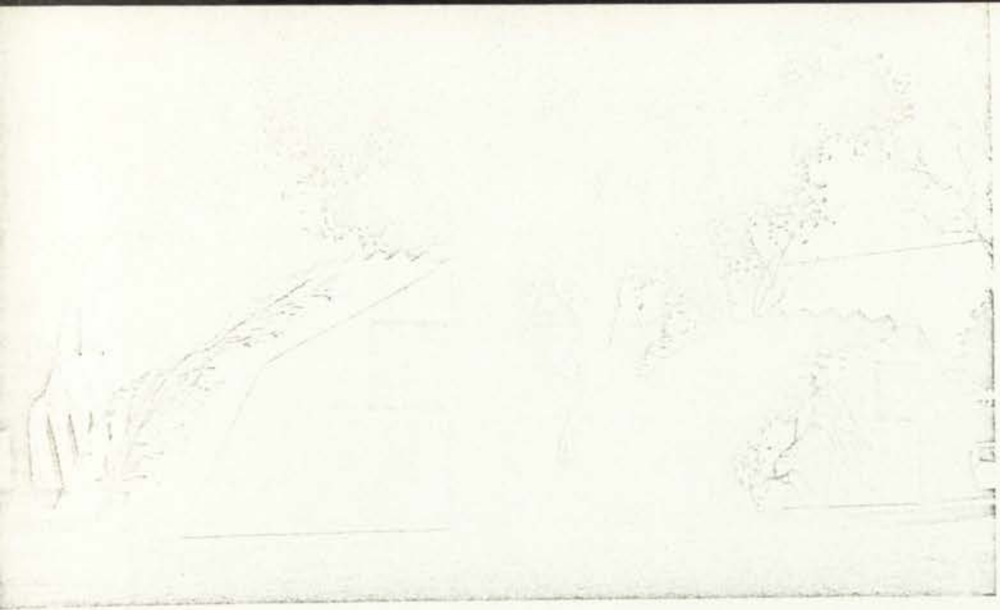
Sleeping facilities, kitchen, recreation, toilets, and office space are the required types of space to be used.

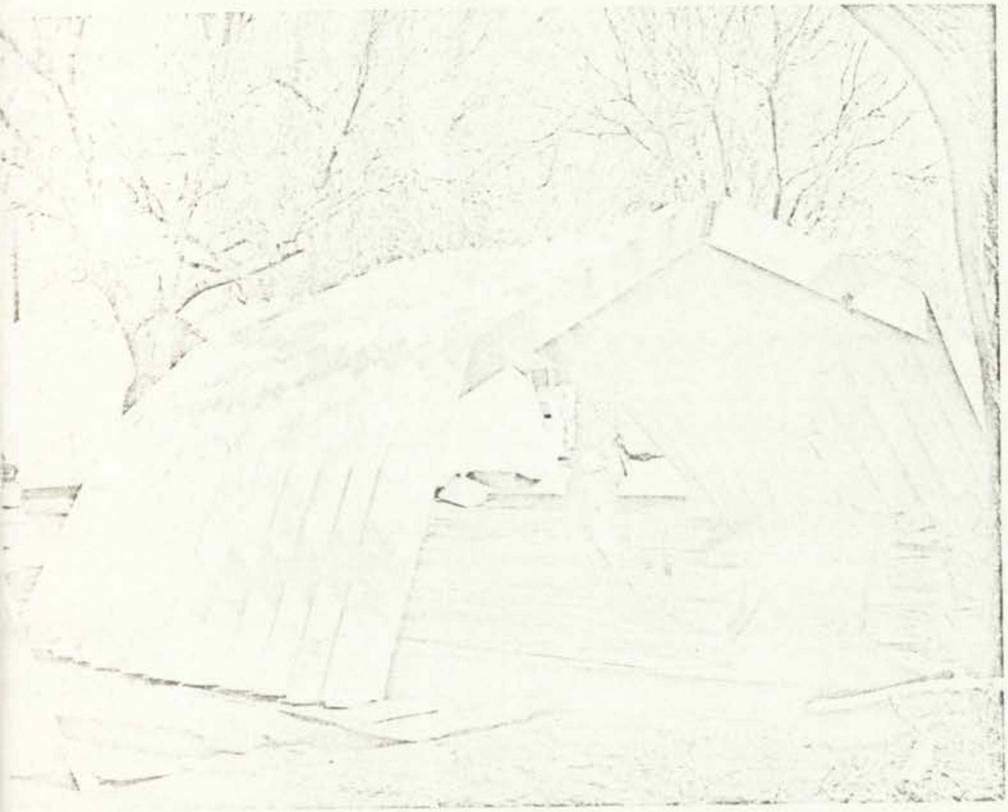
Since I am not working in designing the camp itself I will only give the minimum requirements for each space. Then if they want to they can enlarge spaces.

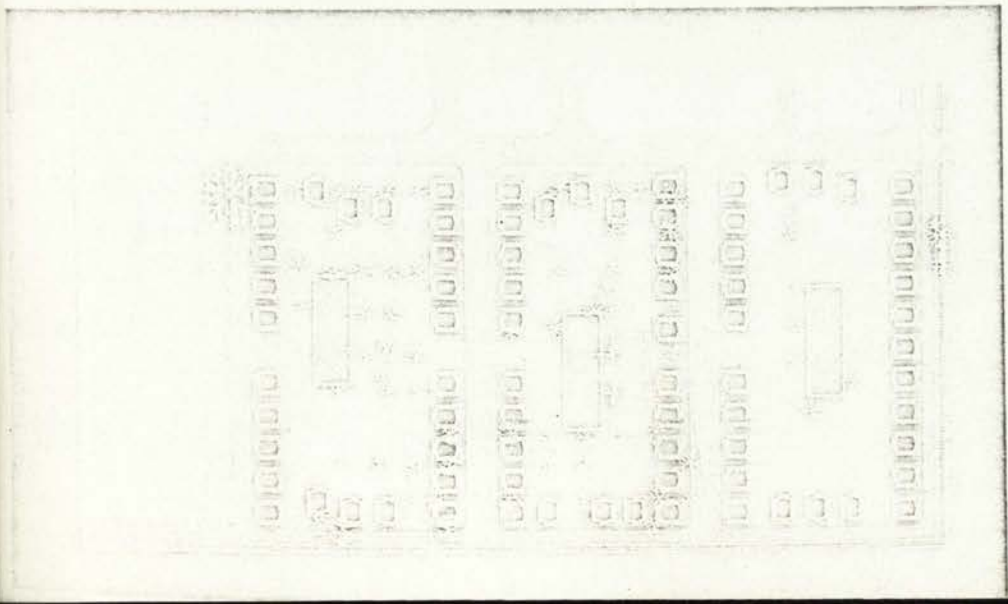
Sleeping	-	Per man	50 Square Feet
Dining	-	Per man	25 Square Feet
Kitchen	-	Per man	75 Square Feet
Recreation	-		500 Square Feet
Office	-		500 Square Feet
Toilet	-		500 Square Feet
Warehouse	-		800 Square Feet
Maintenance	-		800 Square Feet
Dispatcher	-		100 Square Feet
First Aid Station			200 Square Feet



Instant space for sale or rent!







Hirshen/Van der [illegible]

Migrant Master [illegible]
Indio, [illegible]

The perennial [illegible] decent quarters [illegible] and their [illegible] temporary, [illegible] ter. Built of [illegible] meant to last only [illegible] Under an Office of [illegible] tunity program, [illegible] munities have [illegible] evolving from [illegible] quate, [illegible] communal [illegible] ties to a camp in [illegible] providing [illegible] with private [illegible] dividual washing [illegible] ing facilities. [illegible] child care and [illegible] provided to ease the [illegible] isolation of migrant [illegible] mending the plan as [illegible] thought" toward the [illegible] housing problem [illegible] the jury pointed out [illegible] was used "which [illegible] country really haven't [illegible] plastic."

Structural Engineers: [illegible] reau; Mechanical and [illegible] gineers: [illegible] Contractor: [illegible]

physical properties advantages

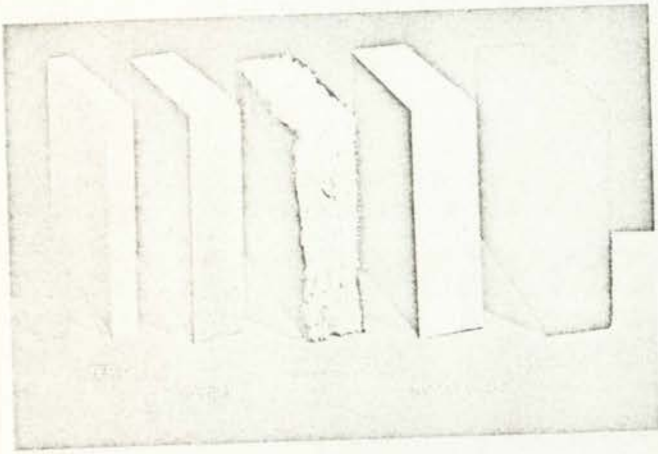
chemically inert

ZER-O-CEL is pH neutral and cannot react upon other material. It imparts no odor or taste to food products. According to independent tests, ZER-O-CEL insulation will not rot, or support fungus growth. It has no food value to attract insects or rodents.

non-toxic

Production - cured slabs of ZER-O-CEL are non-toxic in handling or application. However, when fabricating with mechanical equipment, normal precautions should be taken against irritation of the eyes, nose, throat, and skin, from fabricating dust.

INSULATION CHARACTERISTICS



low thermal conductivity

The photograph and the Insulation Comparison Chart show the thicknesses of other insulations equivalent to one inch of Gold Bond ZER-O-CEL. This low thermal conductivity is based on several factors. The closed cell structure of the foam is important but primarily it is the inert gas within the cell that greatly improves the insulating value.

INSULATION COMPARISON CHART

Non-urethane insulation thicknesses required at 75°F. m.t. vs. 1" of Zer-O-Cel

	"k"	"R"*	Thickness
Urethane (Zer-O-Cel)	.15	6.67	1"
Styrene	.24	4.16	1 5/8"
Mineral Wool: 2.0 pcf Density	.27	3.70	1 3/4"
Wood Fiber (Structural): 20 pcf Density	.38	2.63	2 1/2"
Cellular Glass: 9 pcf Density	.39	2.56	2 5/8"

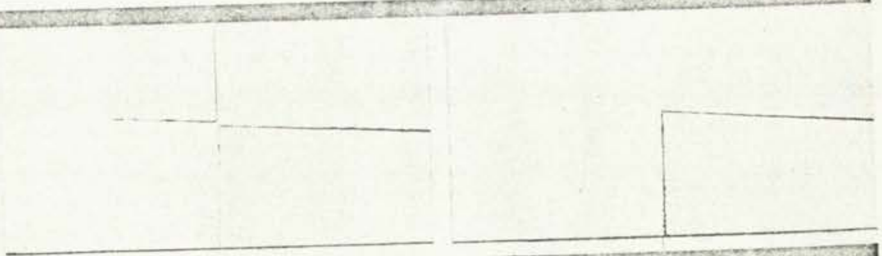
* "R" Factor: Resistance to heat transmission (R=1/k)

When manufactured, all urethanes exhibit an extremely low "k" factor of 0.10 to 0.12 in the uncured stage. Following curing and adjustment to atmospheric conditions, the "k" factor stabilizes at the realistic values shown on the previous page. All ZER-O-CEL produced by National Gypsum Company goes through this aging period before it is released for fabrication or application.

