DOCUMENT RESUME

ED 031 915 EF 003 468

University Residential Building System. Phase II Report (Including Evaluation of Bids).
California Univ., Berkeley. Dept. of Physical Planning and Construction.
Pub Date Sep 68
Note-79p.
EDRS Price MF-$0.50 HC-$4.05
Descriptors-*Building Design, Building Materials, *College Housing, *Component Building Systems, *Construction Costs, Performance Criteria, *Performance Specifications, Programing, Student Needs
Identifiers-University of California

The primary objective of the University Residential Building Systems (URBS) project was the achievement of significant gains in environmental qualities concurrent with reductions in the cost for construction, maintenance and alteration of student housing facilities. Evaluation of the bids for the URBS components indicates that the foregoing expectations have been achieved. This success is due partially to the performance specifications of the building components--(1) structure-ceiling, (2) heating-ventilating-cooling, (3) partitions, (4) bathrooms, and (5) furnishings. The derivation of the performance specifications from the user requirements translates qualitative statements about the needs of the user into quantitative criteria against which the performance of the final components can be compared and evaluated. The bidding procedure used required a preliminary design, a final design and a final priced proposal. This process separated questions arising from technical and aesthetic matters from questions of cost. Background information, priced proposals, bidder attrition and illustrations of URBS requirements and manufacturers proposals are supplied. (TC)

UNIVERSITY RESIDENTIAL BUILDING SYSTEM

PHASE II REPORT

(Including Evaluation of Bids)

UNIVERSITY OF CALIFORNIA

Office of the President

Vice President – Physical Planning and Construction

September, 1968

TABLE OF CONTENTS

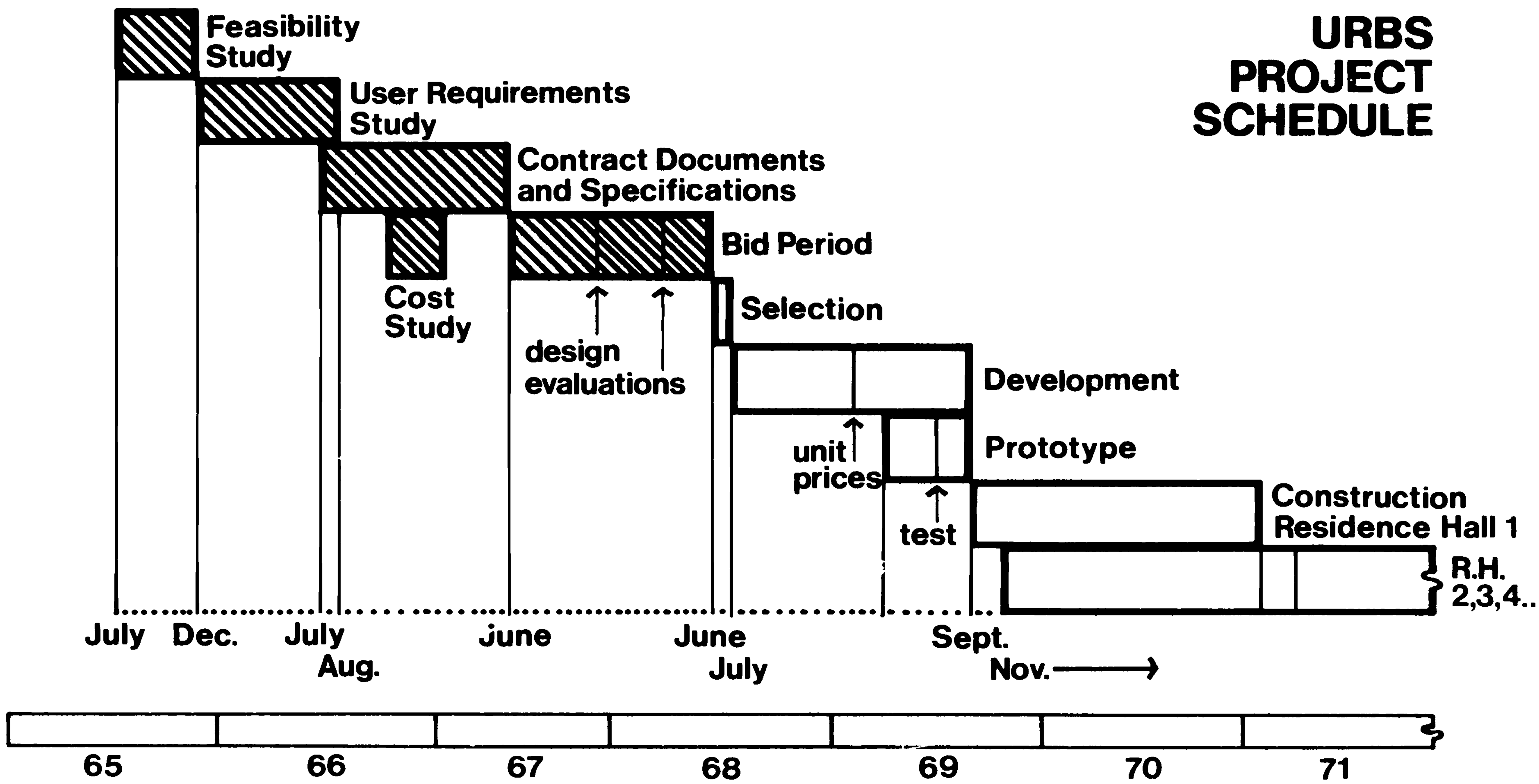
PART I. ABSTRACT

The University Residential Building System (URBS) project was funded in November, 1965, with $200,000 from the Group A Housing Net Revenue Fund of the University of California and $400,000 from Educational Facilities Laboratories, Inc. The University retained the firm of Building Systems Development, Inc., San Francisco (Mr. Ezra Ehrenkrantz, President), as its consultant for the URBS project. The URBS project is conducted under the direction of the Office of the President, Vice President–Physical Planning and Construction.

The primary objective of the URBS project was the achievement of significant gains in environmental qualities concurrent with reductions in the costs for construction, maintenance and alteration of student housing facilities. Another important objective was added adaptability of the building to changes in the physical environment and in the use of space over a period of many years as programs and requirements change.

Evaluation of the bids for the URBS components indicates that the foregoing expectations have been achieved. The reduction in cost of the URBS components, compared with the equivalent component construction cost of four existing University of California student housing buildings, is in excess of 11 percent. This cost reduction is coupled with substantial gains in environmental qualities. In addition, URBS components provide unparalled adaptability to meet future needs.

The results of the University of California's efforts on the URBS project will enable colleges and universities everywhere, large or small. to obtain increased quality and efficiency in the design, construction and use of buildings to house students.


URBS
PROJECT
SCHEDULE
Feasibility Study
User Requirements Study
Contract Documents and Specifications
Cost Study
Bid Period
design evaluations
Selection
Development
unit prices
Prototype
test
Construction Residence Hall 1
R.H. 2,3,4...
July
Dec.
July
Aug.
June
June
July
Sept.
Nov.
65
66
67
68
69
70
71

PART II. PHASE II ACTIVITIES

A. PERFORMANCE SPECIFICATIONS

The performance specifications[1] state what the solution must *do* rather than what it must *be.* The derivation of the performance specifications from the user requirements translates qualitative statements about the needs of the user into quantitative criteria against which the performance of the final components can be compared and evaluated. The writing of the performance specifications requires knowledge of industry's capabilities, particularly in terms of its research and development potential. Otherwise, there is the possibility that the manufacturer might be asked to develop a product which is technically impossible or prohibitively expensive. The final specification represents a balanced judgement between the university's needs in the context of its budget, and industry's capability in the context of its development capability and production costs.

Three of the URBS components must be "compatible" functionally, dimensionally and economically. While each of the three components may be dependent on the other two components, collectively the three must meet all the requirements of the performance specifications for the three components. The components involved are: Structure-Ceiling, Heating-Ventilating-Cooling, and Partitions.

The Structure-Ceiling performance specification requires a structure, with finished ceilings, specifically designed to meet the needs for variety and flexibility in future student housing—allowing the architect maximum freedom in planning and in exterior architectural expression. A structure of constant depth (finished ceiling to floor surface above) and ability to span up to thirty five feet without intermediate columns is specified to facilitate the variety, flexibility, and compatibility requirements. The structure will be from one to thirteen stories in height.

Various requirements were delineated pertaining to increased acoustical separation, low maintenance surfaces, sloping sites, seismic conditions, as well as columns, openings in floor slabs, cantilevers, and stairs.

[1]Contract Documents and Performance Specifications
URBS Publication 1, June 1967.

The HVC performance specification requires consideration of the maintenance and operation costs, as well as the initial construction cost. The solution must be extremely quiet in operation, economical, and with guaranteed performance for a twenty year period. The choice of either heating-ventilating or heating -ventilating-cooling, with the option of adding cooling at a later date is required. The HVC component is to be installed in both single student residence halls and and married student apartments; thus recirculation of return air from one apartment or suite to another is prohibited. Other problems to be resolved include multiple exterior wall exposures, corner rooms, automatic and manual control in various sized rooms, and adaptability to future changes of room sizes.

The Partitions performance specification requires an extremely versatile solution, providing for both fixed and demountable, one-hour fire rated partitions having a range of heights, and surface finishes including paint, vinyl, natural wood, chalkboard, tackboard and glass. A method for hanging pictures, temporary wall coverings, and supporting the Furnishings component is required. Also required are special design features to eliminate the damage caused by the slamming of doors and the impact damage caused by occupant "horse-play." The acoustical requirements, decidely higher than for existing facilities, are: STC[2] 50 for fixed partitions, STC 40 for demountable partitions, and STC 27 for doors. The specified performance is guaranteed, subject to check on the actual installation in the field–rather than laboratory testing under simulated conditions.

The Bathroom component performance specification expresses the desire to "de-institutionalize" the traditional gang bath, and so requires a residential scale bathroom as a complete entity–floor, walls, ceiling and fixtures–in four plan configurations. The fixtures are to be designed to human dimensional requirements. The lavatory unit is to provide ample storage, and the shower has tub, sitting and shelf features. The enclosing shell is to be completely water tight, have a one-piece floor, and highly indestructible against abrasions and acids.

The Furnishings component performance specification requires aesthetically pleasing, exceptionally sturdy furniture that must not suggest a standardized environment to the individual occupying the room. The furniture is to be capable of being fixed in place, or free-standing, or supported by the Partitions component. Requirements include storage units of many sizes, with interchangeable shelves, drawers and counters; both a bolster bed and a bunkable bed; adjustable height desk with storage and a functional lighting fixture, and a comfortable, high strength upholstered arm chair–with swivel and tilt options–specifically designed for student use.

[2]STC : Sound Transmission Coefficient

B. CONTRACT DOCUMENTS AND PROCEDURES

The URBS Contract Documents provided for receipt of proposals covering the design, development, supply, installation and guarantee of five building rooms, and Furnishings. These components represent about fifty-three percent of the building cost of the student housing project. Since many different solutions the building cost of the student housing project. Since many different solutions were expected in answer to the URBS Performance Specifications, bidding on installed components provided the only fair basis of evaluation. This does not mean that the manufacturer must perform the installation–local contractors may be used; but the responsibility for the entire product design, development, supply, installation and guarantee is placed with one party. The advantage to the University is obvious, as all responsibility for each component is on one party rather than on many as is the case with conventional construction practice.

The building system approach enables the University to utilize the volume of its student housing building program to procure directly from industry significant innovation to answer its needs. The URBS project guaranteed a minimum of 4,500 to a maximum of 9,000 student spaces, having an estimated minimum aggregate floor area of 1.6 million square feet. These student spaces were to be erected within a three year time period.

The bidding procedure required three submissions: a preliminary design proposal, a final design proposal, and the final priced proposal. The bidding period was about thirteen months. The ability to submit a final priced proposal was contingent upon receiving the University's approval of the final design proposal. This process separated questions arising from technical and aesthetic matters from questions of cost.The usual bid bond was required with the final priced proposal. Each bid contained "campus multipliers" to allow proper pricing for each of the nine campuses, reflecting the special cost characteristics such as labor, materials, accessibility, transportation and topography.

The Regents of the University of California reserved the right to reject any or all bids and any or all items or alternates or propositions of such bids. Should no acceptable bid be received, the URBS Performance Specifications may be altered and re-bid or that portion of the work for which no acceptable bid was received may then be accomplished by standard contracting procedures.

The approximate type, location, size and estimated completion date of the minimum guaranteed student housing program was extended from the 1967–1972 Major Capital Improvement Program. Provision was made for this schedule to be replaced with the actual schedule shortly after the award of component contracts.

After the successful component contractors are selected, the remaining effort is divided into two phases: the development phase, and the construction phase. Bonds, with provision for liquidated and ascertained damages payable in the event on non-performance, are required for the University's protection during both phases.

> The development phase requires the completion of the final development work on each component. This work includes the final coordination of one component with all other components; construction of non-working mock-ups as well as working prototypes of each component; testing of each component for satisfactory compliance with applicable codes and the URBS Performance Specifications; submission of unit prices for each unit and element involved in any one component in all its various possible configurations; preparation and submission of a component design information manual as well as a component maintenance manual; and establishing a functioning component production facility.
>
> The construction phase requires submission to the University and the architect of a price and quantity take-off setting forth the cost of the component allocatable to each URBS housing project before such project is bid; providing component shop drawings to the architect for such URBS housing project; supply and installation of the component in accordance with the plans and specifications for each URBS housing project, acting as a sub-contractor to the general contractor for that URBS housing project (except the Furnishings Component Contractor who will remain in direct contract with the University); and at the completion of each such project providing two sets of as-built drawings for the component installed in such project. Each Component Contractor is required to have the appropriate State of California license for his construction activity.

Each URBS housing project will be individually designed by an architect retained by the University, and constructed by a general contractor selected on the basis of competitive bidding for all the work not furnished by the Component Contractor. The architects and the general contractors will probably be different for each campus.

Adjustment of bid prices for the components to cost conditions prevailing at the time of construction of each URBS housing project will be made by the application of the Engineering News-Record Construction Cost Index (ENR) as published monthly by the McGraw-Hill Publishing Co. of New York. Escalation in accordance with the ENR Index will be applied before the price multiplier for a particular campus has been applied.

Unit prices derived from the lump sum bid for each URBS component, as applied to a specific URBS housing project, will be adjusted proportional to the change in the ENR Index occurring between June 1968 and the month prior to receiving bids for the general construction of the specific project.

The various construction contract provisions required by the U.S. Department of Housing and Uiban Development for student housing construction contracts funded with its assistance are included in the URBS Contract Documents.

C. COMPONENT DESIGNS

1. Structure–Ceiling

This URBS component includes all structural work above the ground level, including columns, horizontal floors and roof, stairs and shear walls. In addition, it includes finished ceilings.

Six basically different design solutions, involving either steel or concrete or both, were given design approval. Three of these solutions were represented in the final bidding.

The low bid submitted by Interpace Corporation is for a pre–cast concrete structure involving advanced manufacturing processes which have not yet been employed commercially. The structure is most economical at relatively long spans (30–35 feet), thus allowing maximum freedom in architectural planning and exterior expression. The structure will feature faster erecting, very low maintenance costs, non-combustible materials, and exceptionally good acoustical characteristics. The latter is due to the air space (for utilities and services) separating the concrete ceiling and floor. This space will also facilitate later additions or modifications to utilities.

In the URBS structure the distance from finished ceiling to the floor above is a uniform 18 inches, as compared to 26-1/2 inches average for the four existing University of California residence halls used in the cost comparisons. This 8-1/2–inch reduction, with corresponding reduction in height of exterior walls and length of vertical services, results in an URBS structure cost $0.17 per square foot of floor area less than for comparable conventional structure. This solution also requires fewer columns and less weight to be supported by the footings, at the slight further saving of one half cent per square foot of floor area.

The design work was done by Hellmuth, Obata and Kassabaum, Architects, St. Louis, Missouri, working under the auspices of The Portland Cement Association.

2. Heating–Ventilating–Cooling

The H–V–C component provides all of the mechanical equipment required for heating and ventilating plus option of cooling where desired. This represents a substantial improvement in the student environment as compared with existing university practice which, with few exceptions, provides heating only with no mechanical ventilation or cooling and no provisions for adding them in the future. In view of the increasing acceptance of climate control in buildings of all types, planning for future student housing facilities should provide for possible addition of ventilation or cooling at some future time. Without this capability many otherwise adequate buildings face the prospect of early obsolescence and difficulty in maintaining high occupancy.

The design proposed and bid by the Airtemp Division of the Chrysler Corporation is based on multi–zone units specifically developed for the URBS project. The multi–zone unit is sized to service a flexible living area of approximately 2,000 square feet.[3] This area can be subdivided into a variety of different living arrangements.