PERFORMANCE OF URETHANES AT LOW TEMPERATURES

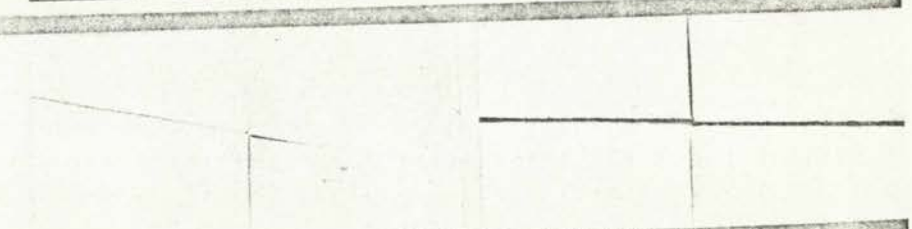
ISOTROPIC ZER-O-CEL URETHANE

Installation at 75°F. and exposure for 70 hours at 0°F. resulted in *less than* 1/4" shrinkage over a 48" dimension.



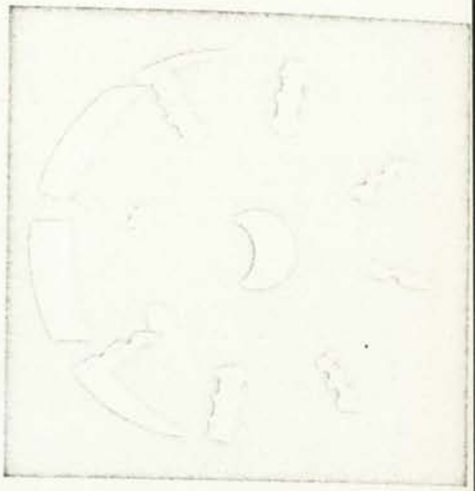
NON-ISOTROPIC URETHANE

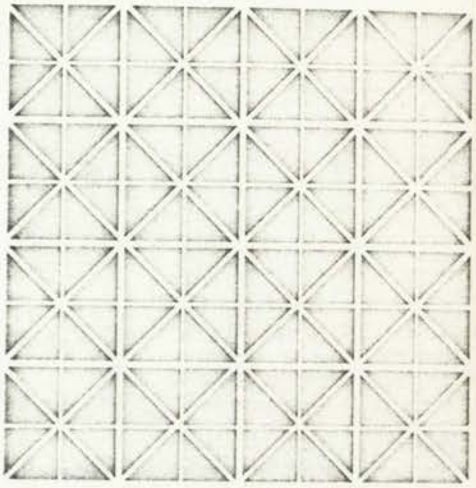
Installation at 75°F. and exposure for 70 hours at 0°F. resulted in 3/4" to 1" shrinkage over a 48" dimension.

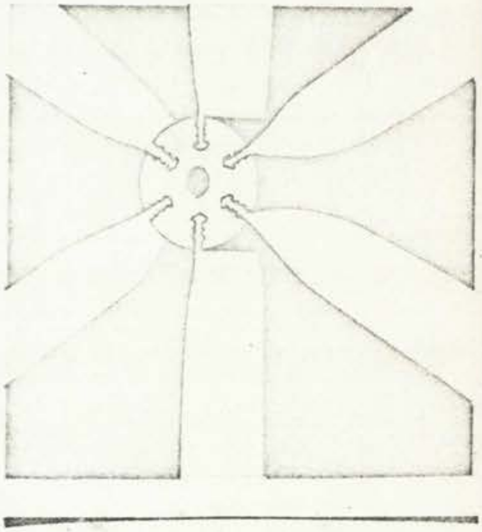


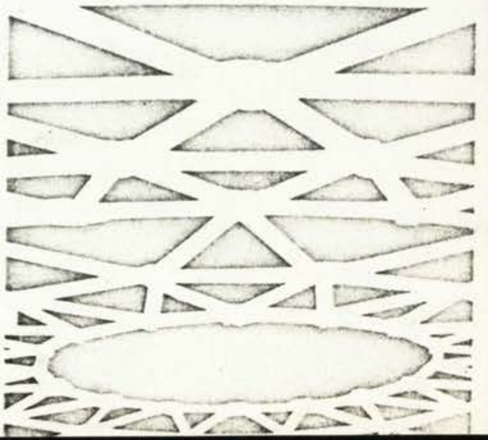
Isotropic characteristics in a urethane foam are extremely important in low temperature operations for two basic reasons:

1. If the compressive strength of the foam, along any axis, is less than 15 psi, atmospheric pressure can cause cell collapse during low temperature service because the









TRIODETIC:
strength and sophistication through the simplest elements

The primary elements of Triodetic are hubs (nodes) and structural tubes. These in combination will form structures as simple as lattice trusses, or as complex as the various braced domes.

It is the unique design of the hubs which gives Triodetic its special advantages. They are made from either steel or aluminum and contain grooved keyways, which run the full length of the hub. A multiplicity of members may be framed into a single hub. The structural members usually are tubular, and rounds are generally the most economical. The ends of these members are formed in a press to fit the serrated keyways in the hubs. There is no loss of material in this process, and dimension is closely controlled.

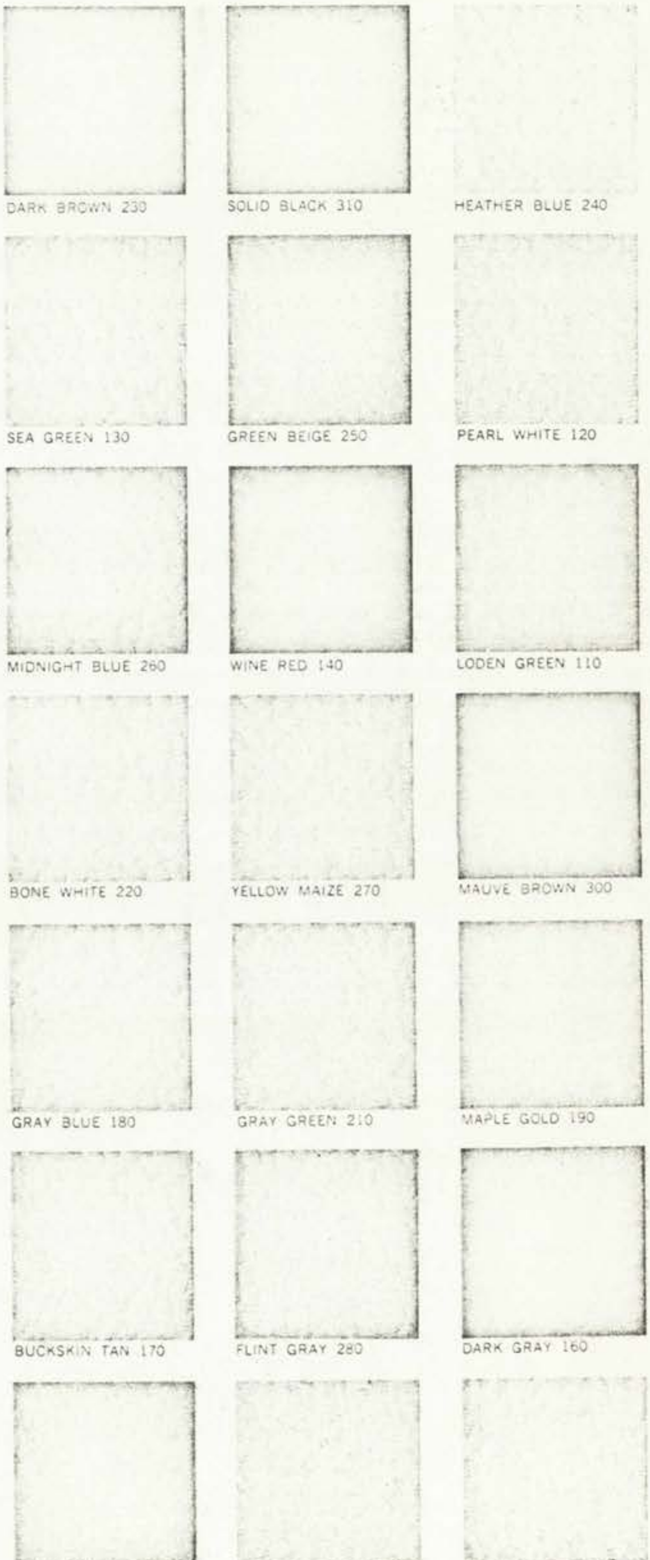
The members insert by easy pressure applied with ordinary tools. The angle of entry can and does vary on a job to job basis. In those instances where the serrated keyway is not occupied completely by the end of the tube, special inserts are used to fill the void. This also applies to unoccupied keyways. Hub ends are closed by washers and a single high strength bolt.

The Butler Triodetic structural system has been tested in the presence of personnel from a recognized independent laboratory. The test report is available upon request and does indicate the high efficiency of the connector under axial tension and compression loads.

PREFINISHED PANELS

Plasti-Clad™ pebble textured predecorated asbestos-cement sheets.

SPECIAL ORDER COLORS



Gold Bond Plasti-Clad® panels are designed primarily for exterior application where a high degree of weather resistance is desirable.

Colors – Furnished in 6 standard and 21 special order fade-resistant colors.

Plasti-Clad Warranty – Gold Bond Plasti-Clad coating is guaranteed by National Gypsum Company to provide uniform color retention and will not peel, blister, or craze for a period of ten years when installed in accordance with published recommendations of National Gypsum Company. This warranty does not apply to Plasti-Clad erected in areas having severe erosive conditions or highly corrosive atmosphere.

If during the guarantee period any Plasti-Clad finish is found by National Gypsum Company to be deficient in any of the above properties, the Company will at its option, either supply new material or recoat that material which is found to be defective. Delivery of replacement material to the building site or application of the recoating will relieve National Gypsum Company from further liability.

Accessories – extruded aluminum joint strips, inside and outside corners and cap strips in matching colors may be secured direct from Porce-Len, Inc., Hamden, Conn.