The component provides strict low–noise level performance due to the remote location of the units from the living areas. Another advantage is that the equipment requires no space taken from the living area, as is often the case. All of the air is supplied to the living areas through ceiling diffusers connected to the remote multi–zone units by means of ducts concealed in the structure. The component can be easily adapted to changing arrangements of spaces within the living area, and offers a variety of control options, ranging from a thermostat in each room to one thermostat for the entire 2,000 square foot living area.

3. Partitions

This URBS component provides both fixed and demountable, one-hour fire rated partitions with a wide selection of surface colors, textures materials and doors. Surfaces may be smooth or textured, with options for epoxy paint, vinyl, redwood, tackboard, chalkboard, glass or a supporting surface for student applied finishes ranging from velvet to sketching paper.

[3] A *flexible living area* of 2,000 square feet maximum, enclosed by 1-hour-fire-rated envelope was established by the URBS project and the California State Fire Marshall. Within this area all construction may be either incombustible or 1-hour-fire-rated, as well as relocatable.

Due to their demountable and movable characteristics, it is relatively simple to change the finished surface of the partitions on either side without dismantling the entire wall. If it becomes necessary to relocate the partition, this can be easily accomplished.

In addition to the flexibility inherent in the design of the URBS partitions (not now possible in any University residence hall) this component is also guaranteed to provide heretofore unequaled standards of sound control, impact resistance and easy, low cost maintenance. The top of the partitions incorporates a hanging device for pictures and other temporary display items. The URBS partition includes inset vertical channels from which URBS furniture can be supported and easily relocated.

The low bid for the Partitions Component was submitted by Vaughan-Walls, Inc., based on design work by the U.S. Gypsum Corporation.

4. Bathrooms

The Bathrooms component presented some of the most interesting challenges for design innovation in the URBS project. Unfortunately, the volume presented by the University did not offer a sufficiently large market to justify the extensive research, tooling and production costs required to translate the excellent design proposals into finished products and yet remain within the cost limitations. However, this does not preclude the possibility of incorporating many of the ideas and possibly the tub-shower fixture in the design of bathrooms, even though they are built using conventional methods in lieu of the 'self contained and integrated package' concept envisioned in the URBS design proposals.

The URBS bathroom concept comprises smaller size bathrooms accommodating three to four students each, as opposed to the existing stereotype 'gang' bathrooms serving all of the residents on one floor of a living unit. The small bathroom concept offers the advantages of greater privacy and a more residential character. Furthermore, housing officials advised that small student groups can and do assume a greater responsibility for cleaning and maintaining "their" bathrooms, thereby eliminating the major expense of the maid service required to maintain 'gang' bathrooms.

The bid by the Johnson–Washer Company, based on designs by the Crane Company, represents an important advance in the development of more durable plastic materials and new prefabrication manufacturing techniques. The URBS bathroom has a 'residential' scale with 9 to 12 square feet per student and one set of fixtures for three students. The fixtures are designed with great regard to human proportions, as described in studies by Cornell University, BSDI and others. Ample bathroom storage is provided under the lavatory. The bathing area includes shower, tub, seat and a shelf. The most significant feature of the component is its water--tightness, It is a single, water-tight vessel, virtually indestructible. Its residential scale is less conducive to the violent horseplay noted in large 'gang' baths, with consequent damage to water-tight surfaces and fixtures.

5. Furnishings

The URBS Furnishings component offers a number of performance advantages compared with existing products. As the design is compatible with the URBS partitions, the various units can be wall hung, or fixed in place, or movable on the floor. The storage units are available in a range of sizes, with all internal elements interchangeable (counters, drawers and shelves). The smaller sized units may be combined to form larger units. All surfaces provide a high degree of durability, in an array of colors including wood-grained.

The bed is available in two models–a bolster bed and a bunkable bed. The surface of the bolster bed is level for sleeping, yet sloped for sitting.

The desk is available in two widths, with adjustable height, and with bin storage at the rear. An efficient lighting fixture, with non glare, low brightness level, may be obtained with the desk.

The chair, designed specifically for student use, is upholstered and has arms.

The low bid was submitted by The Simmons Company. The component represents a modification of an existing line of furniture, developed especially for the URBS project by a major and experienced manufacturer of dormitory and other furniture. The units are made of metal and represent an exceptionally sturdy and well-built product.

D. PRICED PROPOSALS

Final priced proposals were submitted on June 18, 1968, subsequent to approval by the University of component design proposals. Each of eight firms bid one of the five components covered by the URBS contract documents and performance specifications. A total of twelve priced proposals were submitted in order to comply with the compatibility requirement for combinations of components (Structure-Ceiling, H-V-C, and Partitions) proposed by different bidders. The most economical (lowest cost) combination of the compatible components was determined by evaluation of these twelve lump sum proposals together with submitted prices covering several weighting factors. The weighting factors were devised to permit fair comparison of different design solutions for the same component (viz., steel versus concrete).

Bids received were in the form of lump sum proposals based on a *hypothetical* set of conditions encompassing the *full range* of component capabilities for a student housing program of 1,600,000 square feet of floor area for 4,500 students.

It is important to note that the purpose of the lump sum bids was:

1. To permit bid comparison, and

2. To establish the means by which extensive pricing on a per unit basis could be obtained. Thus, prices for various shapes, kinds, sizes, textures and finishes of each component could be obtained upon completion of the testing program.

The lump sum bids, therefore, are not indicative of the economy of the URBS project, but rather a summation of the range of costs inherent in the hypothetical examples.

Prices for five years' full maintenance cost of the H-V-C component (renewable at the same price for three additional five–year periods, 20 years total), and for relocating all demountable partitions through the year 1979 were included in the form of additional lump sum bids.

All prices may be escalated by use of the ENR Construction Cost Index.

LUMP SUM BIDS

COMPONENTS	COMPATIBLE COMPONENTS BIDS		
Structure—Ceiling:	$11,591,000.	$8,995,374.	$10,375,000.
	Abridge Div. U.S. Steel	Interpace Corp.	Stolte Co.
H—V—C			
Supply, Install:	9,355,500.	9,288,252.	9,558,231.
Maintenance:	1,469,485.	1,469,485.	1,469,485.
	The Airtemp Division of Chrysler Corporation		
Partitions			
Supply, Install:	5,216,855.	5,232,784.	5,824,369.
Maintenance:	1,043,370.	1,009,860.	1,164.873.
	Vaughan Interior Walls, Incorporated		

COORDINATED COMPONENTS

Bathrooms:	$4,597,981.	Johnston-Washer Co.
Furnishings:	$4,682,552.	The Simmons Co.
	$5,573,655.	Thonet, Inc.

E. BIDDER ATTRITION

The URBS contract documents and performance specifications were reviewed with two hundred representatives of industry in June, 1967, at a pre–bid conference held to acquaint prospective bidders with URBS requirements. Bidders were required to submit their preliminary design proposals for approval by November 1, 1967, and their final design proposals by March 22, 1968. Final priced proposals were received June 18, 1968. During this thirteen–month period, the number of prospective bidders decreased as firms which could not develop competitively priced products dropped out. Some firms also recognized that they simply would not be able to meet the rigid performance specifications. For a few firms, technical difficulties, financial reservations or bonding difficulties presented problems at the very last moment prior to bid. The eight firms submitting final priced proposals represent a group which persevered through the keenest of competition to offer marketable products meeting all the requirements of the performance specifications.

The limited number of bidders may cause concern to some regarding the apparent lack of competition. Three components received only one bid each (HVC, Partitions and Bathrooms); one received two bids (Furnishings); and one received three bids (Structure–Ceiling). This paucity of bidders would be of real concern in a normal bidding project; however, the URBS design review and bidding procedure is in no way similar to the solicitation of bids for conventional construction. The degree of competition must be evaluated differently. All of the bidders knew they were bidding against a 'significant reduction in existing costs' as a target. Thus, it can be concluded that the URBS competition was of an even higher intensity than expected in conventional bidding procedures.

The cost to industry of this URBS competition is interesting. Conversations with the nineteen final firms provided the estimate that nearly four million dollars have been collectively invested to date. The details of attrition of all of the par icipants are as follows:

Prelim. Design	Final Design	BID	
INTERPACE-PCA	INTERPACE-PCA	INTERPACE-PCA	**S-C**
SLAB-PCA	SLAB-PCA	STOLTE-PCA	
AISI	AISI	AISI	
AIRFLOOR	AIRFLOOR	(Financing Problems)	
LATENSER	LATENSER	(No Installer)	
TEC	TEC	(Gambled on Re-Bid)	
ROCKWIN	(Development Expense)	-	
VERMICULITE	(Development Expense)	-	
CHRYSLER	CHRYSLER	CHRYSLER	**HVC**
LENNOX	LENNOX	(Performance, Time)	
LATENSER	LATENSER	(No Compatible S-C)	
TRANE-CC	TRANE-CC	(Performance, Time)	
ACME	(Development Expense)	-	
PAMECO	(Development Expense)	-	
USG	USG-VAUGHAN	USG-VAUGHAN	**Part.**
VAUGHAN	(Joined USG)	-	
KAISER	KAISER	(Performance, Contract)	
HAUSERMAN	(Non-competitive Design)	-	
LATENSER	(Unable to Compete)	-	
PABCO	(Development Expense)	-	
CRANE	CRANE	CRANE	**Bath.**
ELJER	ELJER	(No Contractor; Expense)	
AMERICAN STD.	(Development Expense)	-	
SIMMONS	SIMMONS	SIMMONS	**Furn.**
THONET	THONET	THONET	
DICKSON-SMITH	DICKSON-SMITH	(Bond)	
KLN	KLN	(Bond)	
DUX	DUX	(Non-Competitive Design)	
SOUTH CROSS	(Development Expense)	-	

URBS BIDDER ATTRITION

ATTRITION PRIOR TO BID

MANUFACTURER/BIDDER		REPORTED REASON FOR WITHDRAWAL
Structure Ceiling		
	Air Floor	Technically acceptable, but unspecified financial problems relative to bonding prevented their submitting a priced proposal.
	Latenser	Unable to complete an agreement with an installer.
	Reticular	Withheld their bid.
H–V–C		
	Latenser	Could not name a compatible structure ceiling bidder.
	Lennox	Withheld bid when last minute testing revealed performance problems.
	Trane	Organizational problems prevented effective participation in final design phase.
Partitions		
	Kaiser	Withheld bid when last minute testing revealed inadequate performance, and because of contract obligations.
Bathrooms		
	Eljer	Could not complete arrangements with an installer in time, and had reservations about development expense.
Furnishings		
	Dickson–Smith	Presumably could not acquire bond.
	Dux	Withdrew design
	KLN	Presumably could not acquire bond.
	Southern Cross	Submitted incomplete non-conforming design. Company could not justify the expense of a thorough development program.

ATTRITION PRIOR TO FINAL DESIGN

H-V-C

Acme and Pameco	Submitted non-conforming proposals based on their standard components. Neither company could justify the expense of a thorough development program.
Climate-Conditioning	Joined Trane in the preparation of a joint proposal.

Partitions

Pabco	Submitted non-conforming proposals based on an existing partition system. Company could not justify the expense of a thorough development program.
Hauserman	Producer of steel partitions. Inquired if gypsum partitions were a feasible solution and when told that they were, withdrew, indicating their product would not be competitively priced.
Latenser	Withdrew when it became apparent he would be unable to compete with established manufacturers.
USG-Vaughn	Joined forces to submit a single proposal.

Bathrooms

American Standard	Submitted non-conforming design based on existing fixtures. Company could not justify the expense of a thorough development program.

F. EVALUATION OF BIDS

The prime basis for acceptance or rejection of the URBS bids is two-fold: either URBS costs are below existing costs for student housing, or the URBS components provide increased performance at no greater cost than for existing student housing.

Evaluation of bids shows that the URBS components do offer **increased performance and lower cost** in the case of the three compatible components: Structure-Ceiling, HVC, and Partitions. The remaining two components, Bathrooms and Furniture offer *increased performance, but at greater cost* than for existing student housing.

The lump sum bids received are not indicative of the economy available from the URBS components. The lump sum bids are the aggregate total of an extensive array of unit prices based on *hypothetical* conditions encompassing the full range of kinds, shapes and sizes available within each component. The hypothetical conditions established for the bidding process were based on an estimated 1.6 million square feet accommodating 4,500 students.

Although the URBS contract documents did not require the submission of the unit prices until six months after the bid opening- after all component testing was complete–it was evident after the bid opening that proper comparisons with existing student housing costs could not be made without such unit prices.

It was decided, to compare the URBS component costs with four existing University of California student housing projects, excluding the cost of facilities for food preparation and serving:

PROJECT	OGSF	NUMBER OF STUDENTS
Berkeley, Priestly Hall	160,000 OGSF	848
Los Angeles, Hedrick Hall	166,000 OGSF	836
Riverside, Lothian Hall	69,000 OGSF	424
Santa Cruz, Cowell College	89,500 OGSF	416

Construction drawings and specifications for these projects were submitted to the low bidders with the request that they apply their components to these buildings in the most economical fashion within the constraints of the URBS Performance Specifications. The bidders were advised that the costs derived must be verifiable. The prices so submitted have been confirmed as guaranteed maximum costs.

In addition, each URBS low bidder was asked to provide the lowest price for his component in an ideal installation–again, within the constraints of the

URBS Performance Specifications, thus obtaining the lowest price that an architect could expect in utilizing the URBS components.

This cost information from the URBS bidders was compared by the consultant, Building Systems Development, Inc., with the costs for the existing projects.[4]

The consultant then recommended to the University that the URBS Bathrooms component bid be rejected, and that the remaining four URBS component bids be accepted.

The Muir College residence hall at the San Diego campus was bid within a few days of the URBS project. The consultant was requested to compare that bid cost with the most economical application of URBS components. This comparison is summarized on page 21 . The $0.56/OGSF additional cost for URBS is considered a small cost for the improved performance offered by the URBS components.

The following plates summarize the cost comparisons resulting from the bid evaluation process:

[4]See Student Housing Cost Study, URBS Publication 3, October 1967.

SINGLE GROUP OF THREE COMPONENTS, COSTS COMPARED:

	Existing Costs[5]	URBS Cost	URBS Difference
STRUCTURE–CEILING HEATING–VENTILATING–COOLING PARTITIONS	$12.08	$11.04	–8.6%*

(Weighted Averages in June 1968 Dollars) / OGSF)

TWO COMPATIBLE COMPONENTS, COSTS COMPARED:

	Existing Costs[5]	URBS Cost	URBS Difference
STRUCTURE–CEILING	$6.63	$5.39	–18.7%
PARTITIONS	3.06	2.25	–26.1%*
TOTAL	$9.69	$7.64	–21.2%*

(Weighted Averages in June 1968 Dollars)/OGSF)

[5] The existing University of California student housing projects compared are: Berkeley: Priestly Hall; Los Angeles: Hedrick Hall; Riverside: Lothian Hall; and Santa Cruz: Cowell College. For areas and capacities see part II of this report.

*Revised November, 1968

HEATING, VENTILATION, COOLING, COSTS COMPARED:

EXISTING RESIDENCE HALLS	OGSF	COST/OGSF	URBS COST	URBS Difference
PRIESTLY, Berkeley	160,000	$1.64 (H)	HV@ $3.32	
HEDRICK, Los Angeles	166,000	2.26 (HV)	HV@ 2.80	+23.9%*
LOTHIAN, Riverside	69,000	4.87 (HVC)	HVC@ 3.88	−20.2%*
COWELL, Santa Cruz	89,500	2.06 (H)	HV@ 4.26	
(Weighted Average June 1968 Dollars/OGSF)		$2.39	$3.40	+42.2%

BATHROOMS COSTS COMPARED:

EXISTING AVERAGE COSTS[6]	URBS COST
$1,800.	$2,200.

(Cost per Room, in June 1968 Dollars / Bathroom Component)

FURNISHINGS COSTS COMPARED:

	EXISTING AVERAGE COSTS[6]	URBS COST
CHEST	$ 85.47	$ 74.40
DESK	71.04	62.40
BED	41.07	76.20
WARDROBE	156.00	142.84
CHAIR	21.09	24.60
TOTAL	$374.47	$380.40

(Weighted Averages in June 1968 Dollars / OGSF)

[6]The average of seven student housing projects on the University of California campuses at Davis, Irvine, Riverside, Santa Barbara and Santa Cruz.

*Revised November, 1968

JOHN MUIR COLLEGE, SAN DIEGO, COSTS COMPARED:[7]

	MUIR COLLEGE COSTS	URBS COST	URBS DIFFERENCE
STRUCTURE–CEILING	$ 4.77	$ 4.40	–7.7%
PARTITIONS	2.47	1.81	–26.7%
Subtotal	$7.24	$6.21	–14.2%*
HEATING	1.21		
HEATING AND VENTILATING		2.80	+131.4%*
TOTAL	$ 8.45	$ 9.01	+6.6%

(Weighted Average , in June 1968 Dollars / OGSF)

URBS: RANGE OF COSTS

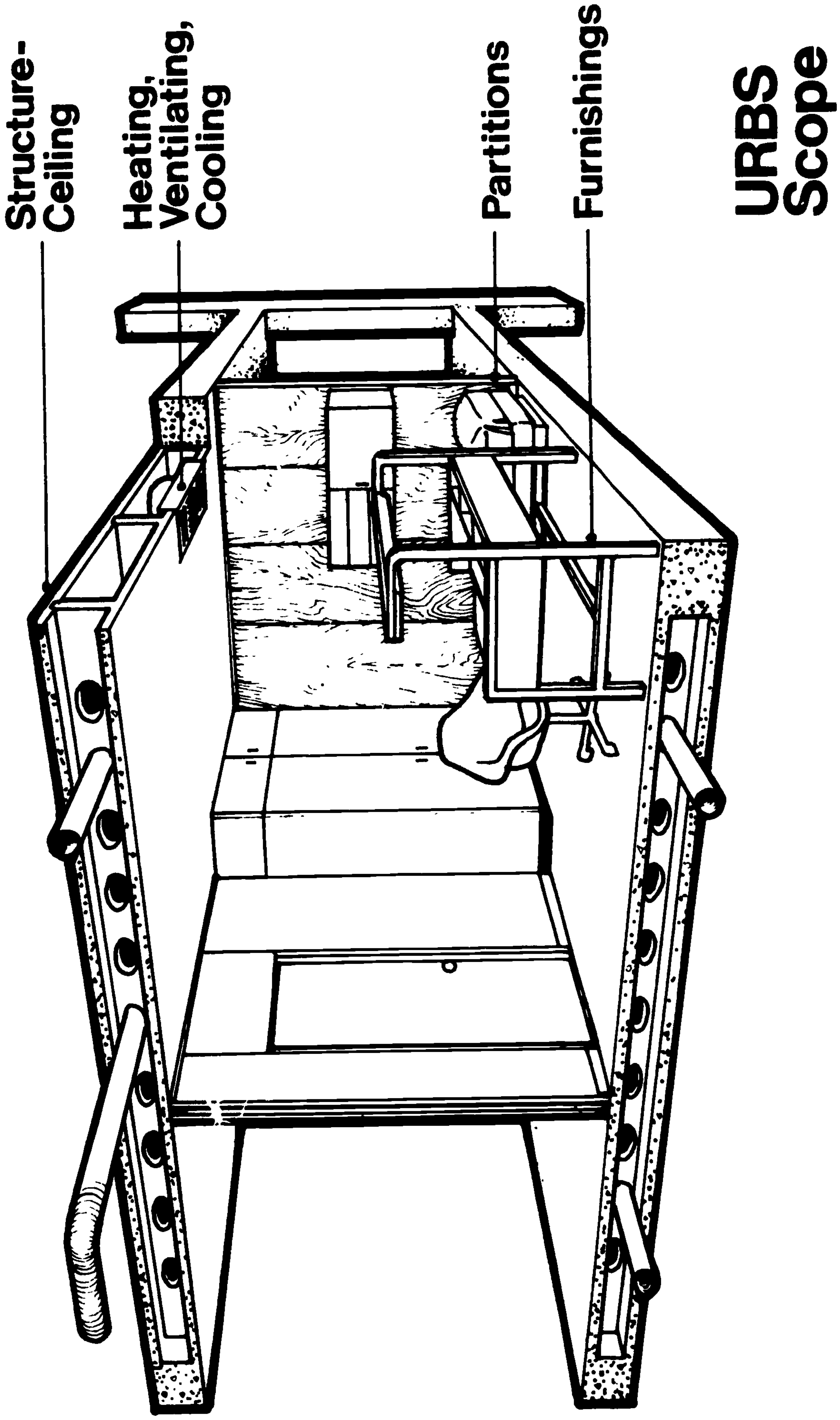
	HIGH	BID	COMPARABLE	LOW
SC	$ 5.95	$ 5.48	$ 5.39	$ 4.57
Part	3.60	3.27	2.25	2.05
HVC	6.84	5.80	3.40	2.80
Subtotal	16.39	14.55	11.04	9.42
Bath	2.86	2.86	2.19	2.02
Furn	1.46	1.46	.75	.75
TOTAL All Components	$20.71	$18.87	$13.98	$12.19

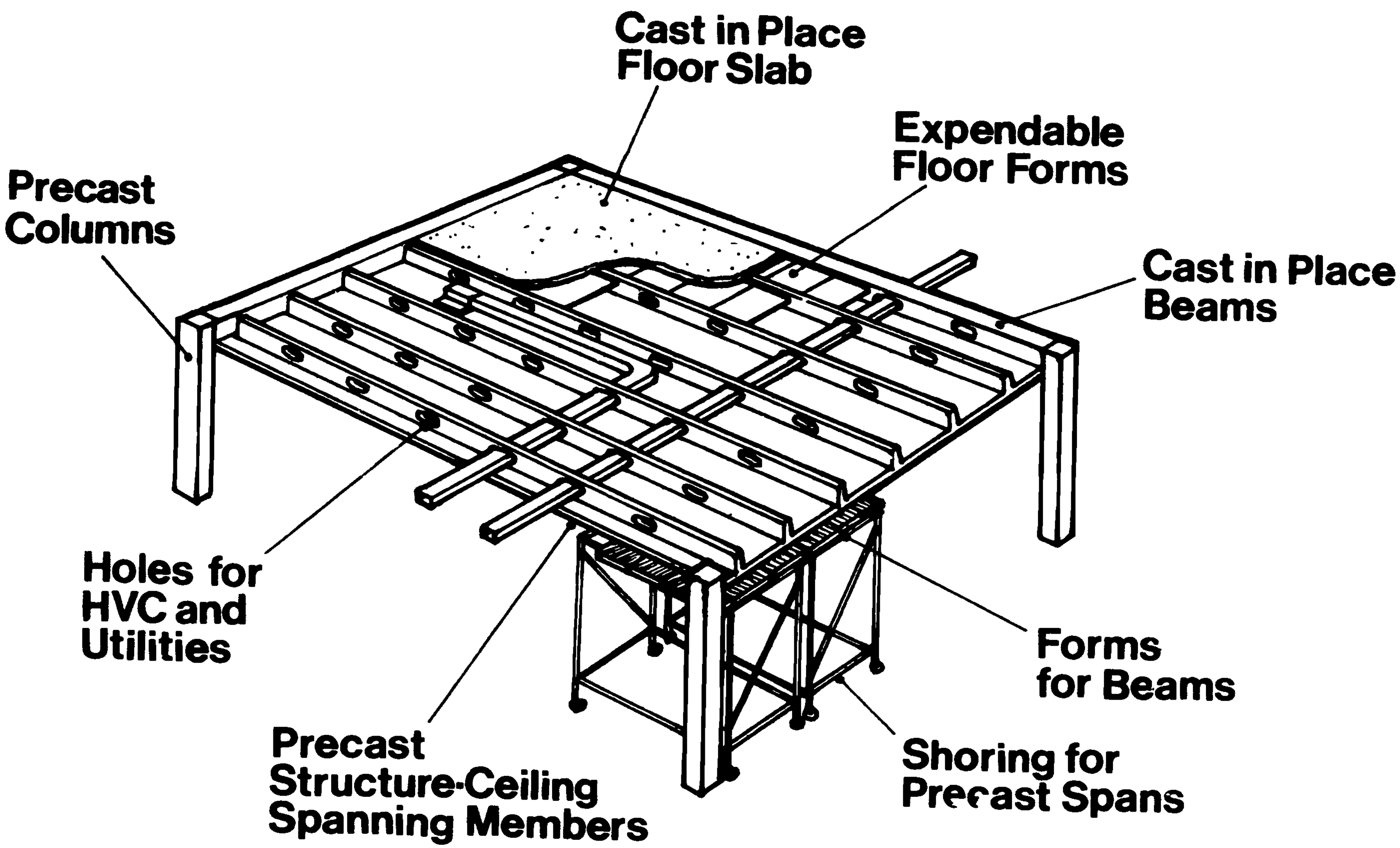
(Weighted Average , in June 1968 Dollars / OGSF)

[7] The John Muir College residence hall was bid within a few days of the URBS project. The consultant was asked to compare the cost of that project with a comparable combination of URBS components.