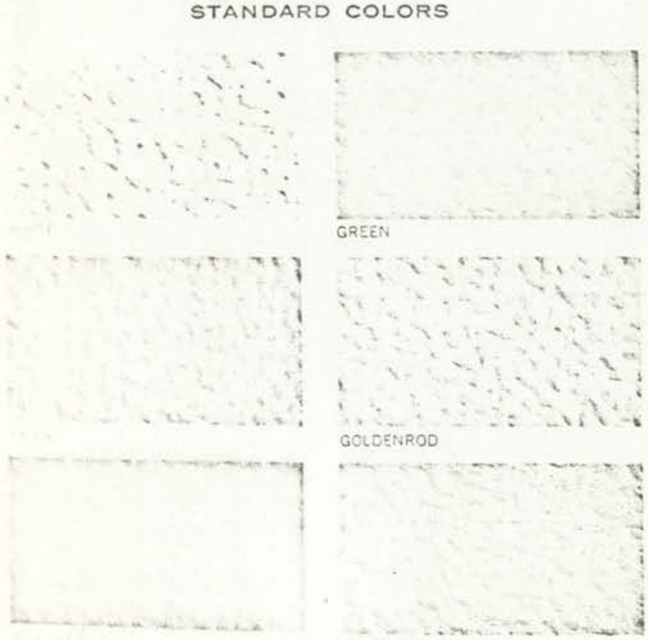
CONDENSED SPECIFICATIONS

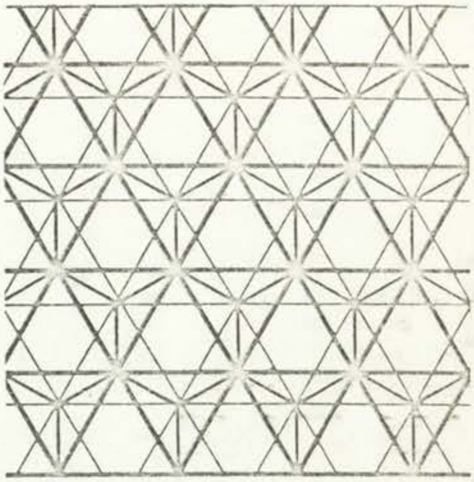
Width	4'	Thickness	1/8" Standard – 3/16", 1/4", 3/8" on special order
Lengths	8', 9', 10', 12'	Weight	1.2 lbs. per SF for 1/8"

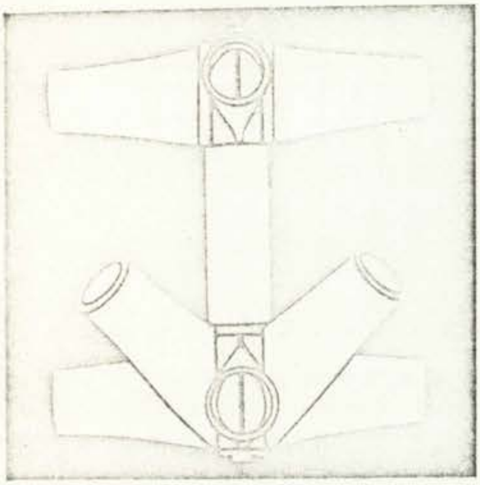
Gold Bond Plasti-Clad Panels meet Federal Specification SS-B-755 Type F and ASTM Specification C-220-67, Type F.

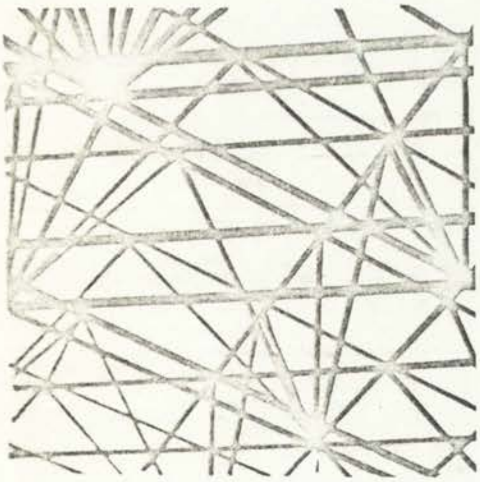
Fire Hazard Classification – Flame spread 0
Fuel contributed 5
Smoke contributed 0

STANDARD COLORS





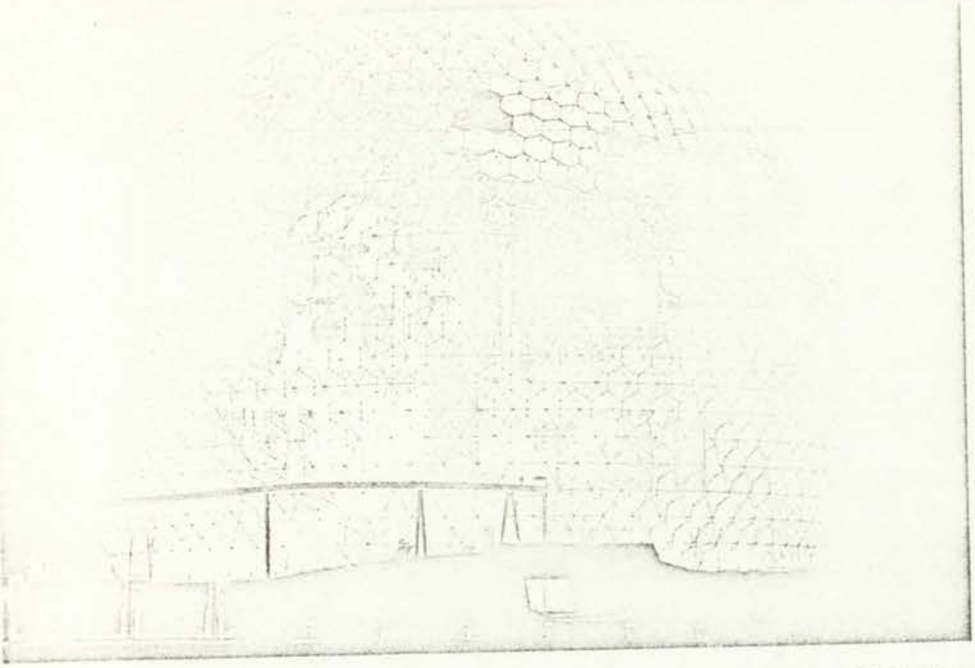


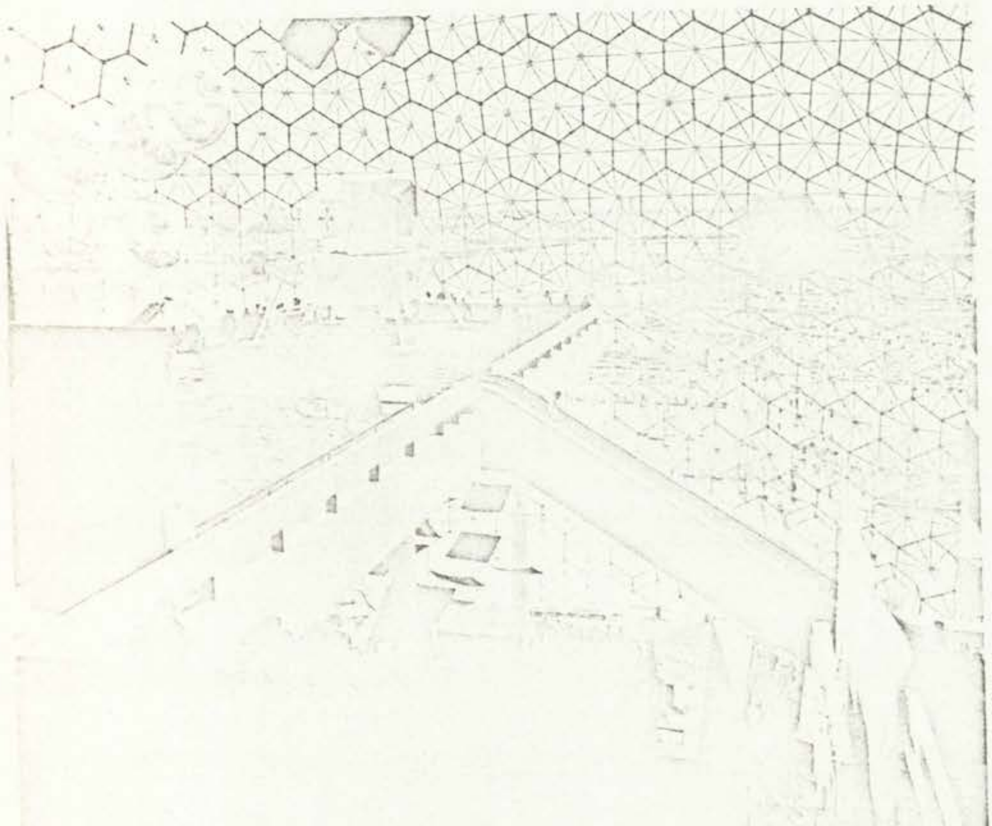


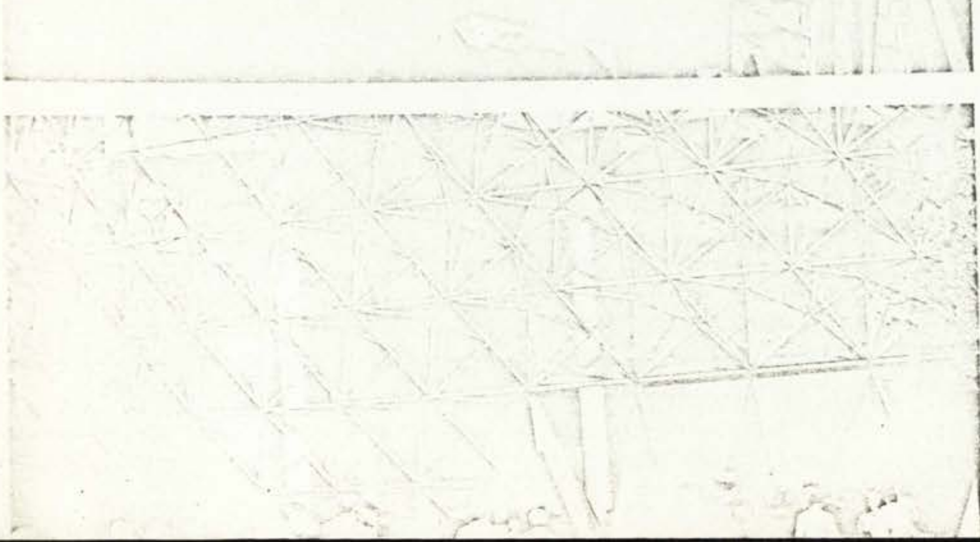
Optimization of members, as far as practical limitations will permit, is determined by a finite method of analysis. It is recommended that wall thickness of the tubes be constant although actual size may vary in diameter. Design efficiency is thereby obtained with material placed to perform its task according to load and stresses.

Components are shipped to the job site, organized and coded in bundles according to their applications on the structure. Construction may proceed in either of two ways: ground assembly and crane lift, or in mid-air. Triodetic is self spanning and ordinarily needs a minimum of scaffolding. This method of site assembly of factory finished components is extremely fast, undoubtedly the fastest of all available ways to produce any of the structural forms within its capabilities.

Triodetic roof structures may be covered using various methods and materials. Metal decking, wood paneling, can be applied together with regular built-up or poured-in-place roofing. Translucent plastic covering and other materials can also be used; however, the type and shape of the roof structure, to some extent, dictates the choice of material and method. This system also expedites the location and installation of overhead mechanicals. Flexible ducting and wiring can be easily run through and fastened to the Triodetic structural latticework.







R. Buckminster Fuller
Fuller & Sadao, Inc.
Geometrics, Inc.

US Pavilion — Expo 67
Montreal, Canada

Cheering the US Pavilion as exciting, handsome and inviting, the jury found that it "solved very admirably a problem of exhibit and translucent space." To make activity within visible from outside, the pavilion was made to seem only lightly poised on earth, a great, airy, lacy web, defining, but not visually separating, exterior and interior space. A three-quarter sphere proved to give the best relationship of ground diameter to height. An altitude of 200 feet was needed to facilitate free suspension of exhibits and erection of elevated platforms. These, as much as 80 feet above the floor, would appear to float, producing a spatial sensation analogous to weightlessness. The space created, in the jurors' words, was "a magnificent setting for the interior architecture that parallels this 20th century structural concept."

Structural Engineers: Simp Gumpertz & Heger, Inc.: **Mechanic and Electrical Engineers:** Paul Lon & Associates: **Landscape Architec** Carol R. Johnson: **Interior Platform and Exhibits:** Cambridge Seven A sociates, Inc.: **General Contractor** George A. Fuller Company.

CRITICAL PATH METHOD

MATERIAL
CONNECTIONS
UTILITIES
DETAILS

RESEARCH & DESIGN
PRESENTATION

PAMPHLET
SYSTEM DESIGN
SECTIONS
MODEL
DETAILS

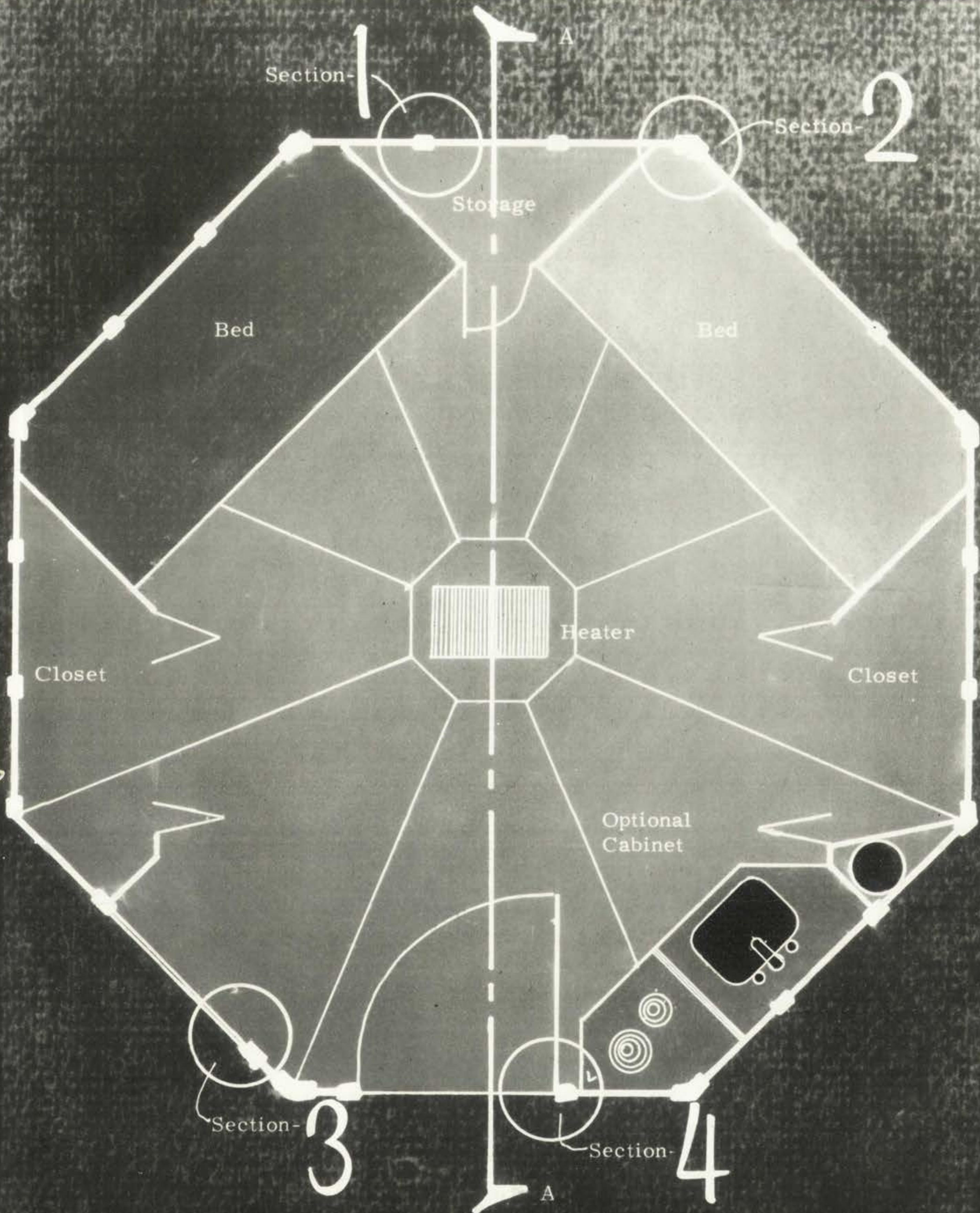
MONTH	DAY	WEEK	HOUR
February	6	1	25
	13	2	30
	20	3	30
	27	4	20
March	6	5	20
	13	6	40
	20	7	40
	27	8	30
April	3	9	0
Spring Break			
	10	10	50
	17	11	30
	24	12	30
May	1	13	40
	8	14	40
Catch Up	15	15	0
21st Presentation	22	16	
Total Hours 425 +	29	17	

BIBLOGRAPHY

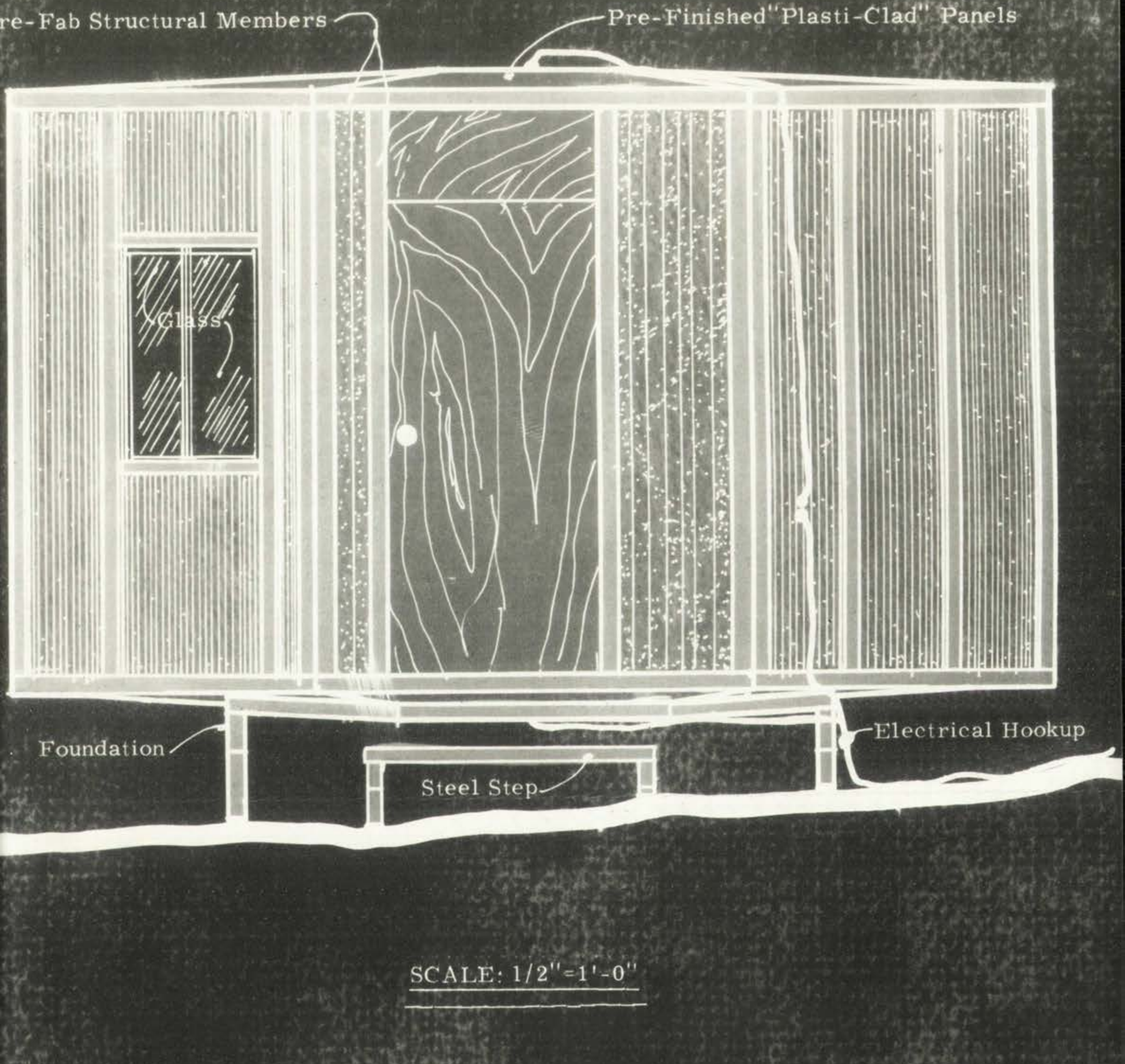
1. Colliers Encyclopedia
   Cromwell Collier & MacMillan Inc. 1966
2. AIA Journal
   William Dudley Hunt Jr. June '68
3. AIA Journal
   William Dudley Hunt Jr. July '68
4. Butler Manufacturing Company
   A. Triodetic Structures 1968
   B. Buildings By Butler 1967
   C. Butler Building System
   D. Space Grid System
5. National Gypsum Company
   A. Technical Bulletin No. 6-4766
      AIA File June '68
   B. Technical Bulletin No. 4367
      AIA File No. 37D January 1966
   C. Technical Bulletin No. 4736
      AIA File No. 21-A-6 December 1966
   D. Technical Bulletin No. 3766
      AIA File No. 19-D August 1966
   E. Technical Bulletin No. 4223
      AIA File No. 37B October 1962
6. American Builder - July 1966
7. Mobile Life - Volume 8, No. 3 - July 1967
8. Correspondence
   A. Holmes & Naduer, Inc., Engineers - Contractors
      Atomic Test Support Organization
   B. National Lumber Merchandisers Association
      Washington, D.C.
   C. Cego Corporation
      Chicago, Illinois
   D. Potlatch Forrests, Inc.
      San Francisco, California
   E. National Gypsum Company
      New York, New York
   F. Butler Manufacturing Company
      Kansas
   G. Fluor Corporation
      California
   H. Mobile Homes Industries
      Florida
   I. Zonolite Company
      Illinois
   J. McKee & Co. Contractors
      Ohio