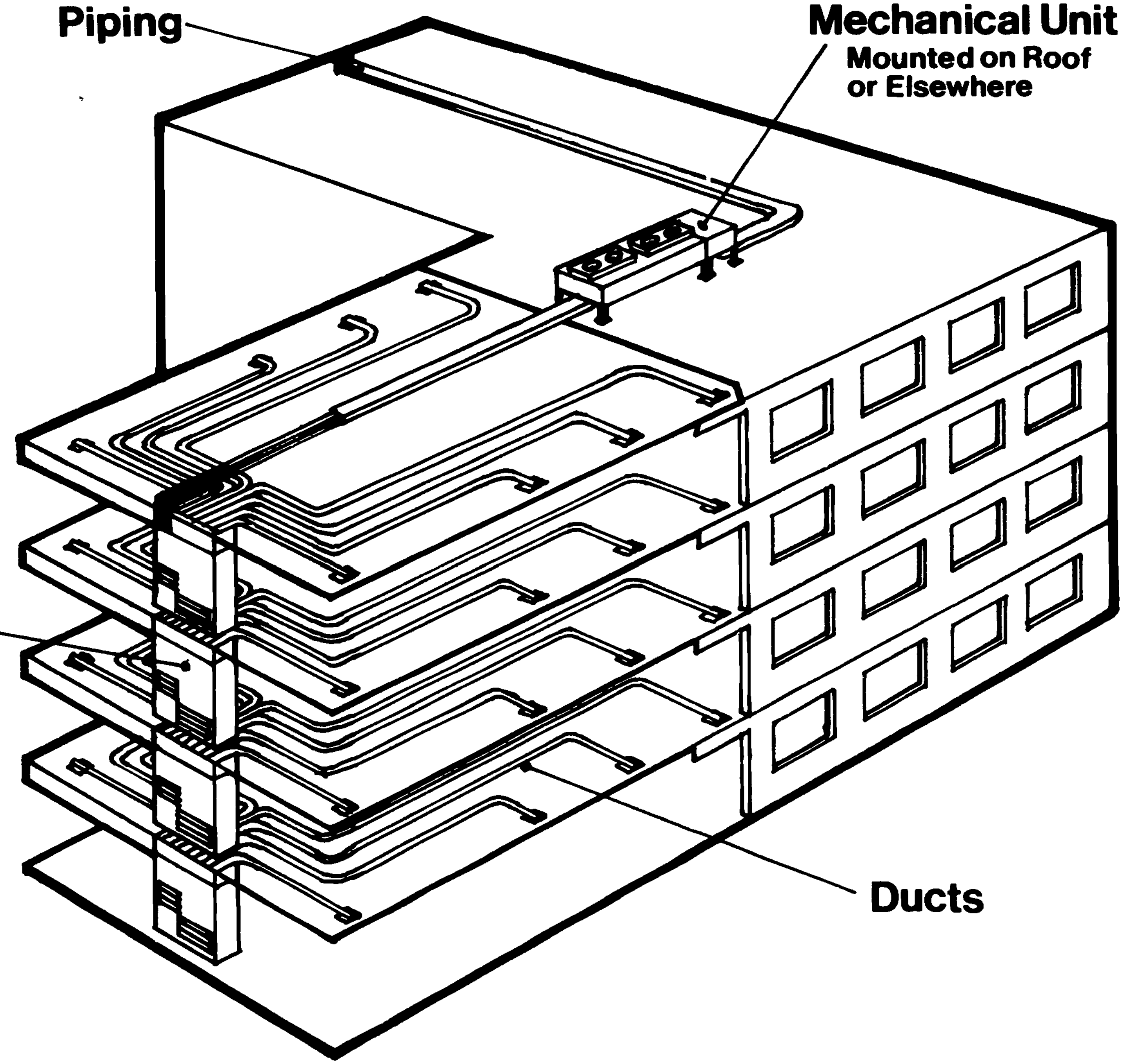
*Revised November, 1968

G. ILLUSTRATIONS OF PROPOSALS

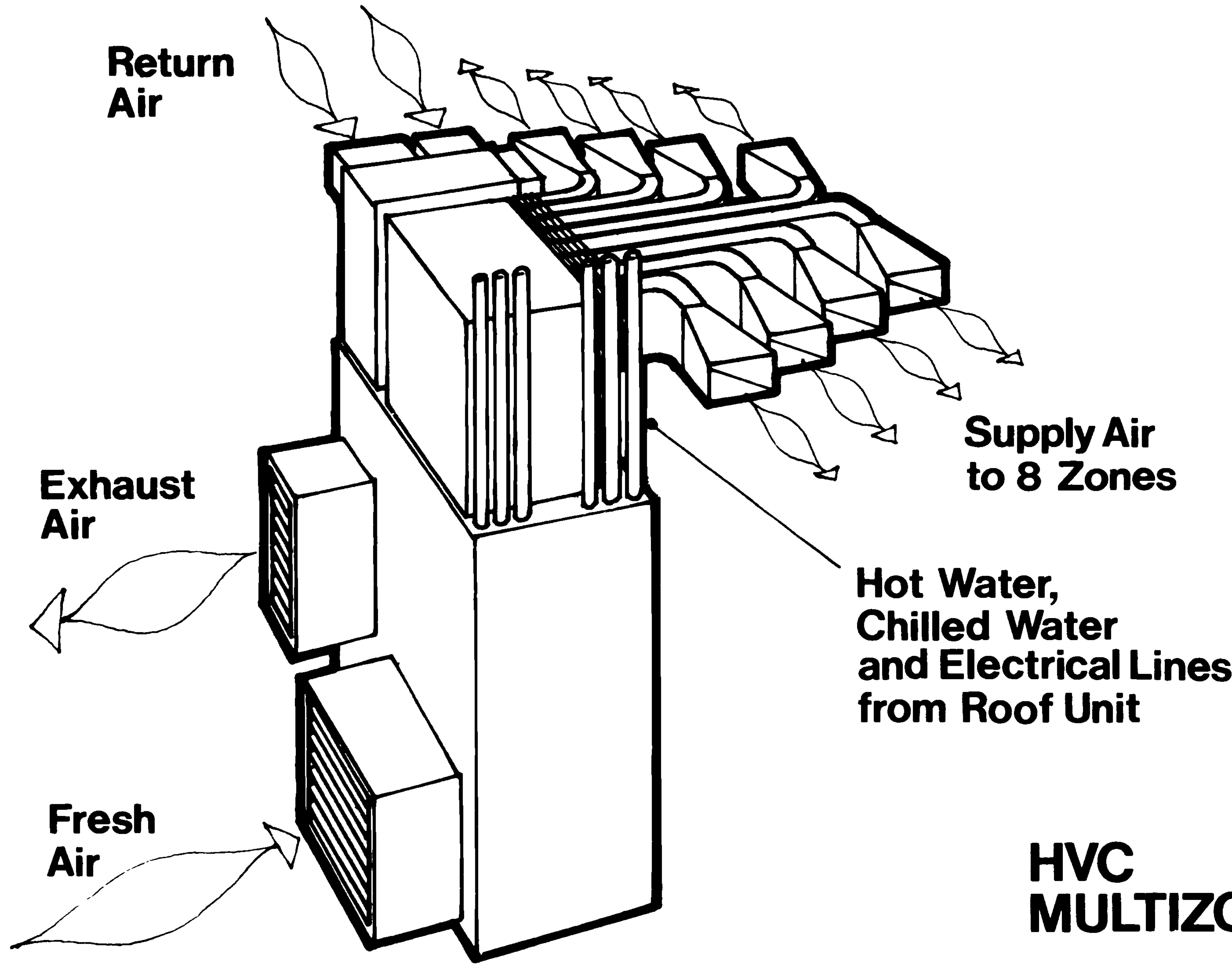




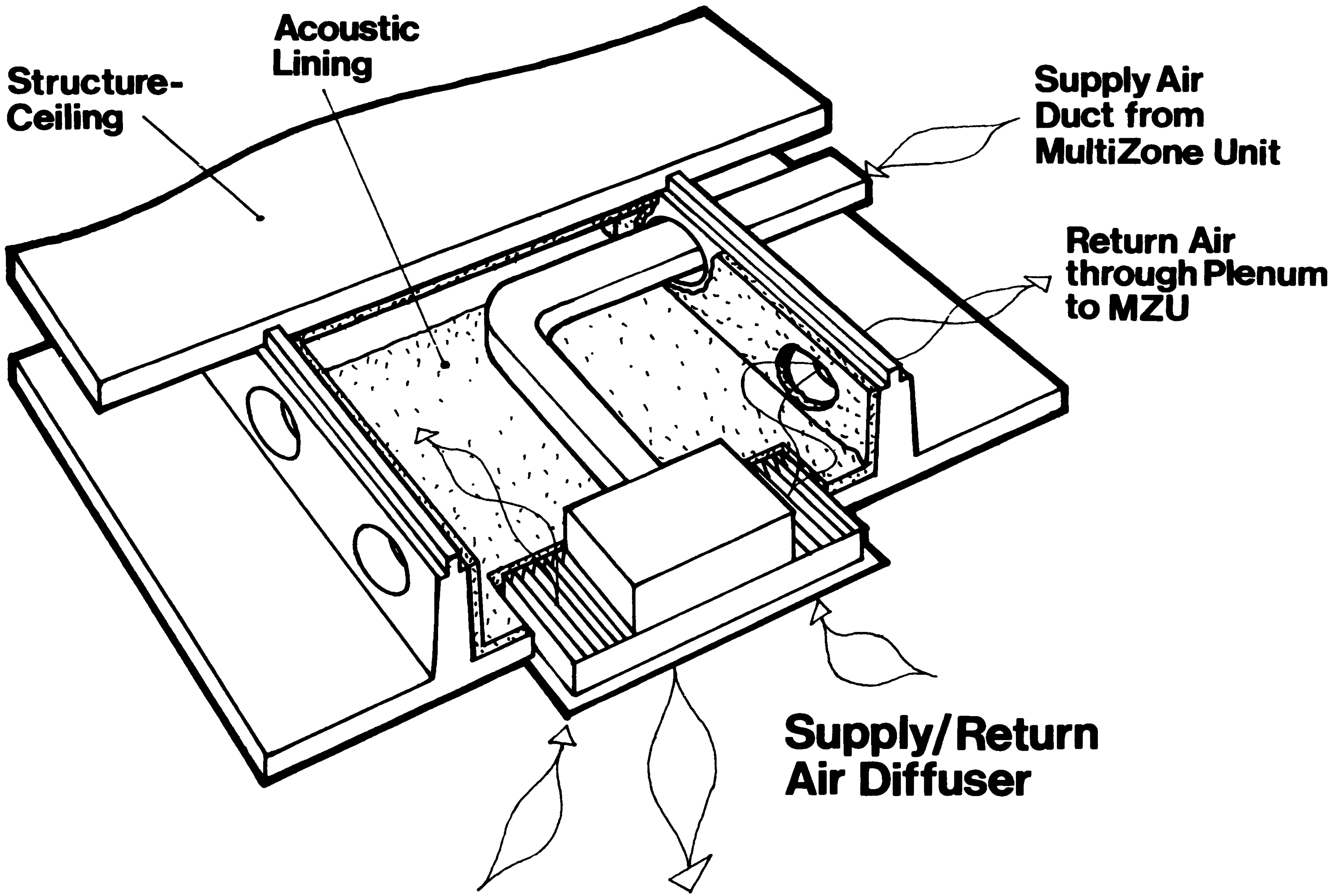
STRUCTURE-CEILING

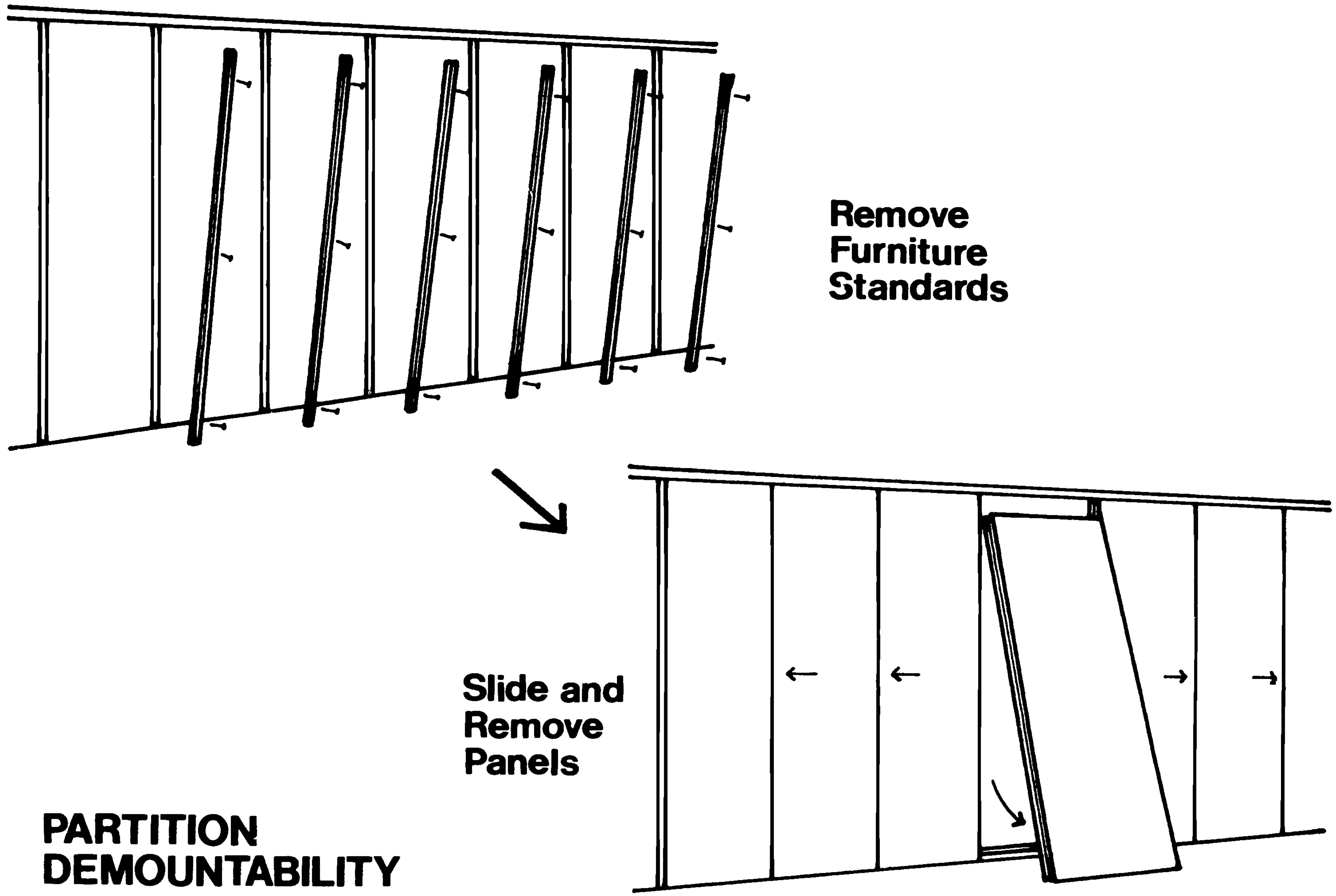


HEATING, VENTILATING, COOLING

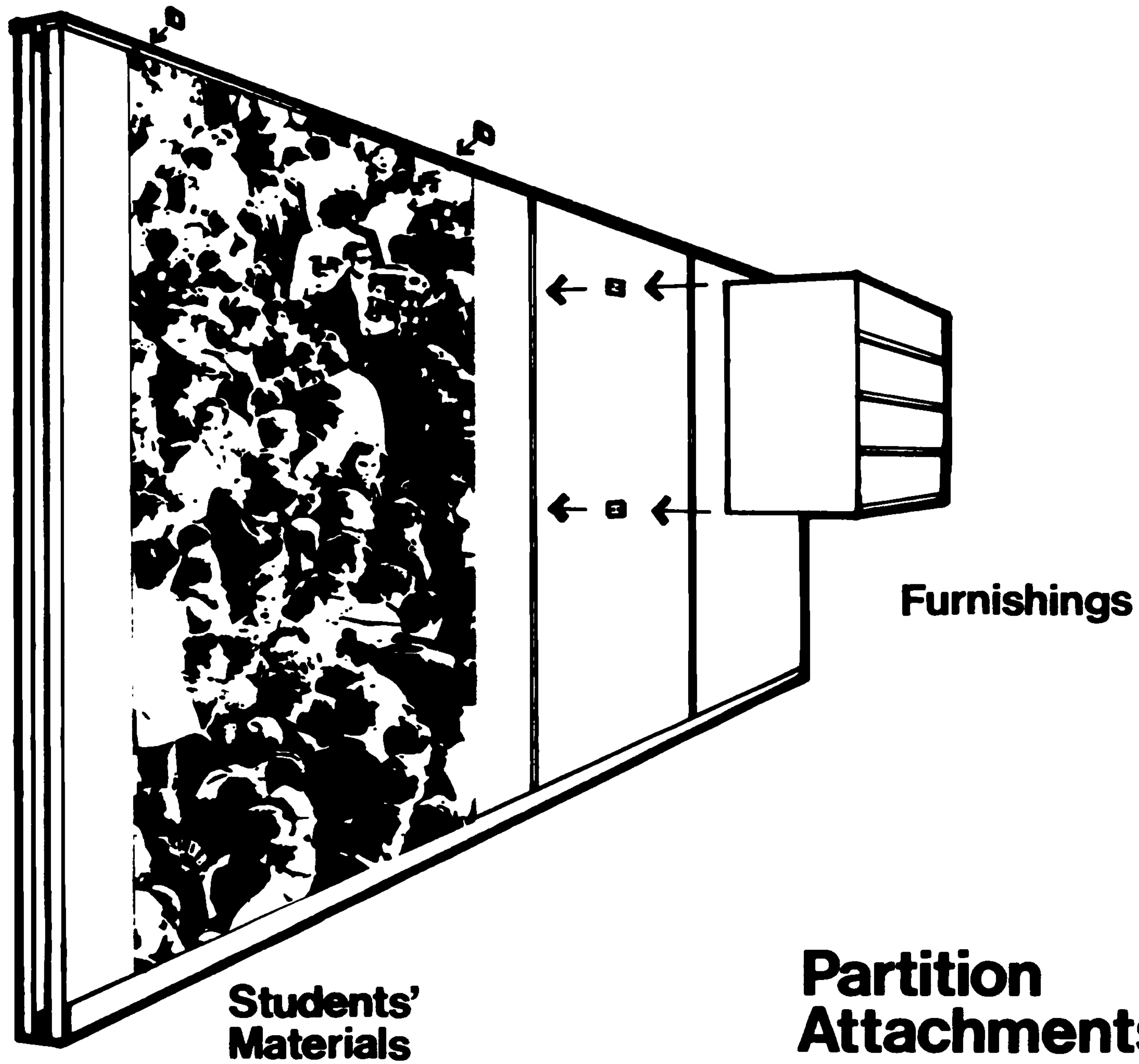


HVC MULTIZONE UNIT

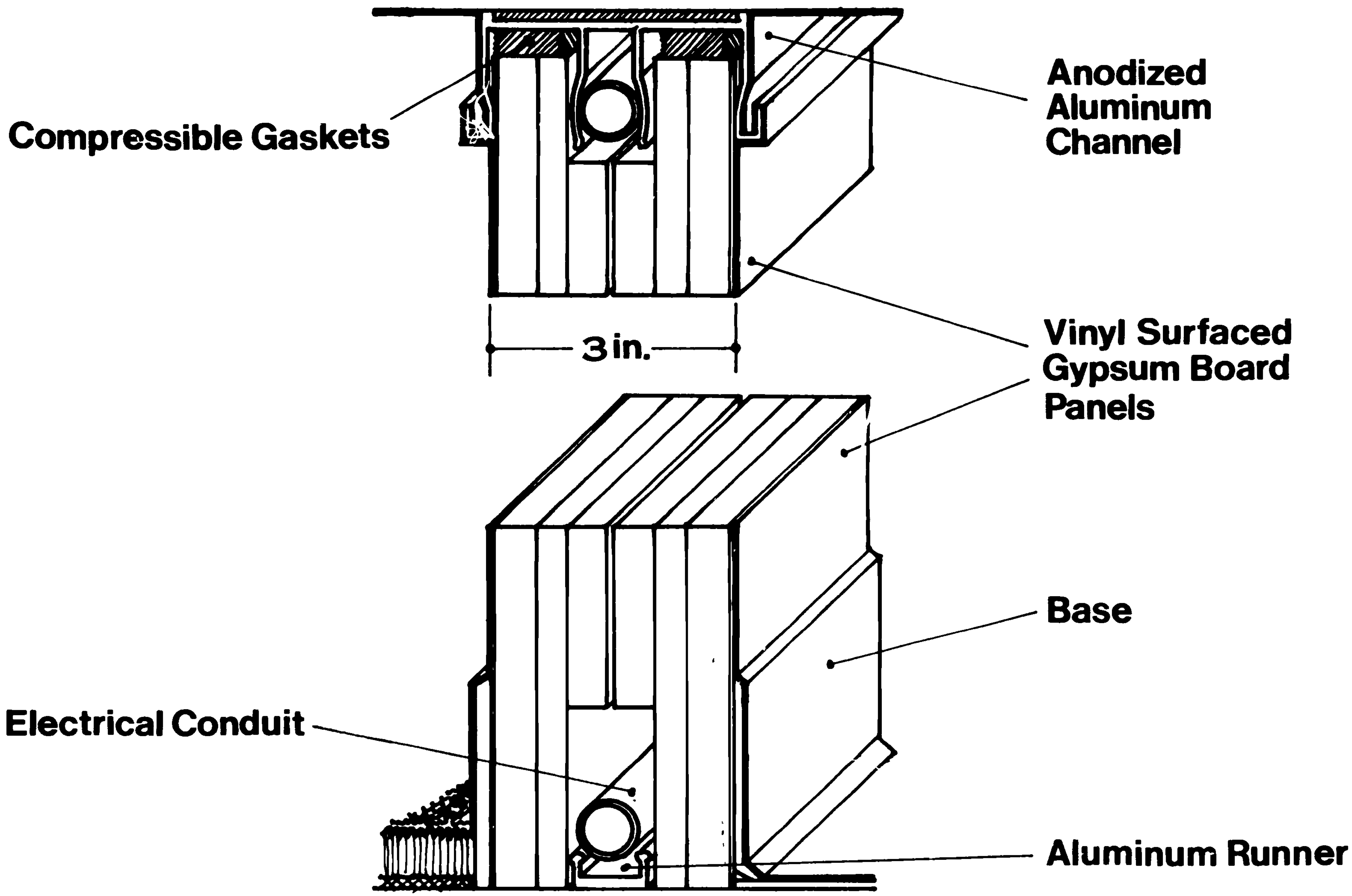

Structure-
Ceiling
Acoustic
Lining
Supply Air
Duct from
MultiZone Unit
Return Air
through Plenum
to MZU
Supply/Return
Air Diffuser