K. Western Wood Products Association
Oregon
L. Kaiser Gypsum Company
Texas
M. Atomic Energy Commission
California

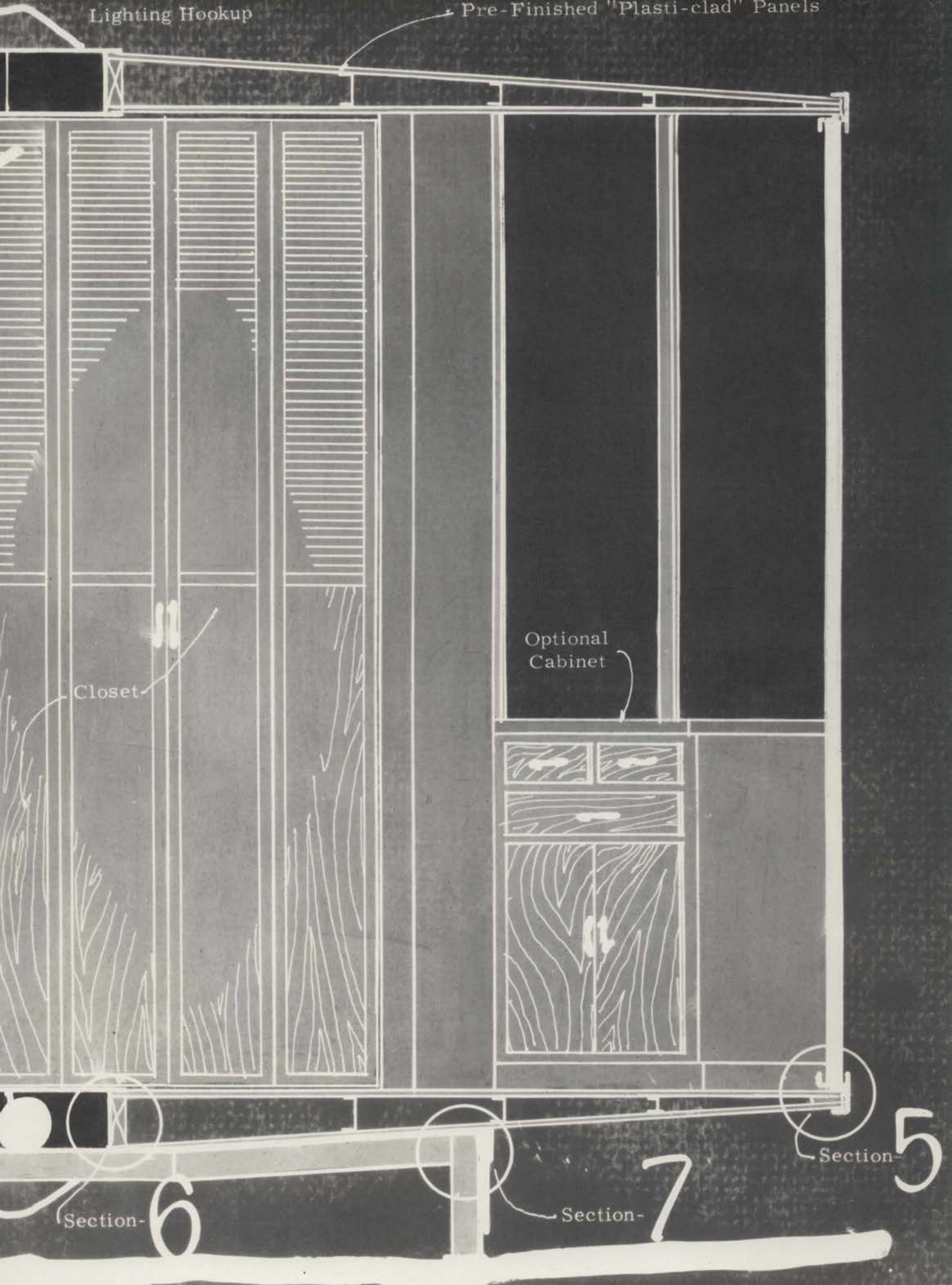
9. Interviews
A. Walt Parker
Eberline Instrument Corporation
Albuquerque
B. Art Gustason
Eberline Instrument Corporation
Albuquerque
C. Jerry Rossi
Eberline Instrument Corporation
Albuquerque
D. Dwaine L. Bendorf
Ultrasonic Engineer
Santa Fe Railroad, Albuquerque
E. Dave Ward
Electrical Engineer
Santa Fe Railroad, Albuquerque
F. Walt White
Kaiser Gypsum Company
Albuquerque
G. Don Michaels
National Gypsum Company
Albuquerque
H. Les File Drywall Company
Les File
Albuquerque
I. William Squires
Portland Cement Corporation
Albuquerque
J. Edward Cunningham
Cunningham Construction
Albuquerque

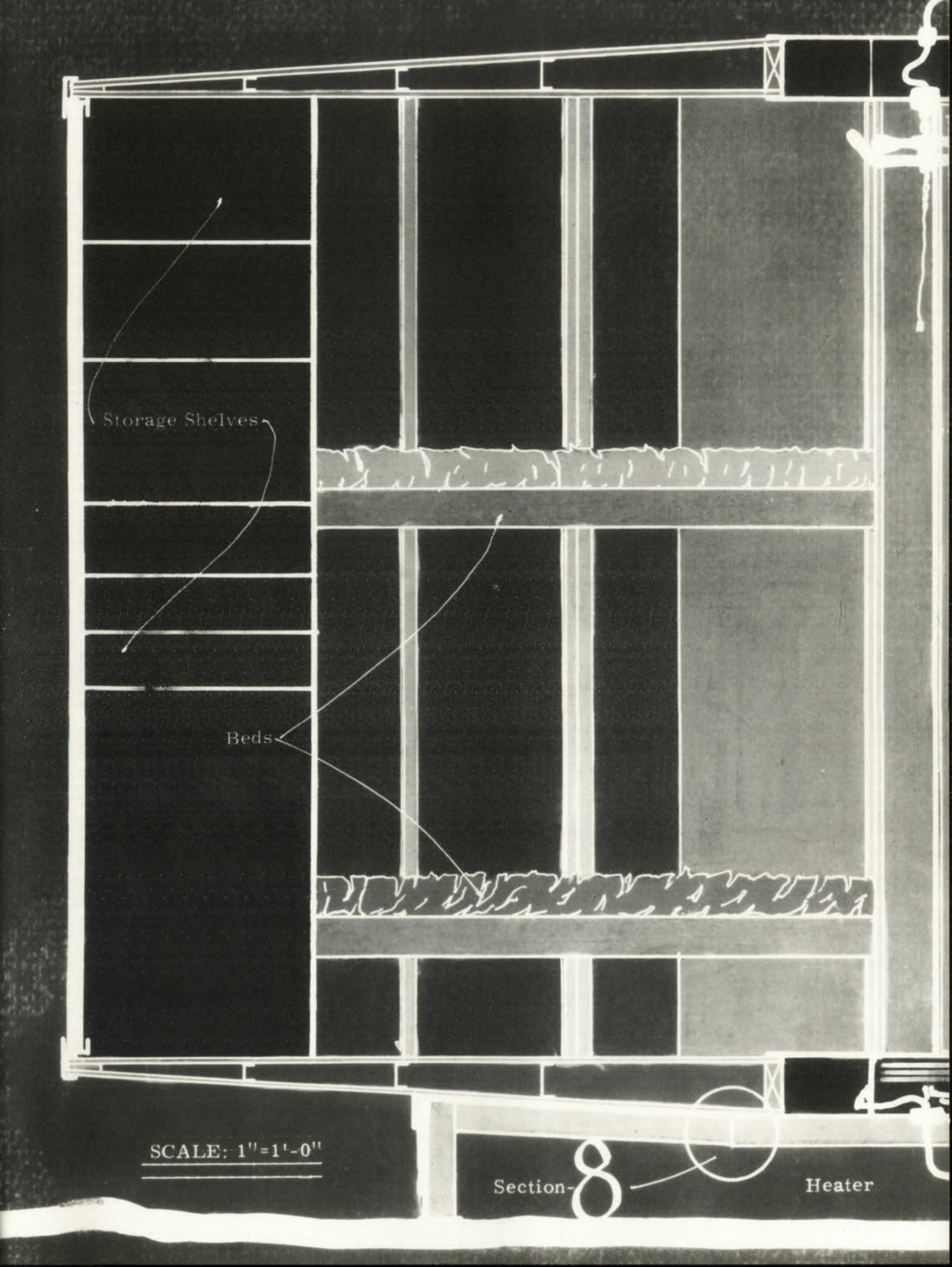

A
Section-1
Section-2
Storage
Bed
Bed
Heater
Closet
Closet
Optional Cabinet
Section-3
Section-4
A

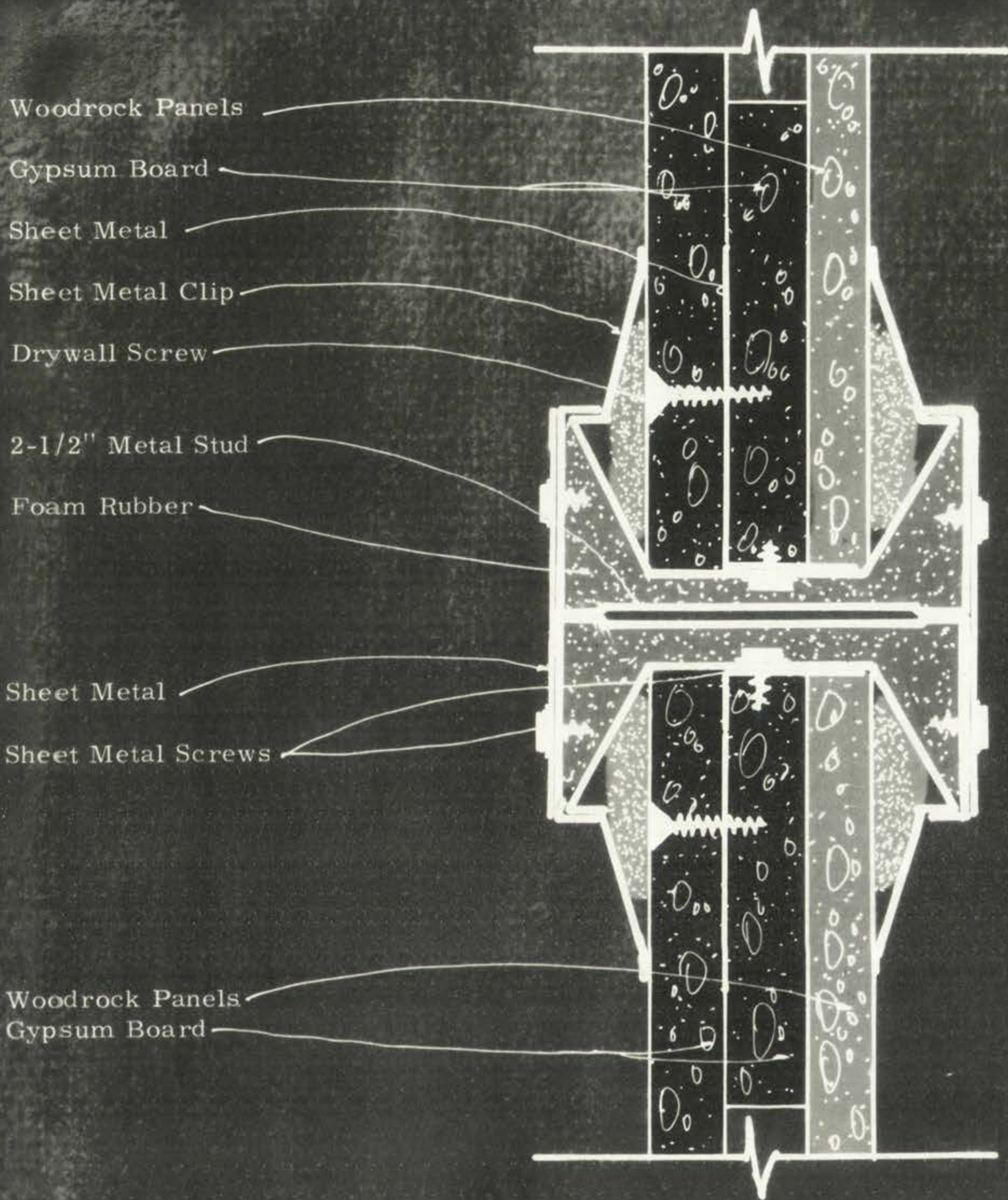
SCALE: 1/2"=1'-0"


re-Fab Structural Members
Pre-Finished "Plasti-Clad" Panels
Glass
Foundation
Electrical Hookup
Steel Step