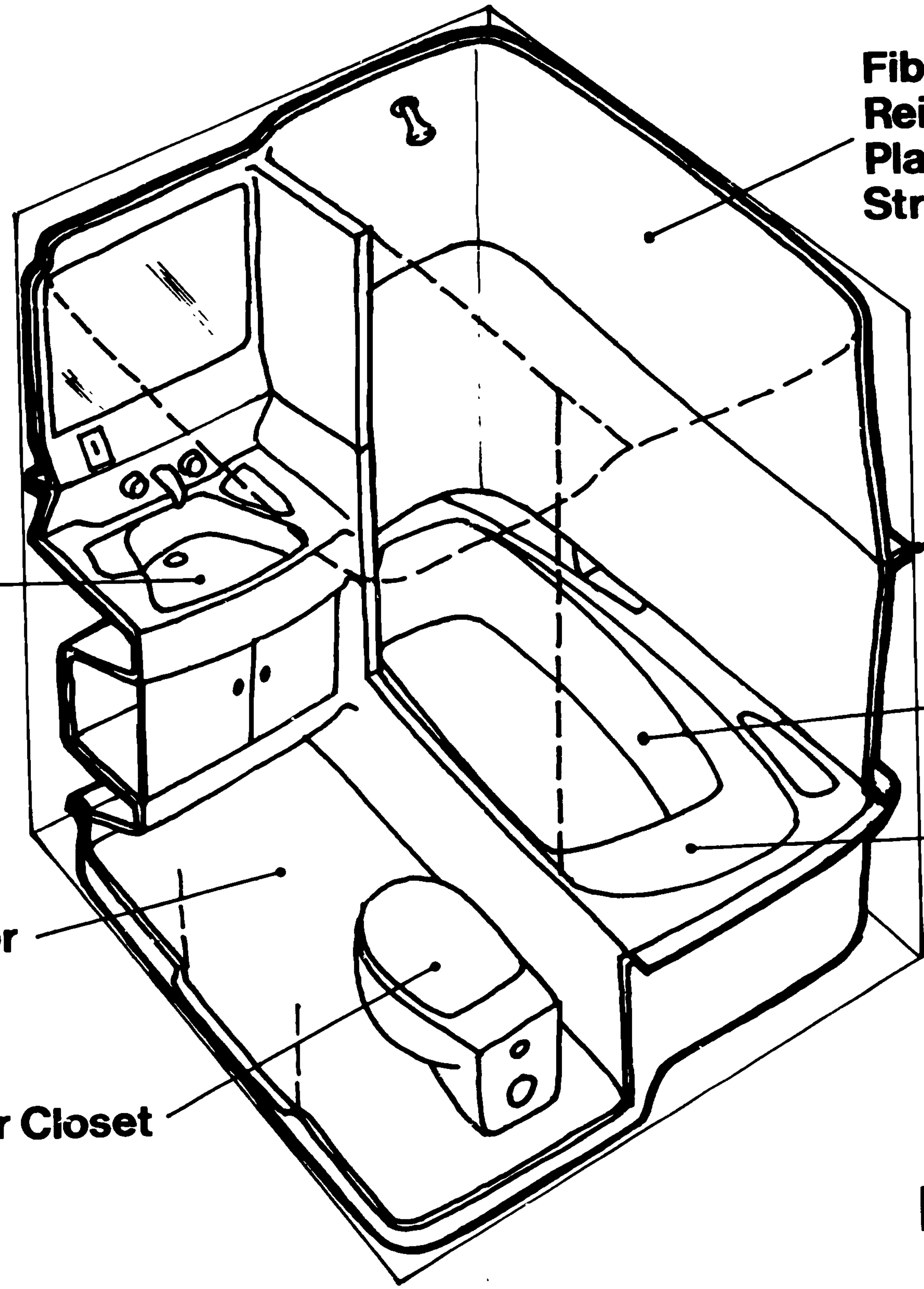
PARTITION DEMOUNTABILITY



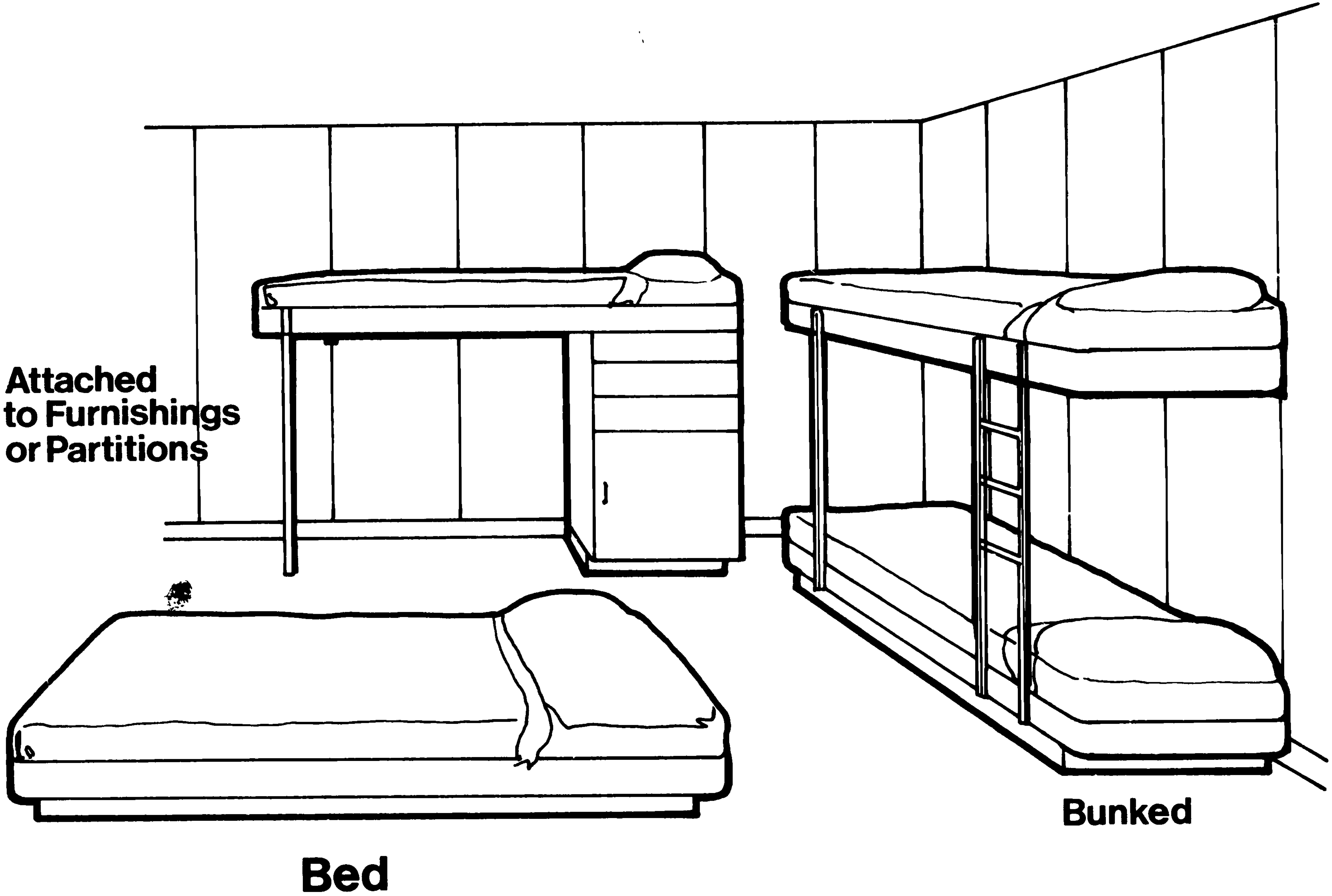
Partition Attachments



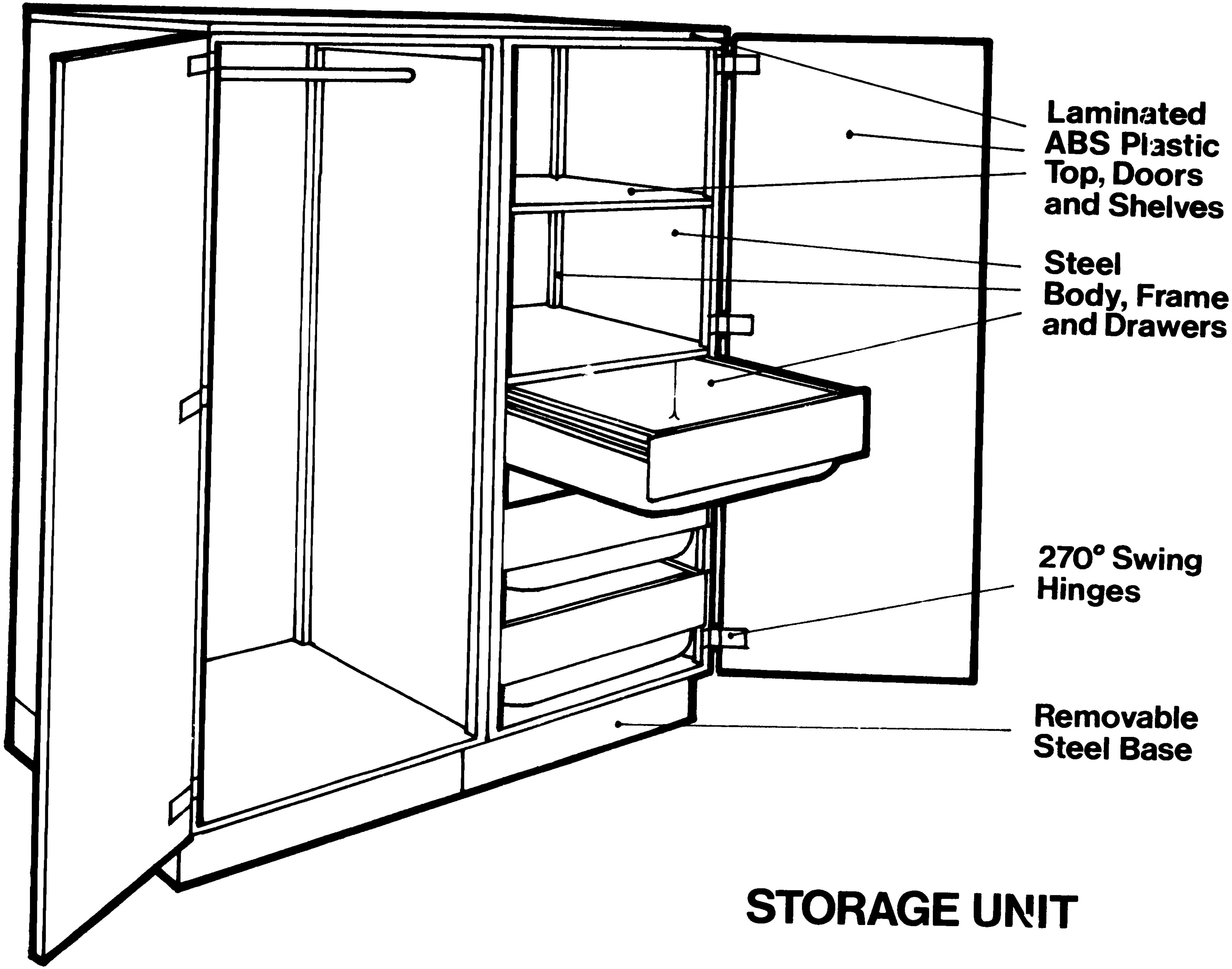
VAUGHAN - US Gypsum Moveable Partition


Fiberglass
Reinforced
Plastic
Structural Surface
Joint
Lavatory
Tub-Shower
Seat
Integral Floor
Water Closet

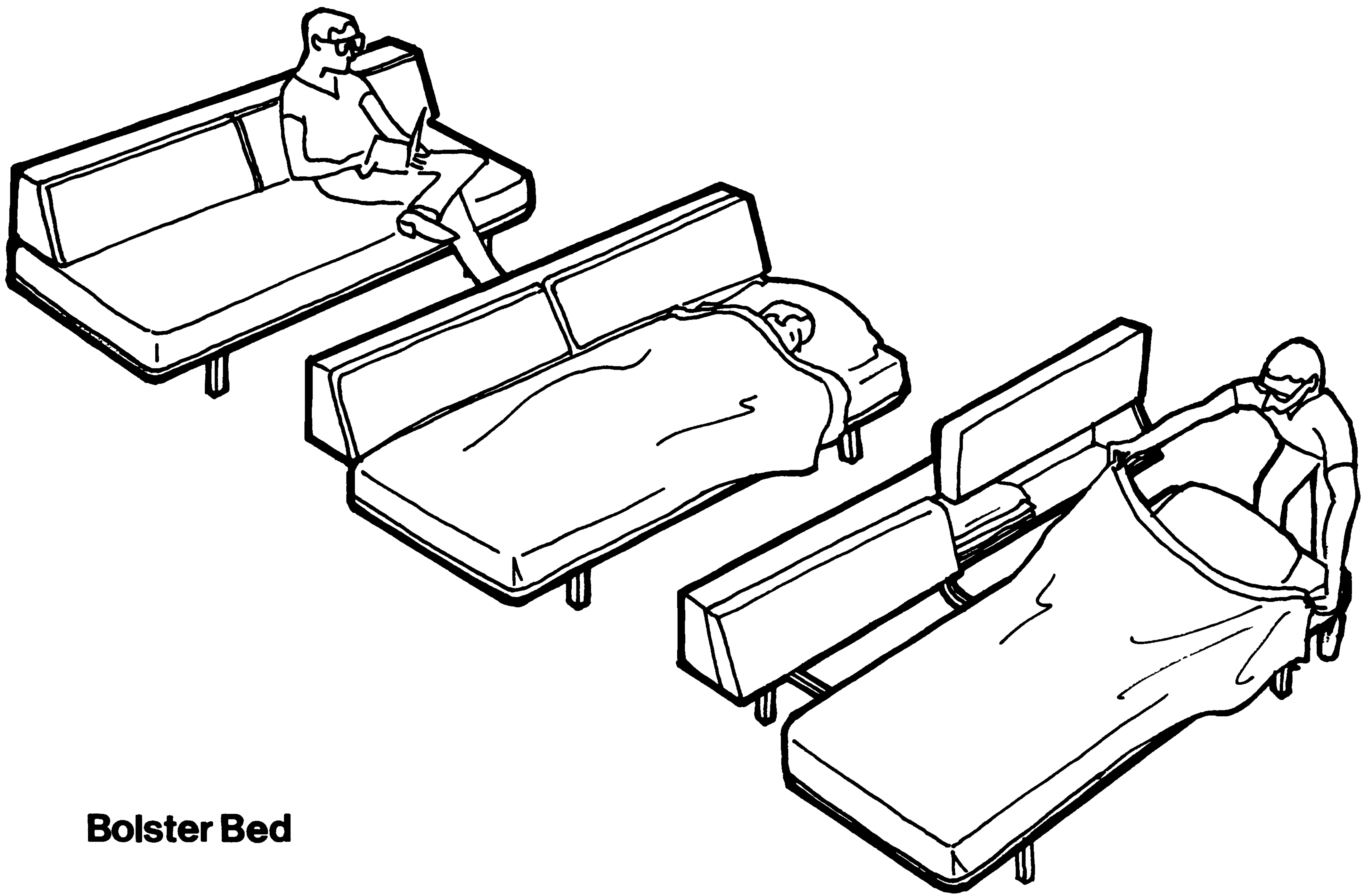
BATHROOM


Attached
to Furnishings
or Partitions
Bunked
Bed

Chair
Plastic Shell, Swivel/tilt Base, Carpet Seat



STORAGE UNIT



Bolster Bed

PART III. COST VERSUS QUALITY

A. The University of California has several existing residence halls and married student apartments constructed[8] with minimal construction quality and cost methods. The minimal quality construction is not confined to the wood framing, but includes the heating, lighting, and finishing materials and methods.

These structures are typified by exterior and interior walls (non–demountable) of wood framing, stucco or wood exterior, asphalt impregnated felt roofing, tract–house quality windows and doors, gypsum board interiors, tract–house quality lighting and electrical distribution, inexpensive short–lived or high maintenance heating systems, and tract–house quality finishes. Commercial quality is usually found in the bathroom fixtures because inexpensive residential fixtures cannot cope with the usage requirements.

As student environment spaces, the buildings must be characterized by one or more of the following: noisy, dirty, poorly heated, poorly ventilated, inadequately lighted or electrically serviced. The students generally prefer them, however, because of the opportunity for freedom from close regulations and for individual 'decor.' The World War II converted units are particularly notable in this respect. The somewhat more 'permanent' structures have tighter rules of conduct to sustain the higher level of 'decor,' whereas the older buildings with less permanent materials have less restrictive rules.

B. During Phase I of the URBS project, the Standing Committee on Residence Halls established desirable standards to be included in the user requirements. An evaluation of existing residence halls was made comparing their performance with these standards. The URBS consultant and University staff decided, at that time, that Type V construction provided excessive conflicts with the desirable standard and should be eliminated from consideration by the URBS project. The five principal conflicts are concerned with acoustic separation, heating, ventilation, flexibility and durability.

[8] These buildings are generally referred to as Type V structures, following the Uniform Building Code nomenclature for wood frame construction.

C. During Phase II, of the URBS project, cost studies were prepared for ten existing University of California residence halls, three of which were Type V. The costs for these buildings, as abstracted from the Building Cost Study (URBS Publication No. 3) and escalated to June, 1968 dollars, follows:

Project: Campus:	Crown College Santa Cruz	Mesa Court Irvine	Regan Group Davis	Weighted Average Per OGSF
Floor Area (OGSF)	85,940	83,400	83,000	
Structure–Ceiling	$2.82	$2.51	$2.35	$2.57
Partitions	2.22	1.72	1.79	1.93
Heating–Ventilating–Cooling	1.02	1.24	2.76	1.61
Bathrooms	1.42	1.25	1.14	1.28
Furnishings	.60	.61	.67	.64
Components	$8.08	$7.33	$8.71	$8.03
Non Components	10.22	9.56	7.59	9.12
Building Cost	$18.30	$16.89	$16.30	$17.15

D. These costs established unquestionably that conventional Type I structures could not compete with Type V in first costs. The analysis is not complete, however, until total owning costs are reviewed. Type V structures cannot compete with Type I (URBS) in fire, insect, and rot–proofing, adaptability to remodeling, maintenance, and land utilization. All partitions are fixed and generally load bearing, thus immovable, in Type V. The cost is high for modifying these partitions for changing requirements. The inadequacy of wood frame structures to resist long term weather erosion and student negligence results in higher maintenance and repair costs. Type I structures, because of their greater height capability, have the potential of lesser land coverage. Type V are limited to three stories, whereas Type I may be as high as eleven. Type I should therefore occupy considerably less land area for the same building area. The difference in land coverage, when equated with land cost, could diminish the building cost difference by a significant amount.