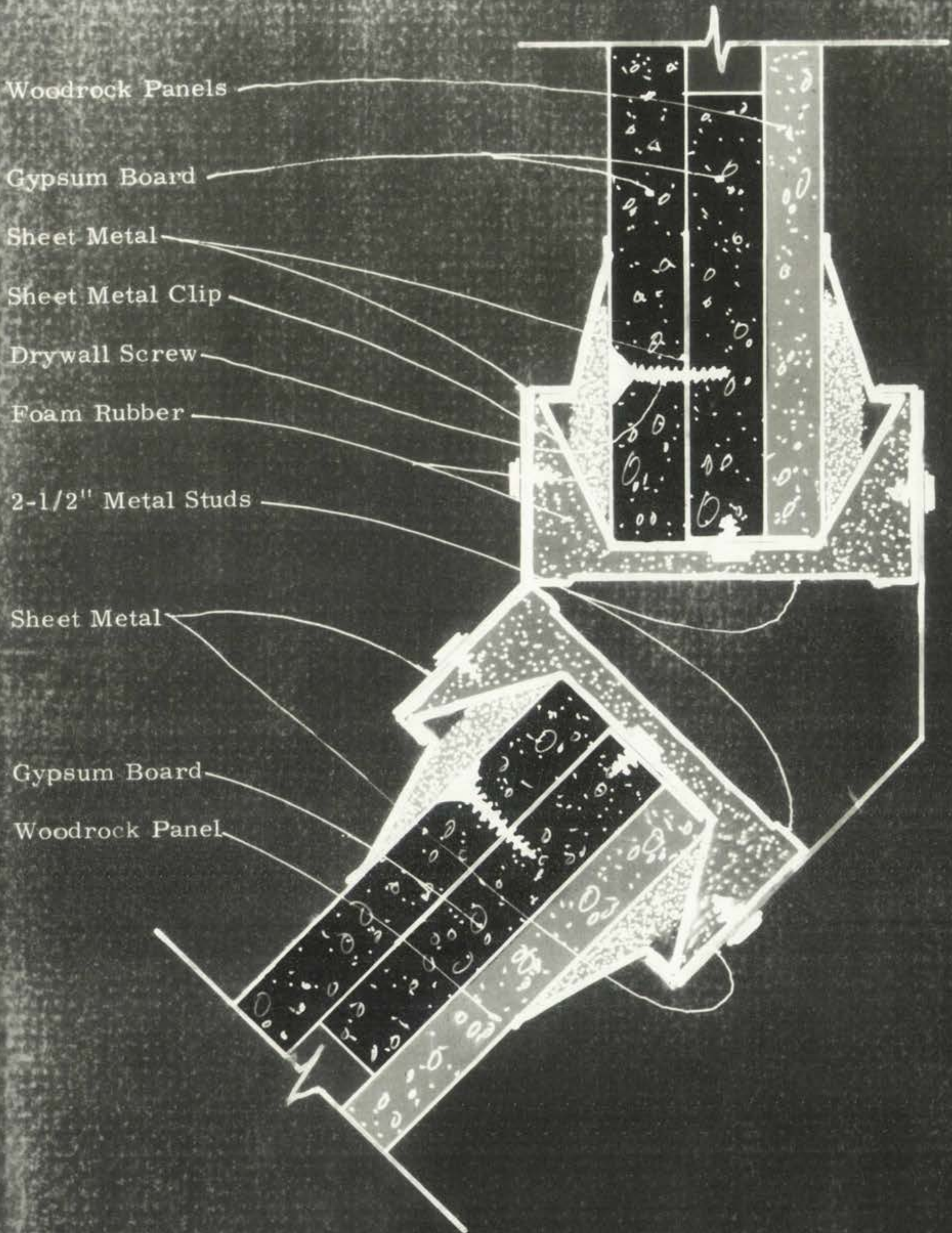
SCALE: 1/2"=1'-0"


Lighting Hookup
Pre-Finished "Plasti-clad" Panels
Optional
Cabinet
Closet
Section-5
Section-6
Section-7

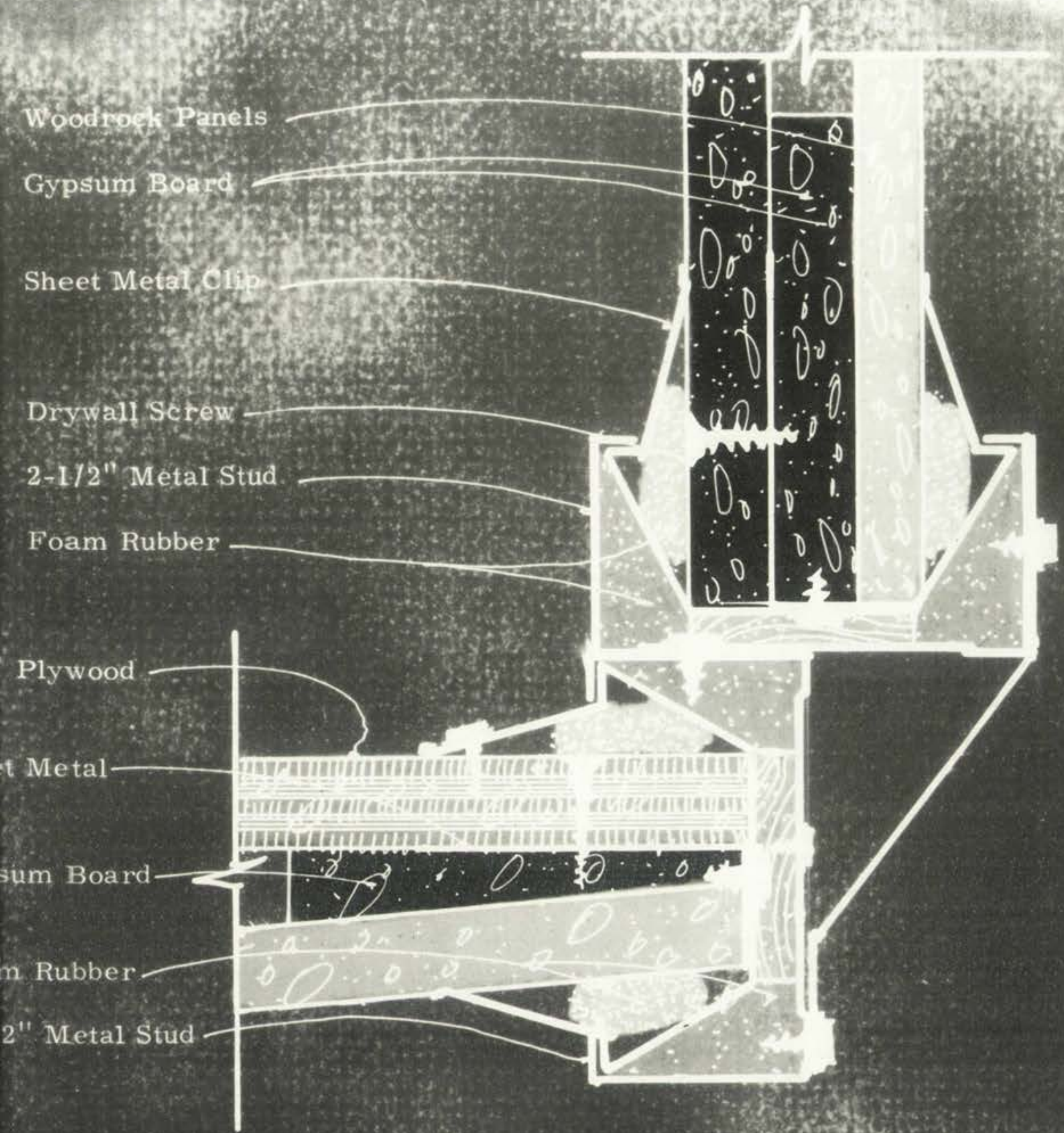

Storage Shelves
Beds
SCALE: 1"=1'-0"
Section-8
Heater


Woodrock Panels
Gypsum Board
Sheet Metal
Sheet Metal Clip
Drywall Screw
2-1/2" Metal Stud
Foam Rubber
Sheet Metal
Sheet Metal Screws
Woodrock Panels
Gypsum Board

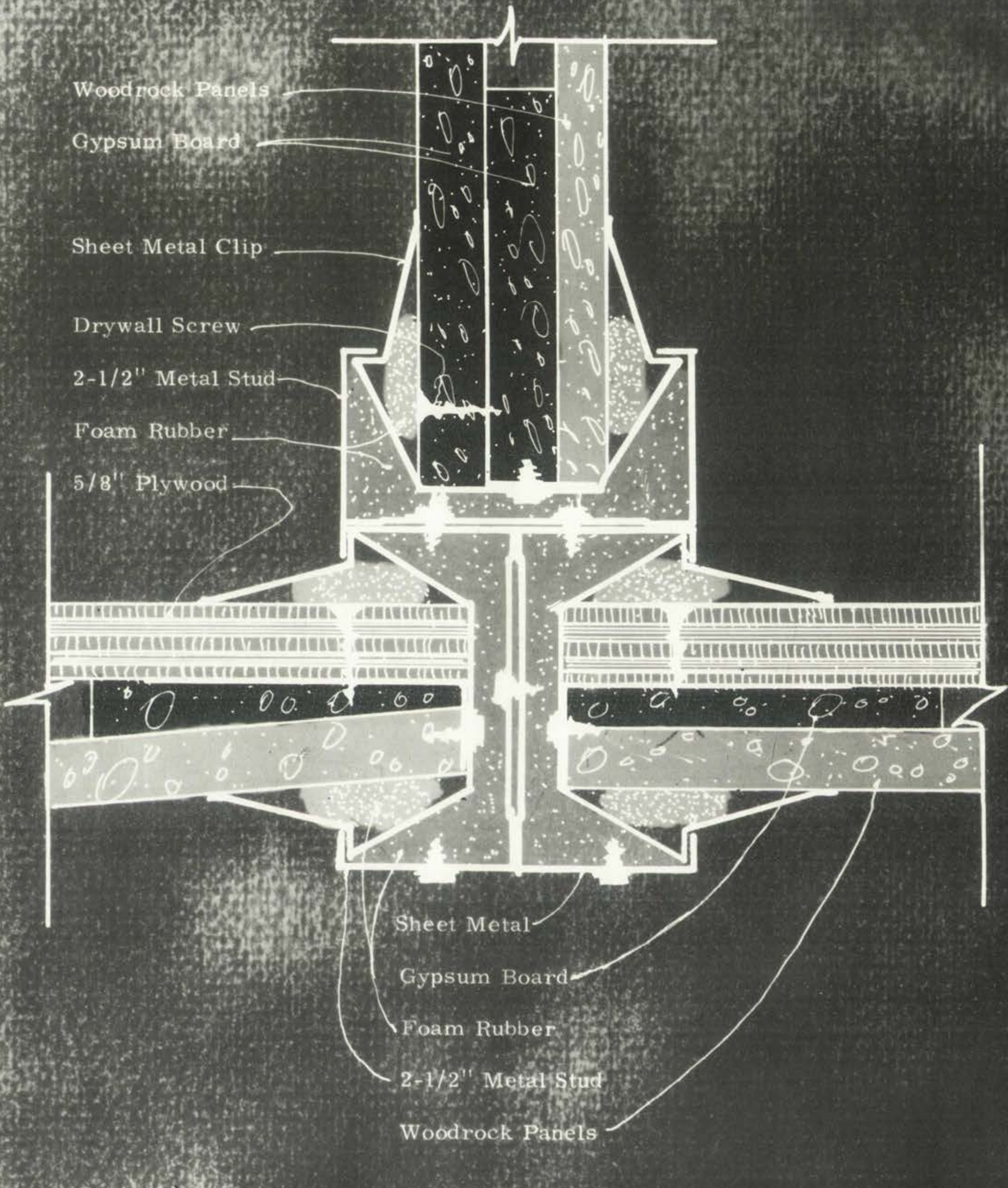
FULL SCALE


Woodrock Panels
Gypsum Board
Sheet Metal
Sheet Metal Clip
Drywall Screw
Foam Rubber
2-1/2" Metal Studs
Sheet Metal
Gypsum Board
Woodrock Panel

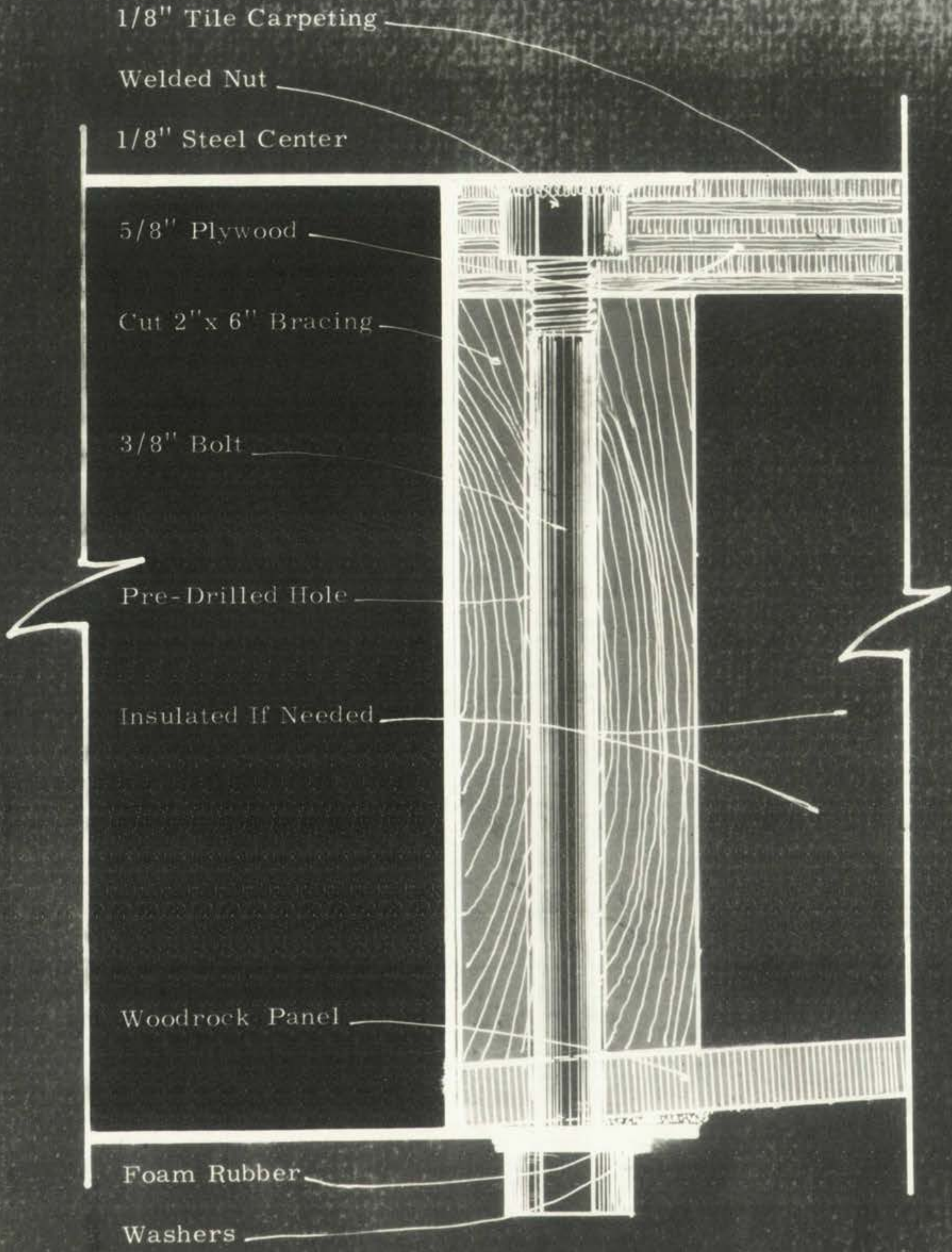
FULL SCALE


Woodrock Panels
Gypsum Board
Sheet Metal Clip
Drywall Screw
2-1/2" Metal Stud
Foam Rubber
Plywood
t Metal
sum Board
n Rubber
2" Metal Stud

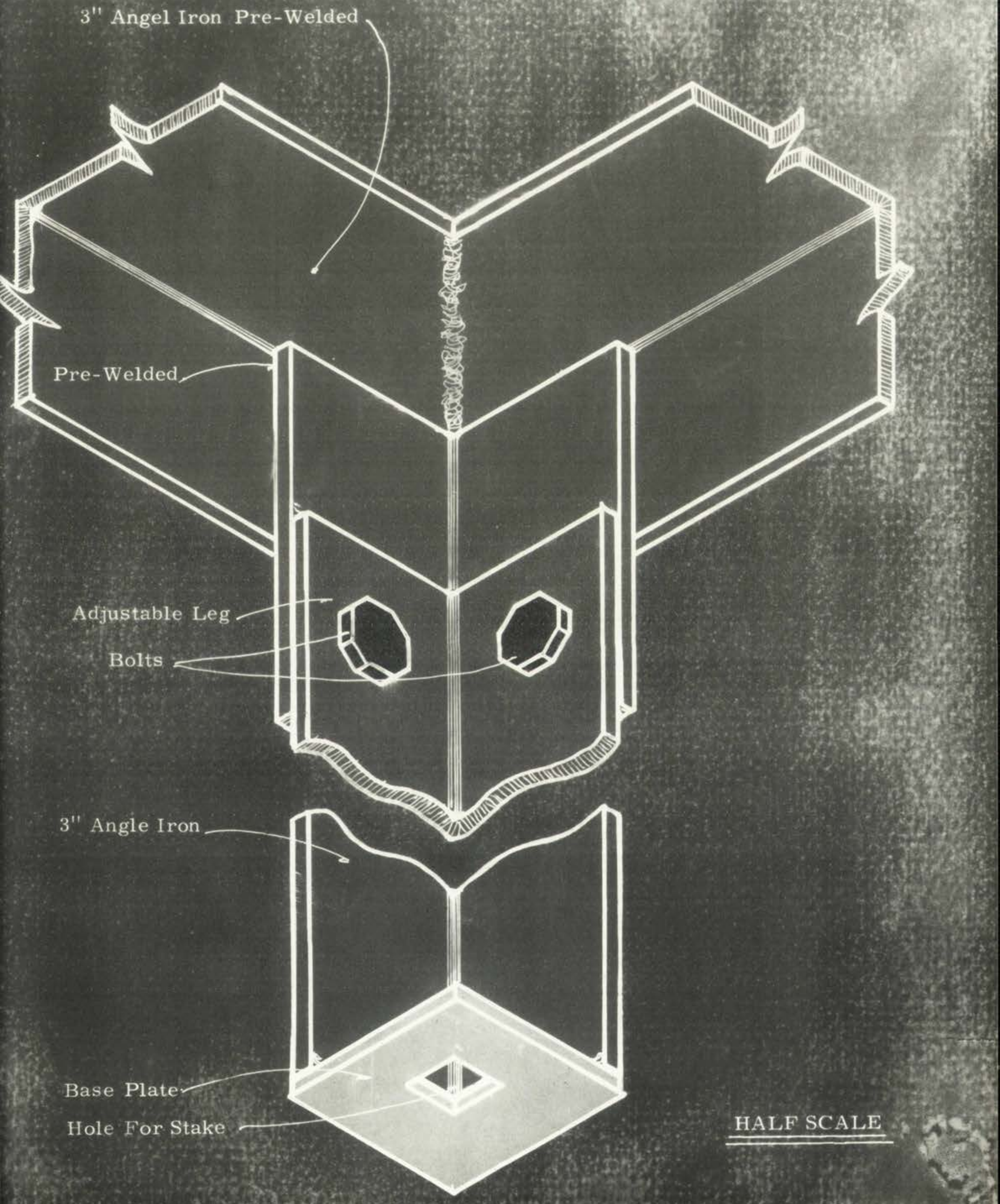
FULL SCALE

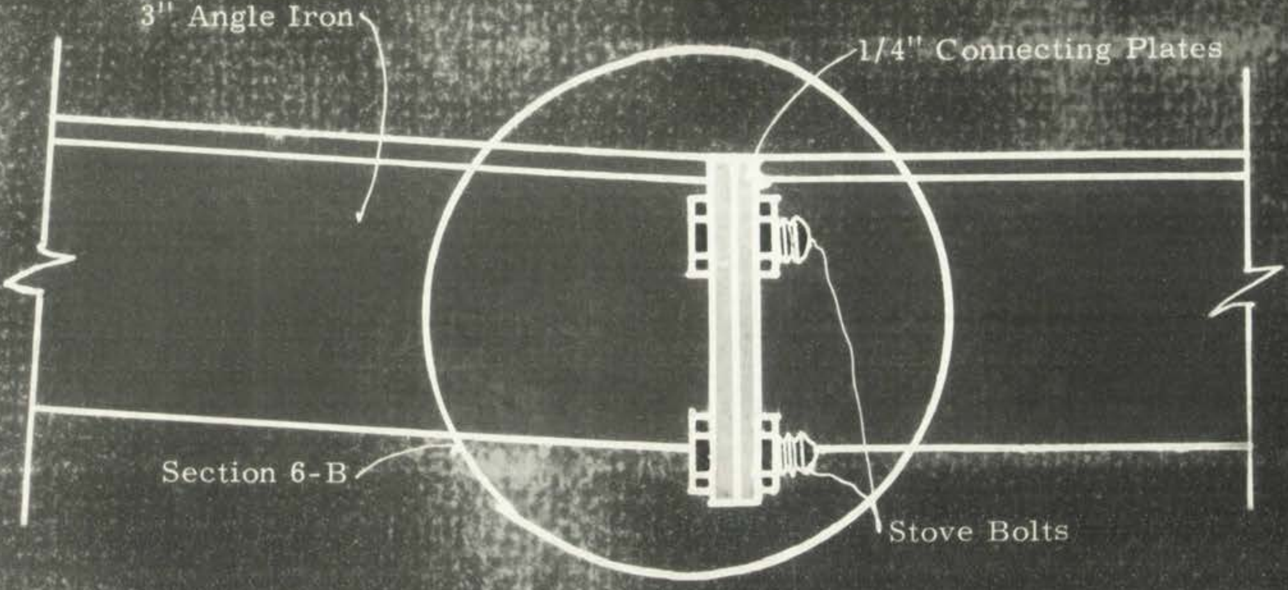

Woodrock Panels
Gypsum Board
Sheet Metal Clip
Drywall Screw
2-1/2" Metal Stud
Foam Rubber
5/8" Plywood
Sheet Metal
Gypsum Board
Foam Rubber
2-1/2" Metal Stud
Woodrock Panels