The continuing cost of maintenance and operations should be reviewed in the context of debt coverage––$1.00 per student per year savings in operation and maintenance is equivalent to $20.00 more in first cost for the same annual student cost. Applying this factor to the differences between minimal cost construction and Type I, conditions in the latter may well provide sufficiently lower maintenance and operation costs to offset its higher construction cost.

E. It should be noted that Type V construction in itself need not have many of the negative factors heretofore attributed to it. Its fire risk and maintenance costs quite often are due to the overly economical method (assumed) of utilization. Wood framing can, through the use of pressure treatment, be made both incombustible and insect proof. Proper application of substantial finishes can provide protection from weather and from student negligence. However, when these improvements are made, the cost of the facility is likely to equal Type I construction.

F. Married Student Apartments

All of the University of California married student apartments are of Type V construction. Some, such as at Berkeley, Davis and Riverside, are World War II units. Newer units often reflect the vocabulary of the speculative builder in an attempt to provide the lowest possible cost to the student occupant.[9] One example of the newer units was selected from the Irvine campus for cost analysis (in June 1968 dollars per OGSF):

Structure-Ceiling	Partitions	HCV	Bath.	Furnishings	Total Component	Total Non-Component	Total Building
\$2.77	\$2.72	\$0.76	\$1.12	\$0.28	\$7.65	\$7.04	\$14.67

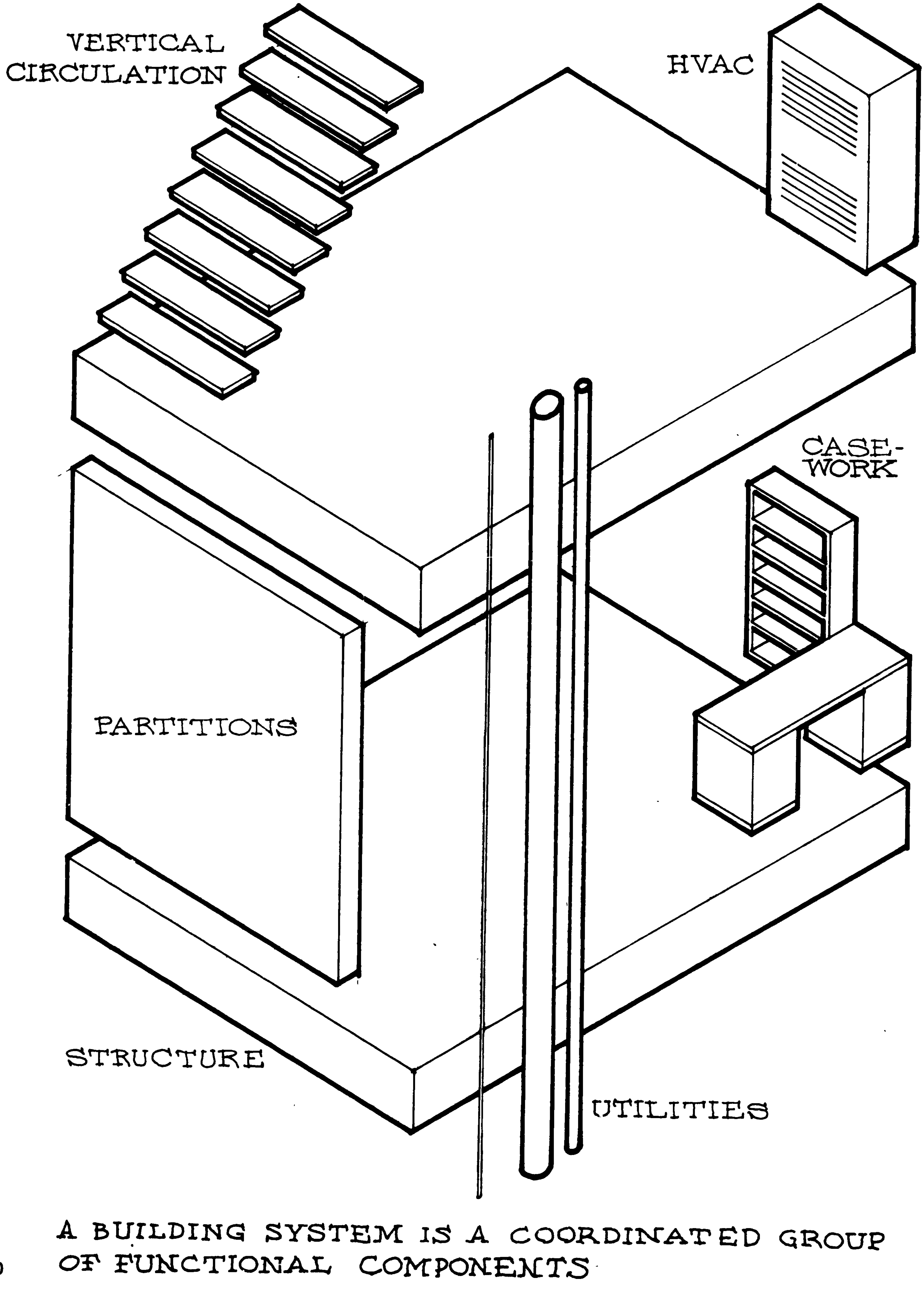
The total building cost of \$14.67, as compared to \$17.15[10] for existing Type V residence halls, indicates a reduced level of quality characteristics. Existing Type V residence halls provided, in many instances, a higher level of durability for the single student, although not as high as the more permanent facilities of Type I. Married student units consistently provided the lowest quality level of family dwelling construction. For example, residence hall bathrooms included institutional fixtures. Apartments included a lower grade residential fixture. Residence halls provided either hot water convector or radiant, or in one instance, air conditioners with room or area controls. Apartments included gas fired wall convector units. The partitions cost for apartments is higher than for residence halls because of the higher percentage of wall area to floor area. The partition quality in apartments is often less than in residence halls.

[9] The rates married students can pay and the cost of adequate student housing represents the most difficult housing problem facing the University of California. Off-campus apartment house owners can and do rent an apartment to three or four single students at rates far higher than married students can afford. Married students are forced to find substandard quarters at often considerable distances from the University.

[10] See Article C, preceding.

Since no Type I apartments existed in the system, an analysis was made of Stanford University's high rise married student apartments. The building cost in June 1968 dollars is $20.28 per square foot. The Stanford costs do compare quite favorably with existing and Type I (URBS) construction. Current studies of low–rent housing for the U.S. Department of Housing and Urban Development indicate that costs approaching $17.00 per square foot for one and two bedroom high rise Type I construction are possible.

G. Because of uncertainties in the present University of California student rate structure, there is a tendency for the campuses to see a solution in the construction of minimal cost facilities. The implications of this may be serious for the long term owning costs of the University student housing system. A detailed study of this situation should be undertaken at once.



A BUILDING SYSTEM IS A COORDINATED GROUP OF FUNCTIONAL COMPONENTS

PART IV. BACKGROUND INFORMATION

A. THE BUILDING SYSTEM CONCEPT

The increasing complexity of modern buildings requires a high degree of coordination in the use and installation of building products. The building system concept recognizes the need for initial coordination at the building product design stage, so that a comprehensive attack can be made on all the problems of user requirements, production, appearance, installation, operation, maintenance and cost. The concept also enables the owner to utilize the volume of its building construction program to procure directly from industry significant innovation in answer to its needs. The process involves the translation of the owner's requirements into technical performance terms. Properly established performance requirements enlarge, rather than restrict the range of product application. When these performance requirements relate to the needs of a sufficiently large market, industry is willing to undertake substantial research and development.[11] Thus the efficiency of modern industrial mass production is harnessed, yet the owner avoids standardized plans or monotonous repetition of either rooms or exterior appearance. A by–product gain is the mutually challenging relationship between the owner and the building industry, producing new creative thinking on both sides.

The building system concept involves the development of a selected group of separate 'components' or 'sub–systems' to work together as a 'building system.' The components are selected on the basis of functional requirements and economic practicability. Any one component is comprised of a related group of building products, e.g., the heating–ventilating–cooling component includes the fuel or energy source, the processing machinery for conversion, the distribution network, terminal devices and controls.

Since components are related, these relationships are studied from the initial stage of building product design in the building system concept. By so doing, criteria may be achievable which would otherwise be too costly to attain with components acting in isolation. For example, not only does the URBS structural component include a finished ceiling, but also some of the structural elements act as passageways for the heating component, and both electrical and plumbing distribution lines. Significant monetary savings are obtainable in many instances.

[11] Industry has invested approximately 4 million dollars to date in the URBS project.

The building system concept cannot be applied dogmatically. It must be related to a careful study of all requirements, for there are many alternatives in the selection of components and in the processes by which they are developed. Comprehensive evaluation of every alternative is a part of the systems approach.

The procedures are aimed at achieving the maximum gain for the minimum expenditure:

1. For the University, it means gain in building performance saving in building cost, and a minimum expenditure on the systems development itself.

2. For industry, it means procuring a maximum share of the market for minimum development and production costs.

The building system procedure creates a dialogue between owner and industry. This dialogue is carried on by a specially created organizational team[12] administering the program and coordinating all activity. This team must be equipped to speak the language of both parties; i.e., it must be able to:

1. Determine the needs of the owner.

2. State these needs to industry in such a way that industry can relate them to product design and technical performance.

3. Evaluate for the owner the results coming back from industry.

The building system procedure involves five basic steps:

1. Analysing User Requirements and translating these into Performance Specifications.

2. Soliciting design proposals, based on the Performance Specifications.

3. Competitive bidding procedure and the subsequent evaluation of bids.

4. Final development and testing of the components.

5. Construction of buildings, using the approved components.

[12]The URBS project team is shown on page 53.

B. USER REQUIREMENTS

1. General

The study of the requirements for all users is the initial step in the development of a building system. More than a simple record of student needs and wants, the analysis must relate to knowledge of cost, technical feasibility, owner's policy, and long–term trends as related to all the activities utilizing the spaces within the building. The analysis is concerned with the individual user as he relates to his environment and to other individuals and groups. The social structures resulting from this relationship are important for they affect individual spaces as well as arrangements of spaces.[13] Thus the user requirements considered the relationships among such items as: function, physiological, psychological, equipment, degree of adaptability required, costs, and the applicability on a national basis. The process involved a constant interrelation of ideas and experiences among the University of California, the project team and industry, as well as many conferences with other universities. Those involved[14] were students, housing officers, deans of students, architects, university and campus administrators, faculty and physical plant officers.

2. Costs

The University of California's student housing program must be financially self–supporting, with the students paying the entire cost[15] of the construction, operation and maintenance through room rental changes. An occupancy level of approximately 95 percent of capacity is required to keep the financial system viable. It is The Regents' policy that to do so, parietal rules are not to be invoked. The spiral of inflationary costs create a dual concern, in that the University's student housing must be kept competitive in rental rates, and student requirements must be satisfied[16] to maintain the required occupancy ratio. The final requirement was to reduce the initial building construction cost by 10 percent, and to reduce maintenance and alteration costs if possible.

[13] The way in which the social structures are provided for within the individual building is decided by the architect, and not by the building system.

[14] See Part III, Section E, Authorization Support.

[15] The State of California provides the land occupied by University student housing.

[16] It was found that much of the students' disaffection with university student housing results from resentment of university regulations. However, this problem does not directly concern development of a building system.

3. Technical Feasibility

The limits of the construction industry's capability were considered even while determining the user requirements. Thus, most of the requirements were within the limitations of standard methods and materials currently available from industry. In some instances requirements were allowed to approach conditions that industry was known to be in the process of developing. In the instances of industry innovation, cost feasibility was considered simultaneously with technical feasibility.

In acoustical separation considerations, desirable levels were found to be at the upper limit of the partitions manufacturers' capabilities, but definitely higher than those of many heating, ventilating and cooling equipment manufacturers. Appropriate levels were established permitting a wider range of participation but still within the user requirements. The combination of temperature control, individual student control, open windows and adequate ventilation–all within reasonable operating levels –required considerable dialogue with industry before capability was established.

The adaptability to change is not a known characteristic of most existing building products. The user requirement of demountable partitions to allow room size and furnishings change within a limited cost context was not the most acceptable criteria for industry. Relocatable partitions had been available, but had been neither adapted to student housing requirements nor of sufficient economy to satisfy student costs. Student furnishings had been, with few exceptions, of reasonable durability for floor mounting only, with little or no provisions for wall hanging or stacking. Heating, ventilating, and cooling distribution systems had fixed terminals related to fixed room use, volumes and orientation. Structural systems, while providing for known floor loadings and configurations, were not economical in wide bay and long span sizes. The adaptability of these building products to meet the requirements of changing from single student to double room occupancies to married student apartments was nil.

Conferences with industry concerning technical feasibility produced acceptable integrated criteria permitting each industry within its limits to contribute the concerted capability to provide the required adaptability.

The user requirements, as finally evolved, thus reflected reasonable industry capability–although in some instances both users and industry had to be made aware of that fact.

4. Owner's Policy

The University and campus administrators required:

(1) Achievement of significant gains in environmental quality concurrent with a 10 perce it reduction in initial building construction cost;

(2) Reduction in maintenance and alteration costs;

(3) Component adaptability permitting change in environment and space usage over a long period of time, as program requirements change;

(4) Provision for low–rise and high–rise buildings;

(5) A variety of building shapes and masses for both level and sloping sites;

(6) The ability to simply and economically plan rooms of many different sizes, and to arrange blocks of space in varied ways;

(7) Accommodation of both single and married students, of both undergraduate and graduate standing;

5. Long Term Trends

The building system must permit a wide variety of single and double rooms, suites and apartments;[17] the opportunity to include academic spaces in addition to varied recreational/hobby areas; and ability to later incorporate communication devices and teaching equipment.

6. Food Service Areas

Areas for food preparation, food service and dining for single students were not included in the URBS project. However, these spaces may use the URBS components where appropriate to do so. Provision is made in the URBS project for conventional kitchen facilities in apartments.

[17] Irrespective of quality of construction, the most critical housing problem facing the University is providing housing for the married student at a rate he can afford. The area requirement for the married student is approximately three times that of the single student.

7. Students

The outstanding requirements were for quiet and personal privacy,[18] thus denoting increased visual and acoustical separations and an ability for the individual to shape and control the environment at least within his own room. Other requirements were for improved study conditions, increased comfort including appropriate environment (acoustical, thermal and lighting), storage space of all kinds and of sufficient quantity. Much more storage space is required by women than by men. Students requested group areas functionally sized and environmentally appropriate adaptable to their study, recreation, hobbies, cultural and social activities—suggesting that the 'furniture showrooms' (large lounges)[19] should go. Recognition was requested that in a mixed community of smokers and non-smokers it is important that the air be kept moving and clean. Thermal and ventilation conditions in toilet rooms were a common cause of complaint. Of significance in terms of a residential environment was the request that windows be operable, and that the interior decoration be more subject to control by the occupant.[20] The ability to use and store a wide array of electrical appliances within the student room was requested (i.e., guitar, coffee pot, clocks, toothbrush, hair dryer, typewriter, record player, radio, and TV).

Graduate students requested a variety of study spaces, such as for computer access, typing or greater desk area for library material. Critical study requirements engender a substantial need for single rooms. Suites,[21] composed of single rooms, but sharing certain social spaces seem most desirable.

Married students tend to be relatively serious and impecunious. The majority have great difficulty in financing their education. Their major concerns were cost, acoustical separation, far more adequate study area, and more storage area of various kinds. Mothers were concerned for their children's safety, although primarily as affected by site planning.

Commuter and foreign students need to be brought into campus life in a more effective way than at present—the solution of this problem is controversial. It was noted that the foreign student tends to be a more mature student—more akin to the American graduate student in his attitude to social and academic life.

Physically handicapped students form a small but important group, and must be accommodiated in appropriate ways. Perhaps ground floor rooms with either access direct or by ramps, with wider access and other necessary aids.

C. SEQUENCE OF PROCEDURES

The procedure established for the URBS project was divided into four phases:

Phase I: Compile the broad range of user requirements for University student housing and commence their translation into performance specifications.

Phase II: Complete the contract documents and performance specifications and invite industry to submit bid proposals for building components that answer the problems posed in the performance specifications.

Phase III: Evaluate the bids, nominate the potentially successful bidders, test the prototype components for compliance, and award contracts to the nominated bidders whose components most successfully comply with the performance specifications.

Phase IV: Use the accepted components in the conventional way, i.e., in design of the individual buildings by architects in private practice, with construction on a competitive bid basis by general contractors.

[18] 'No place to cry out my problems but the toilet stall', said many women students.

[19] 'Large, ground floor lounges are nice places to receive parents, but all that space for a few couples' use.'

[20] 'No tacking, no taping on walls' is a universal rule.

[21] There is more tendency for upper classmen than for graduate students to desire the apartment—because of the extra demands of apartment life on the student's time.

A report on Phase I completion was presented to The Regents of the University of California in November, 1966. The report was revised December 15, 1966, and published in the revised form. The document you are reading is the Phase II report, including evaluation of the bids.

Contract Documents and Performance Specifications were issued June 15, 1967, at a meeting attended by approximately 200 industry representatives. The Preliminary Design submission on November 1, 1967, resulted in 29 acceptable preliminary designs submitted by different firms for the five components.

The Final Design proposals, submitted March 22, 1968, by nineteen different firms, were approved for compliance with performance specifications and have become eligible for submission of final priced proposals. Final priced proposals were received June 18, 1968.

Evaluation of the bids has been incorporated in this report. The remainder of Phase III activities will include the award of contracts to the apparent low bidders, followed by the testing of prototype components. Compliance with performance specifications will be mandatory. The URBS contract documents additionally require unit pricing and furnishing of information manuals. This work is to be commenced fourteen days after contract award and completed within six months.

URBS contract documents provide for supplementary agreements for supply and installation of components in each building project by the component contractor. The remainder of the building and coordination of the entire project will be by general contract. The first construction to be commenced not later than September 20, 1969. The last URBS housing project is to be completed August 1, 1973.

D. URBS PUBLICATIONS AND REPORTS

Building Systems Program Feasibility Study for University of California Student Housing
Prepared by Building Systems Development, Inc., October 1965

University Residential Building System, Phase I Report
Revised December 15, 1966

Performance Specification Illustrative Information
March 31, 1967

Contract Documents and Performance Specifications
URBS Publication 1, June 1967

Contract Documents and Performance Specifications, including Addenda Numbers 1 through 8
URBS Publication 2, May 24, 1968

Student Housing Cost Study
URBS Publication 3, October, 1967

Storage Study
URBS Publication 4, October, 1967

University Residential Building System Phase II Report
September, 1968

E. AUTHORIZATION AND SUPPORT

July, 1965	The Regents of the University of California authorized the expenditure of $20,000 for student housing studies. (The URBS Feasibility Study was a product of these studies.)
October, 1965	The Regents of the University of California authorized the following: 1) Application to Educational Facilities Laboratories, Inc., for a grant of $400,000. 2) Expenditure of $200,000 from Group A Housing Net Revenue Funds. 3) Dedication of 4,500 to a maximum of 9,000 student housing spaces to be constructed over a three–year period. 4) The President of the University to initiate and carry out the URBS project.
November, 1965	The University of California received a grant in the amount of $400,000 from Educational Facilities Laboratories, Inc.
February, 1966	The President of the University of California appointed a National Advisory Committee for URBS.[22] The support of the University's Standing Committee on Residence Halls[23] was obtained.
November, 1966	The Regents of the University of California reviewed URBS Phase I Report, and approved proceeding with Phase II of the URBS project.

[22] A list of the National Advisory Committee follows.

[23] A list of the University of California Standing Committee on Residence Halls follows.

THE UNIVERSITY OF CALIFORNIA

UNIVERSITY RESIDENTIAL BUILDING SYSTEM

THE NATIONAL ADVISORY COMMITTEE

Robert J. Evans: (Chairman)	Acting Vice President–Physical Planning and Construction The University of California.
Louis T. Benezet:	President; The Claremont Graduate School and University Center.
Frank Burrows:	Partner; Williams and Burrows, Inc., General Contractors.
Paul Emmert:	Executive Secretary for Program Policy Review Board; Community Facilities Administration; formerly head of San Francisco office of HHFA.
Robert L. Geddes:	Dean; School of Architecture, Princeton University.
Cornelius J. Haggerty:	President; Building and Construction Trades Department, AFL–CIO.
William LeMessurier:	Owner; LeMessurier and Associates, Structural Engineers; Professor of Structural Engineering at Massachusetts Institute of Technology.
Elmo R. Morgan:	Deputy Assistant Secretary of the Interior for Water Pollution Control.
Donald E. Neptune:	Partner; Neptune and Thomas, Architects.
Walter Andrew Netsch:	General partner; Skidmore, Owings and Merrill, Architects.
Theodore Newcomb:	Professor of Psychology, The University of Michigan.
Fred A. Schwendiman:	Director of Auxiliary Services, Brigham Young University; past President, Associate of College and University Housing Officers.
Robert Shaffer:	Dean of Students, The Indiana University.
Jonathan King:	Vice President and Treasurer; Educational Facilities Laboratories, Inc.
Jay DuVon*	Director; Division of College Facilities, U.S. Office of Education, Department of Health, Education and Welfare.

*Deceased.

UNIVERSITY OF CALIFORNIA

STANDING COMMITTEE ON RESIDENCE HALLS

CURRENT

William F. Shepard: (Chairman)	Assistant Vice President and University Dean, Office of the President.
John H. Stanford:	Director, Business Services, Office of the President.
Adolph T. Brugger:	Dean of Students, Riverside.
Louis A. DeMonte:	Campus Architect, Berkeley.
Ira Fink:	University Community Planner, Office of the President.
Ted D. Johnson:	Assistant Director of Relations to Schools, Office of the President.
R. Clayton Kantz:	Director, URBS, Office of the President.
John R. Kropf:	Residence Hall Administrator, Los Angeles.
Oscar Norr:	Manager of Auxiliary Enterprises, San Diego.
Van R. Richards:	Dean of Students, Davis.
Byron Stookey:	Assistant to Chancellor, Santa Cruz.
Myles E. Tobin:	Assistant Business Manager, San Francisco.
Arleigh Williams:	Dean of Students, Berkeley.
James G. Wilson:	Business Manager, Irvine.

FORMER

Byron Atkinson:	Dean of Students, Los Angeles.
Robert S. Downie:	Assistant to Vice Chancellor, Business Affairs, Davis.
Theodore Forbes:	Dean of Student Affairs, San Diego.
Charles Halberg:	Vice Chancellor, Student Affairs, Riverside.
Lyle G. Reynolds:	Dean of Students, Santa Barbara.
Scott Wilson:	Residence Halls Administrator, Berkeley.

URBS PROJECT TEAM

University of California

Office of the Vice President – Planning and Construction –

- R. Clayton Kantz, AIA, Project Director
- William A. Kinst, AIA, Assistant Project Director

Office of University Dean – Educational Relations –

- Norman M. Better

Office of Vice President – Business –

- John E. Forsberg, University Housing Advisor

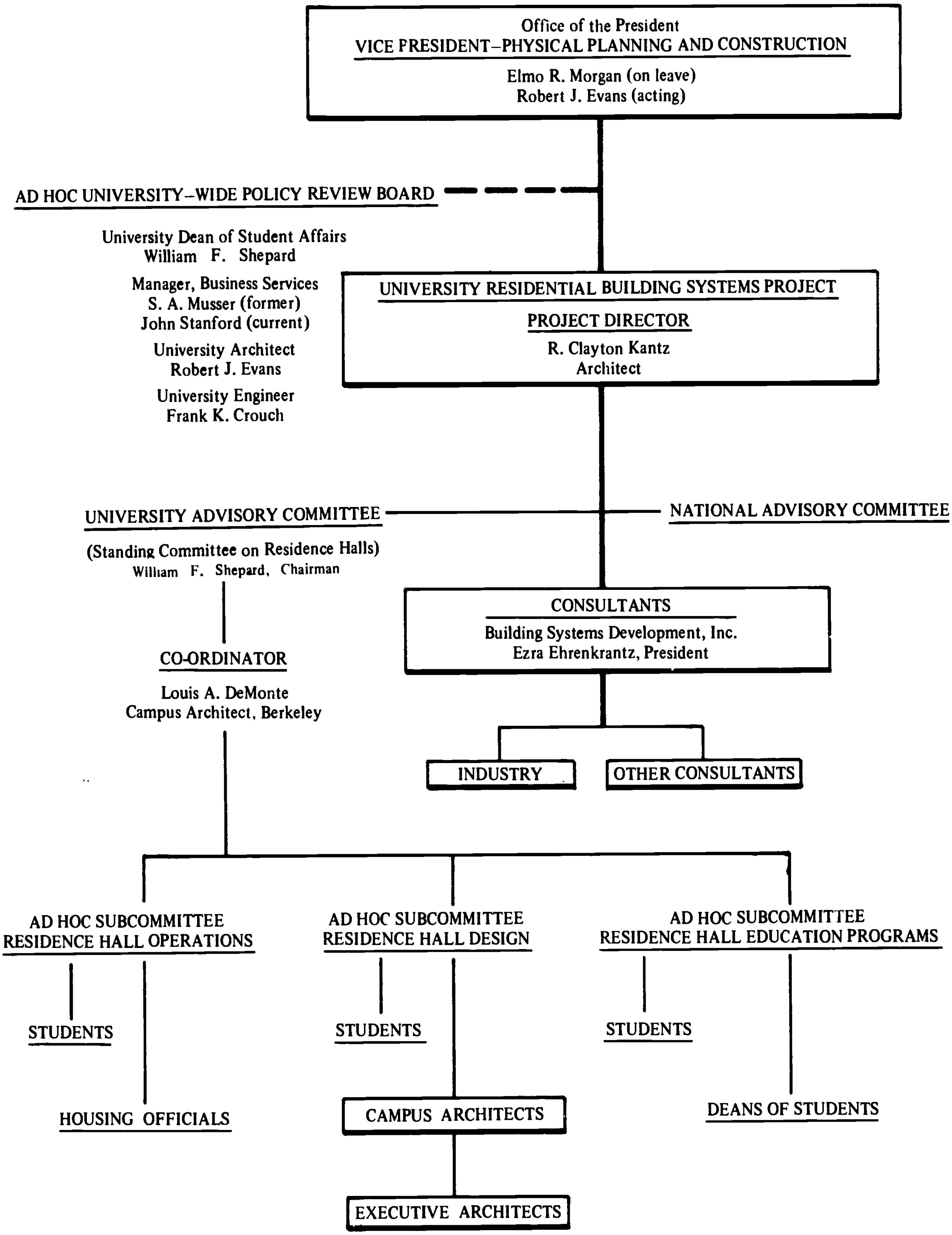
Building Systems Development, Inc.

Consultants

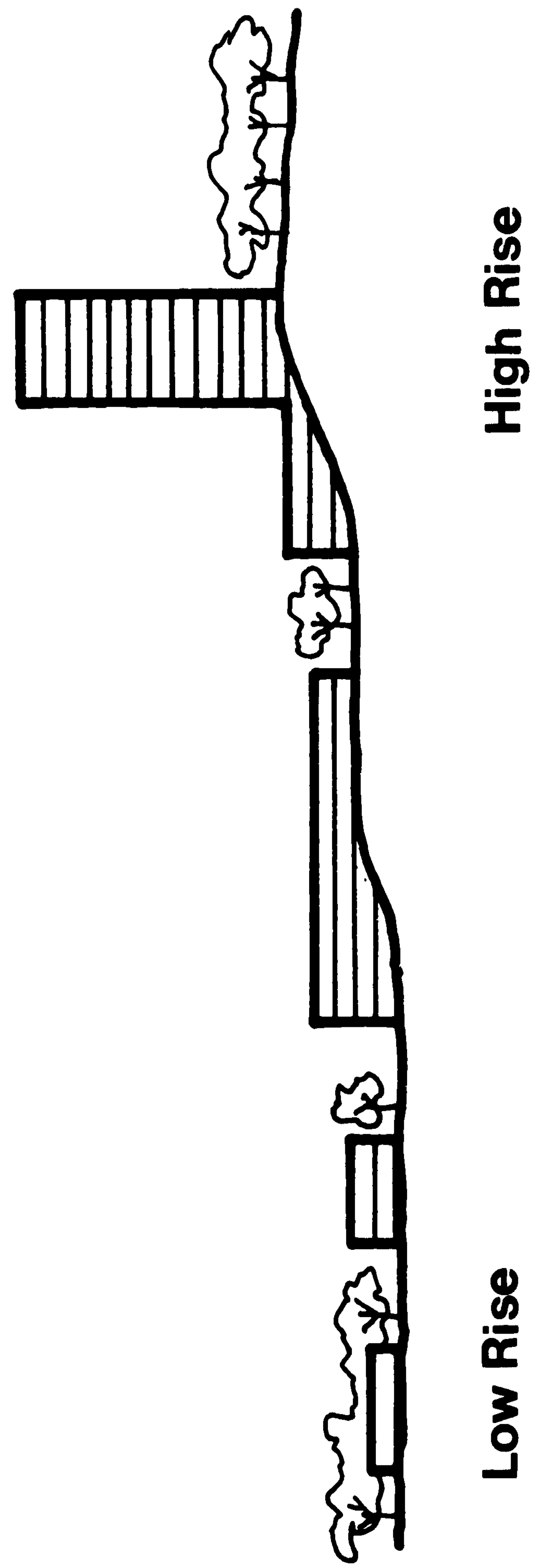
- Ezra E. Ehrenkrantz, AIA, President
- Christopher Arnold, RIBA, Vice President