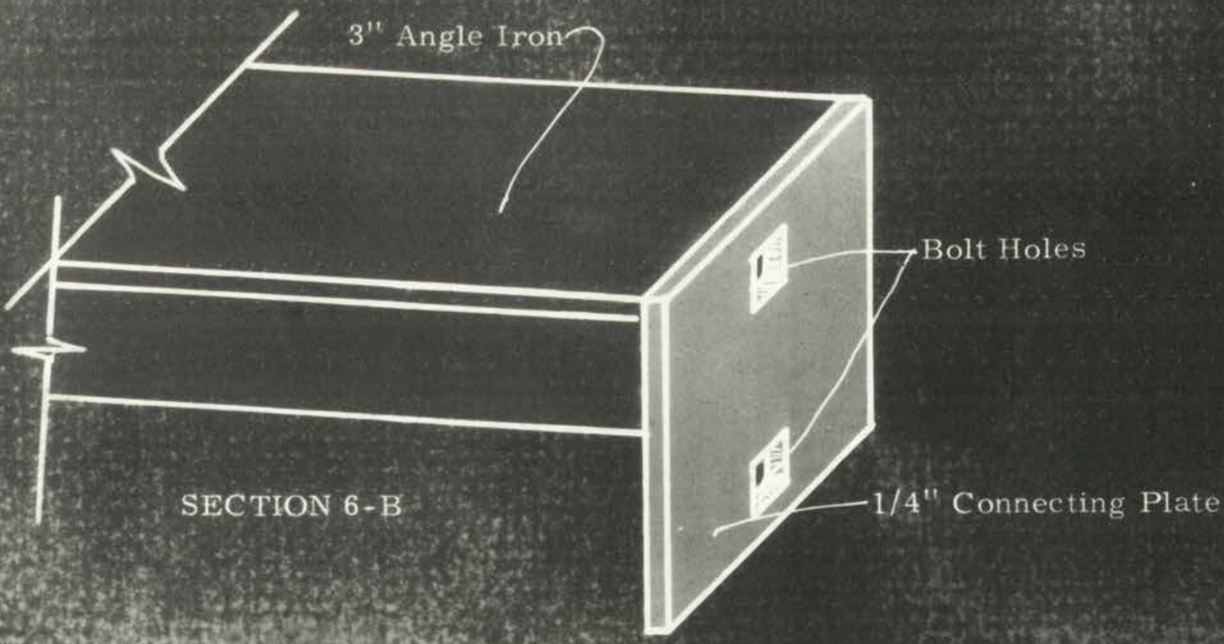
FULL SCALE


1/8" Tile Carpeting
Welded Nut
1/8" Steel Center
5/8" Plywood
Cut 2"x 6" Bracing
3/8" Bolt
Pre-Drilled Hole
Insulated If Needed
Woodrock Panel
Foam Rubber
Washers

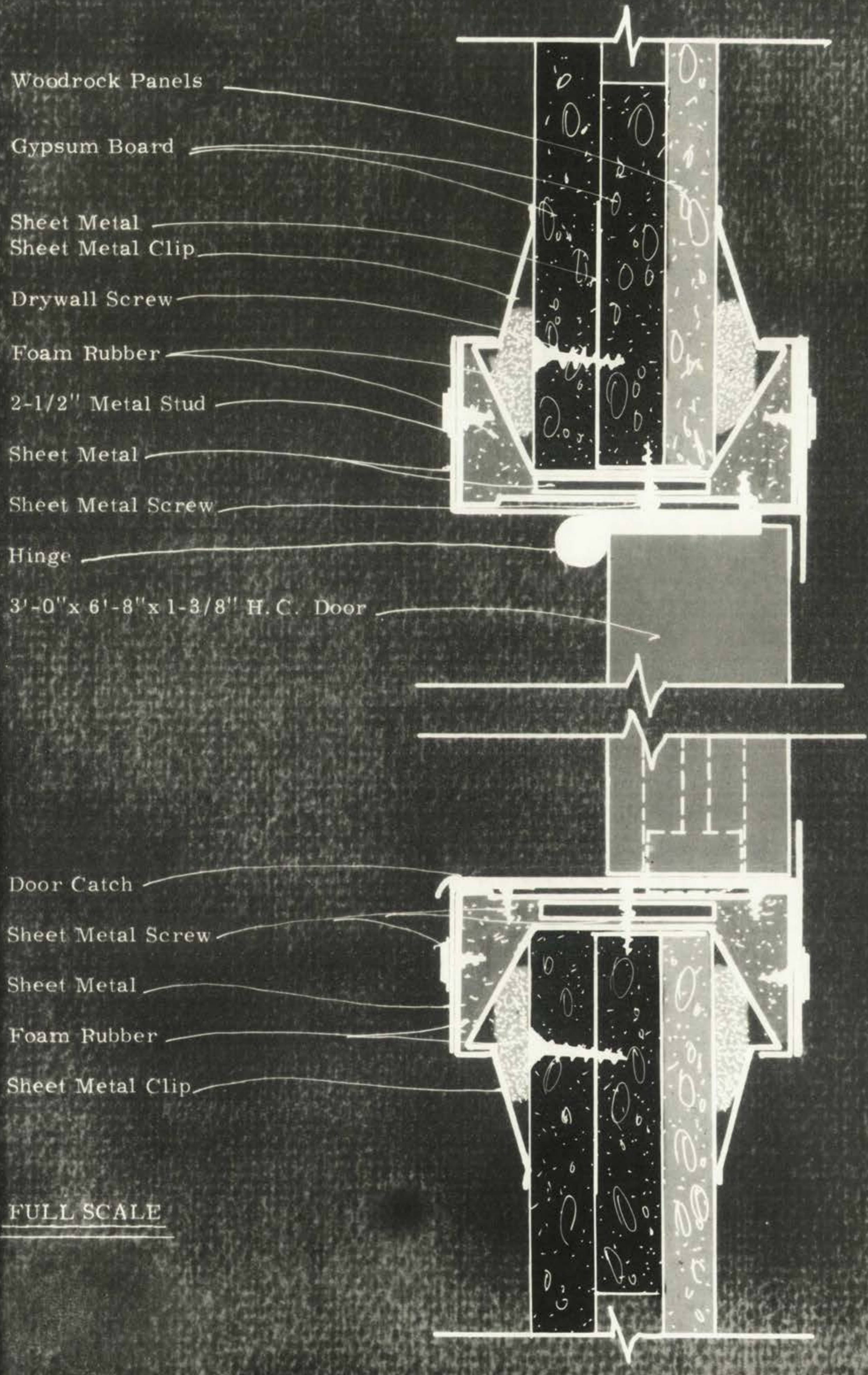
FULL SCALE


3" Angel Iron Pre-Welded
Pre-Welded
Adjustable Leg
Bolts
3" Angle Iron
Base Plate
Hole For Stake
HALF SCALE

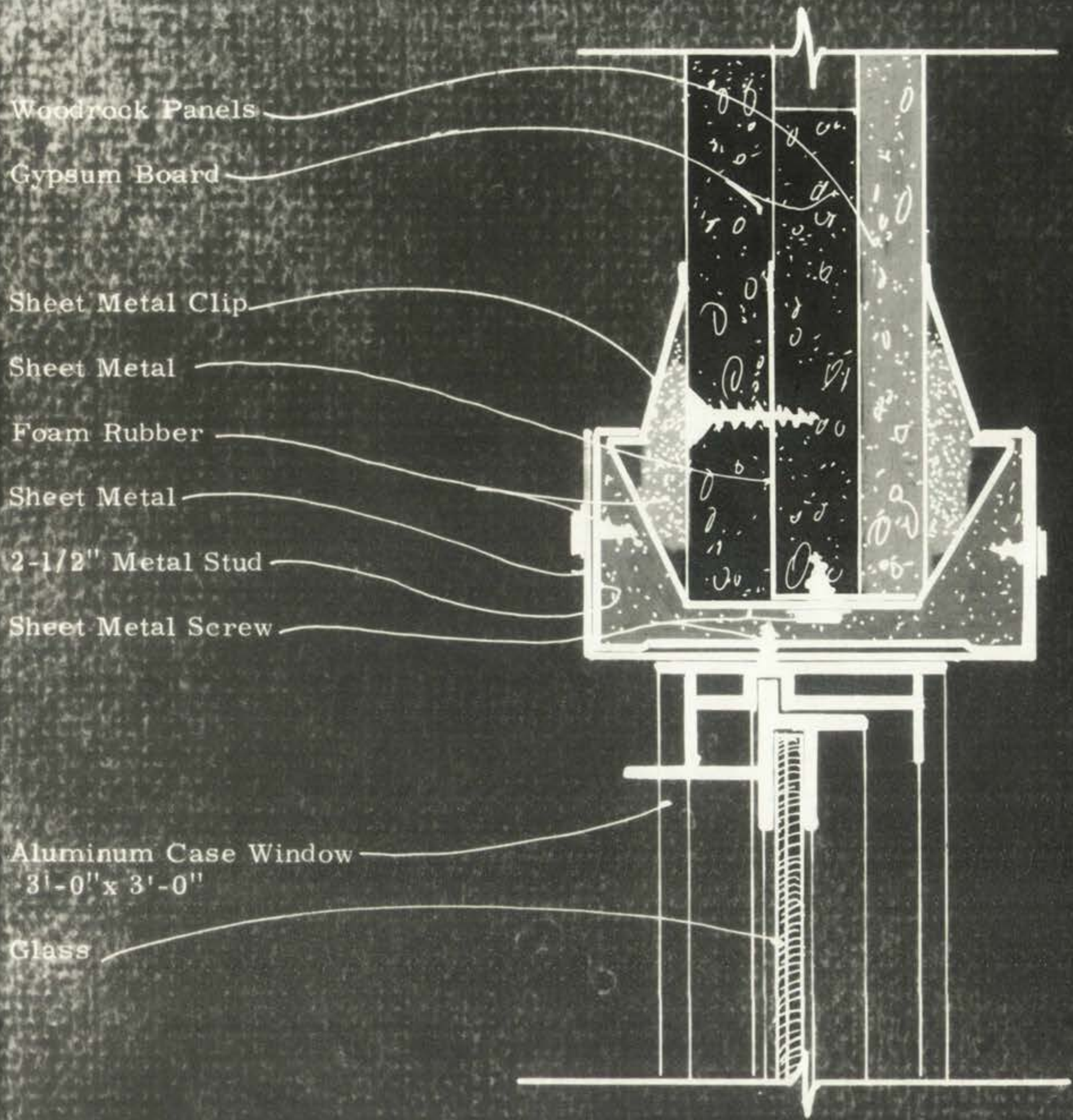

3" Angle Iron
1/4" Connecting Plates
Section 6-B
Stove Bolts


3" Angle Iron
Bolt Holes
SECTION 6-B
1/4" Connecting Plate

HALF SCALE


Woodrock Panels
Gypsum Board
Sheet Metal
Sheet Metal Clip
Drywall Screw
Foam Rubber
2-1/2" Metal Stud
Sheet Metal
Sheet Metal Screw
Hinge
3'-0"x 6'-8"x 1-3/8" H.C. Door
Door Catch
Sheet Metal Screw
Sheet Metal
Foam Rubber
Sheet Metal Clip

FULL SCALE


Woodrock Panels
Gypsum Board
Sheet Metal Clip
Sheet Metal
Foam Rubber
Sheet Metal
2-1/2" Metal Stud
Sheet Metal Screw
Aluminum Case Window
3'-0"x 3'-0"
Glass

FULL SCALE