– Visscher Boyd	– Peter Kastl
– Carl Bryant	– John Vilett

ORGANIZATION CHART

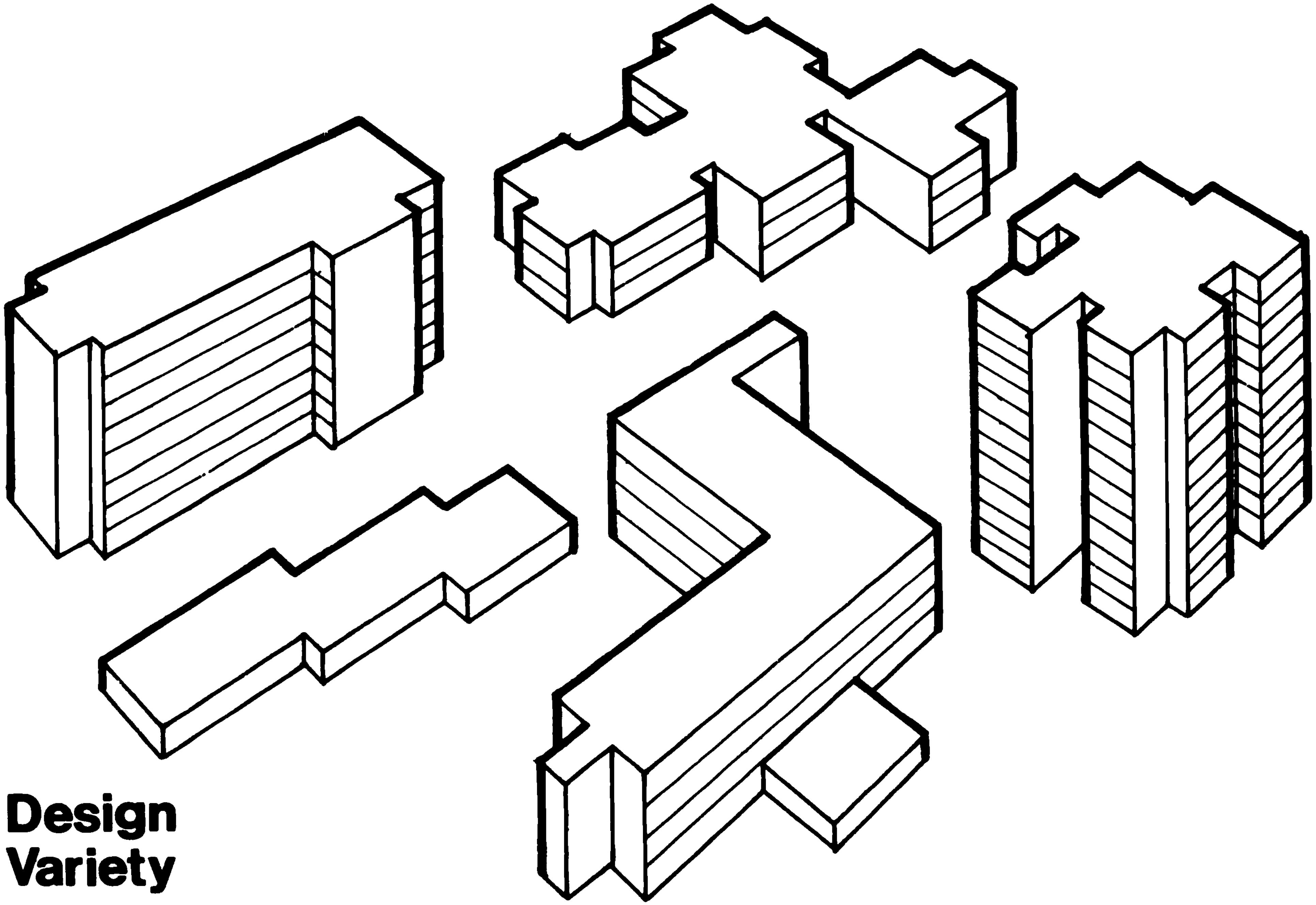


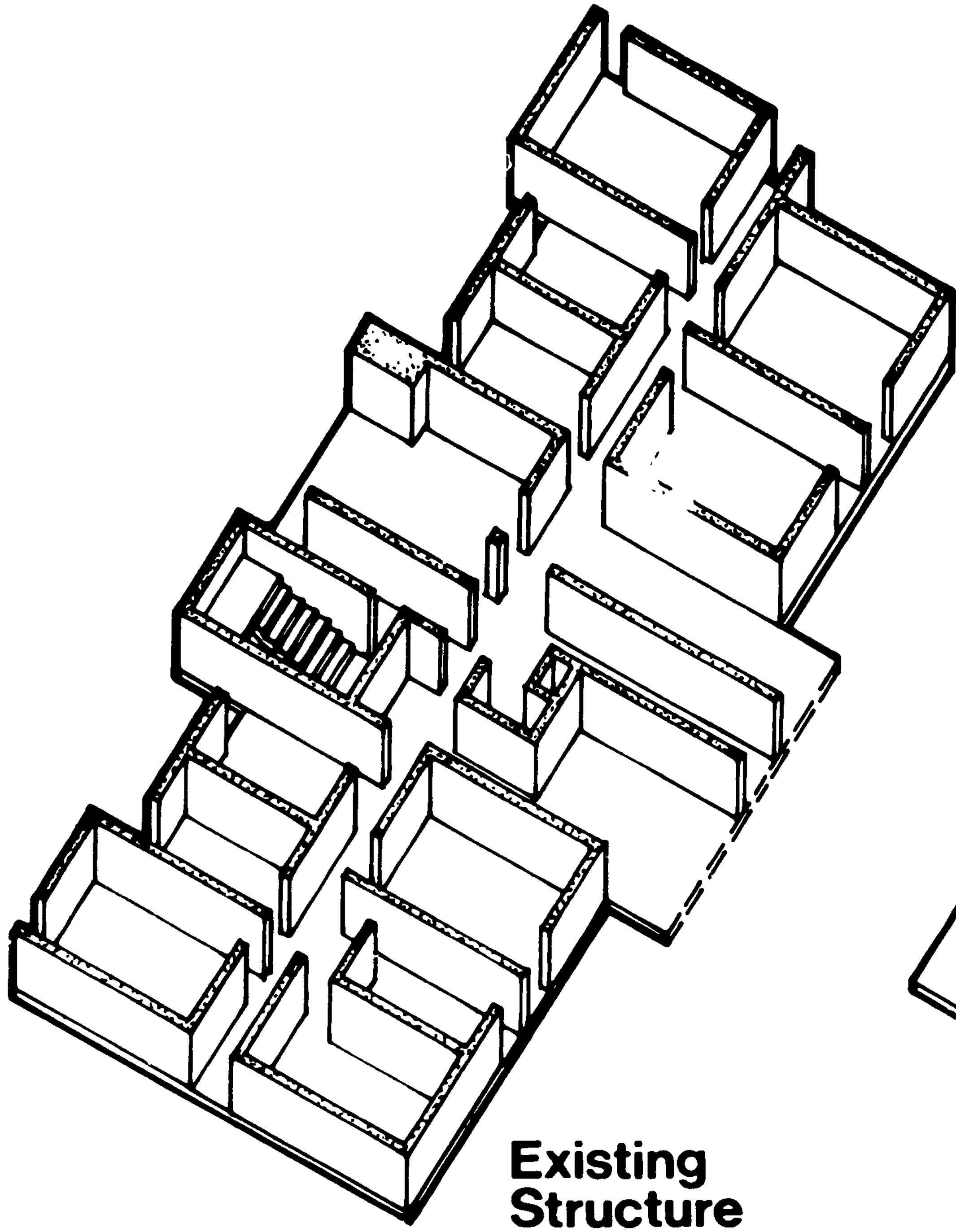
PART IV. BACKGROUND INFORMATION



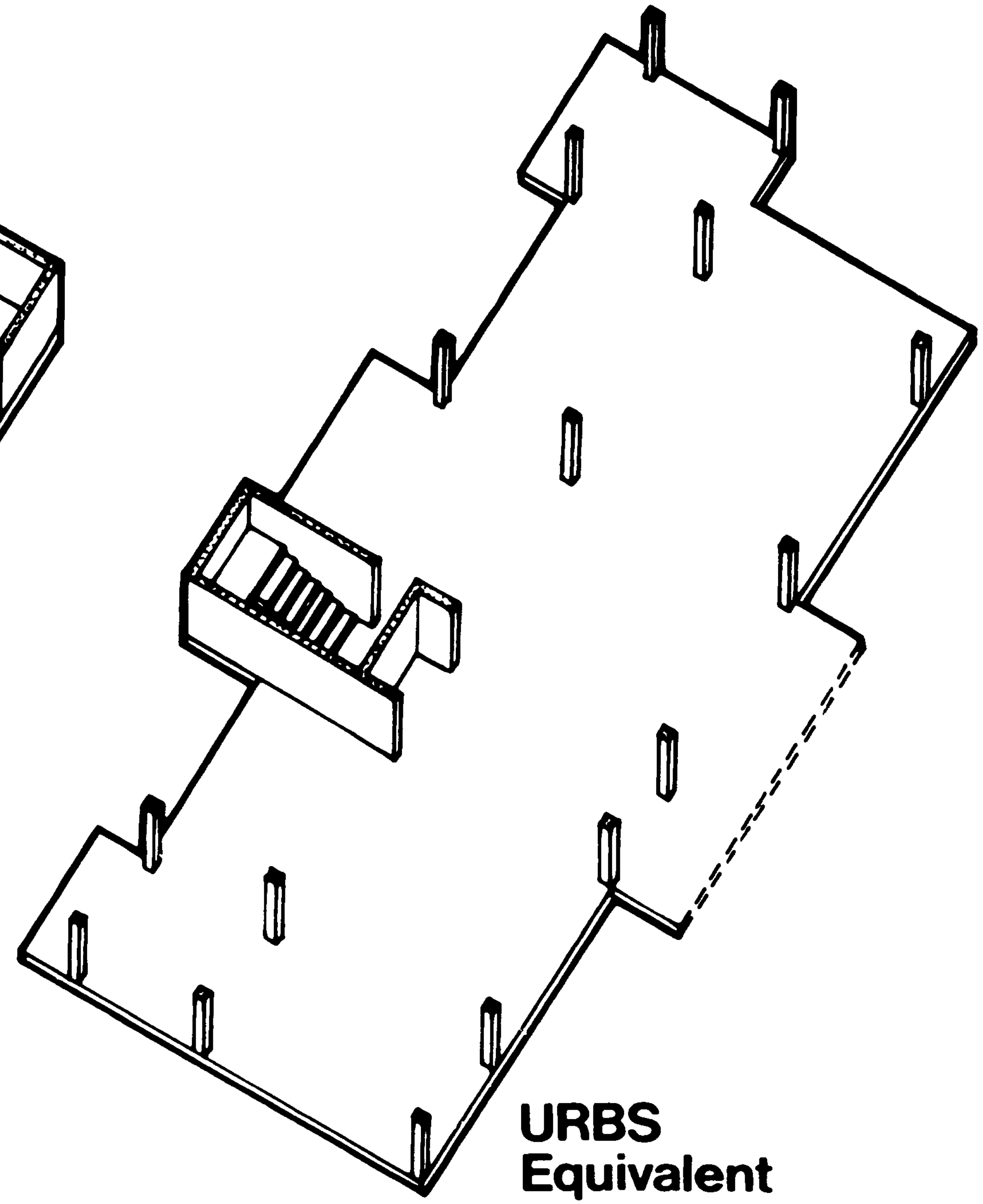
Design Variety

Design Variety

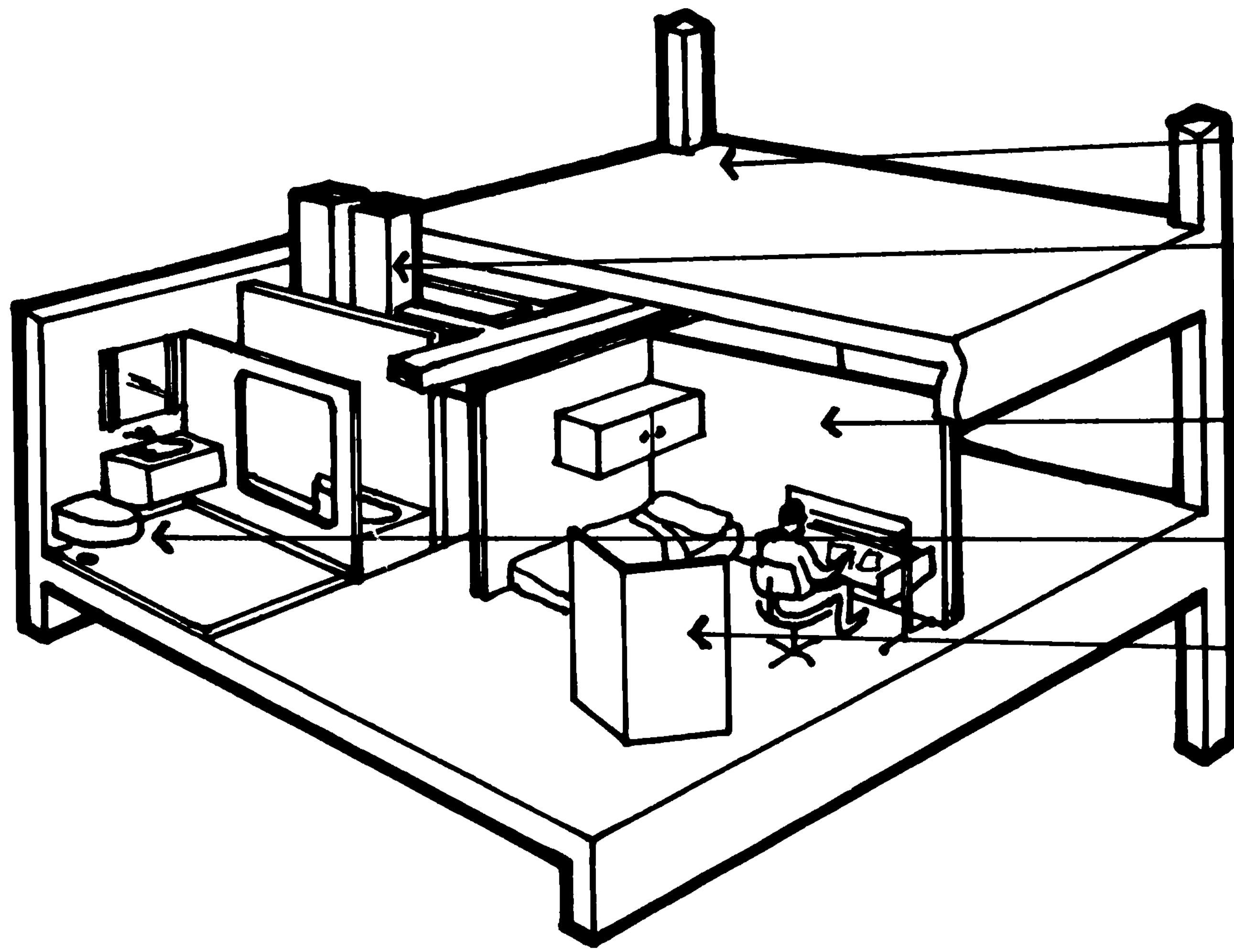




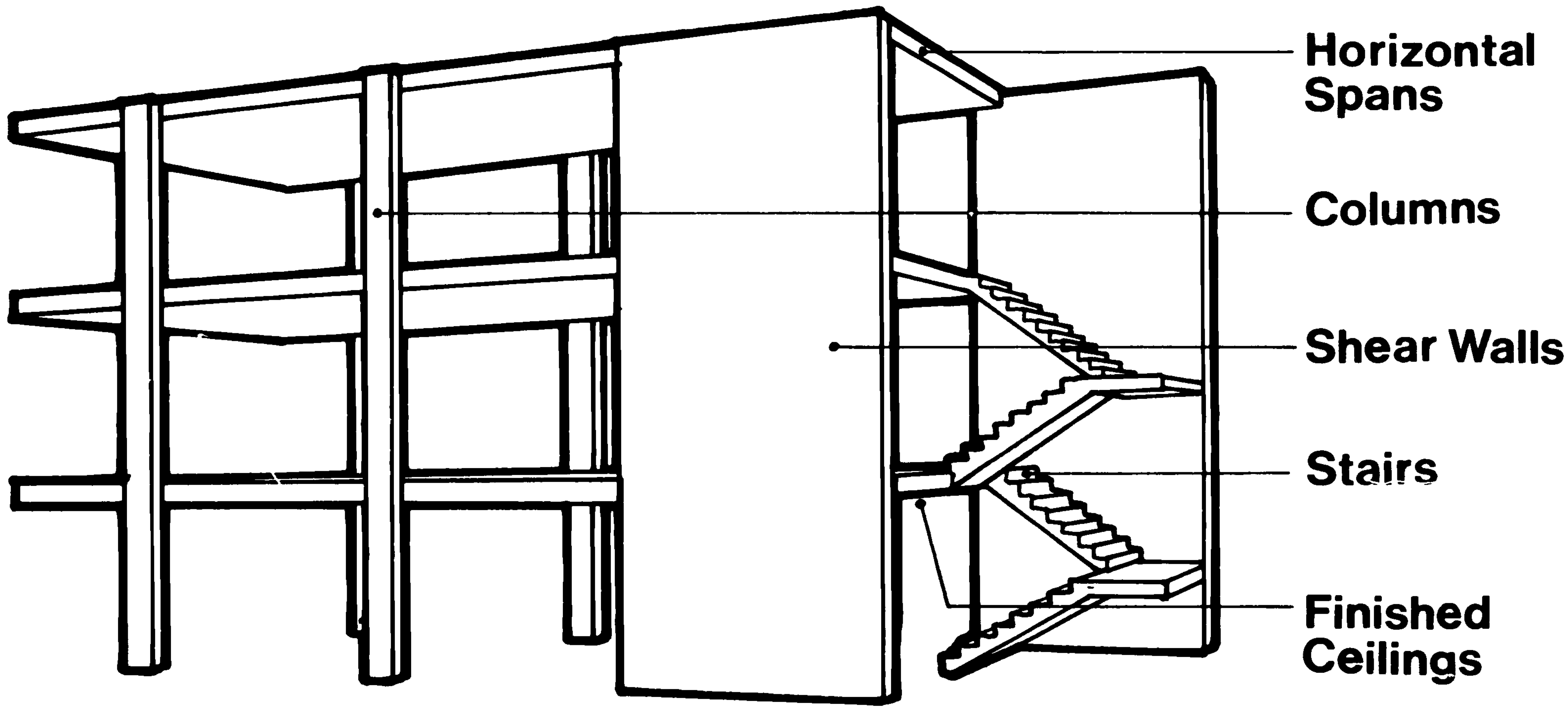
Existing Structure



URBS Equivalent

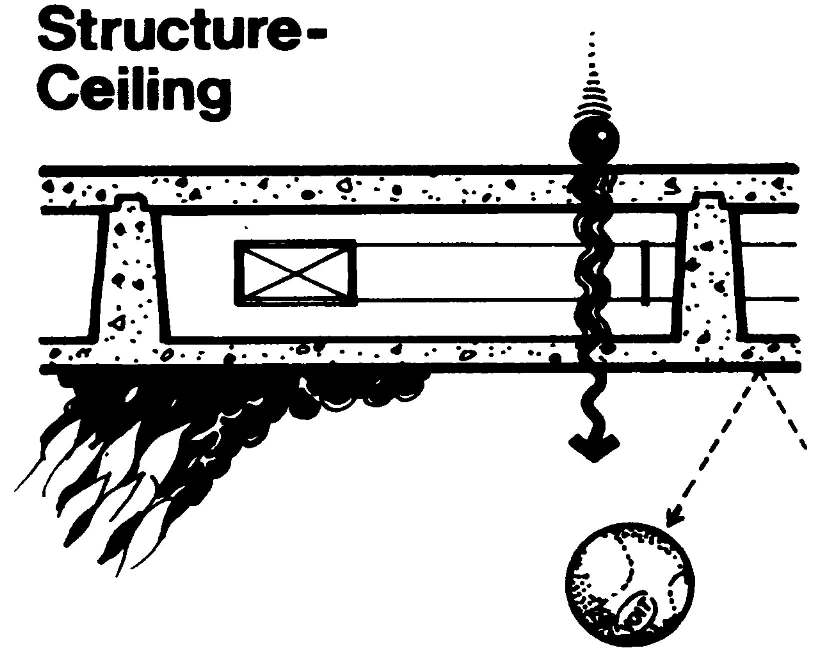

Structure-Ceiling
Heating, Ventilating, Cooling
Partitions
Bathrooms
Furnishings

Scope
URBS

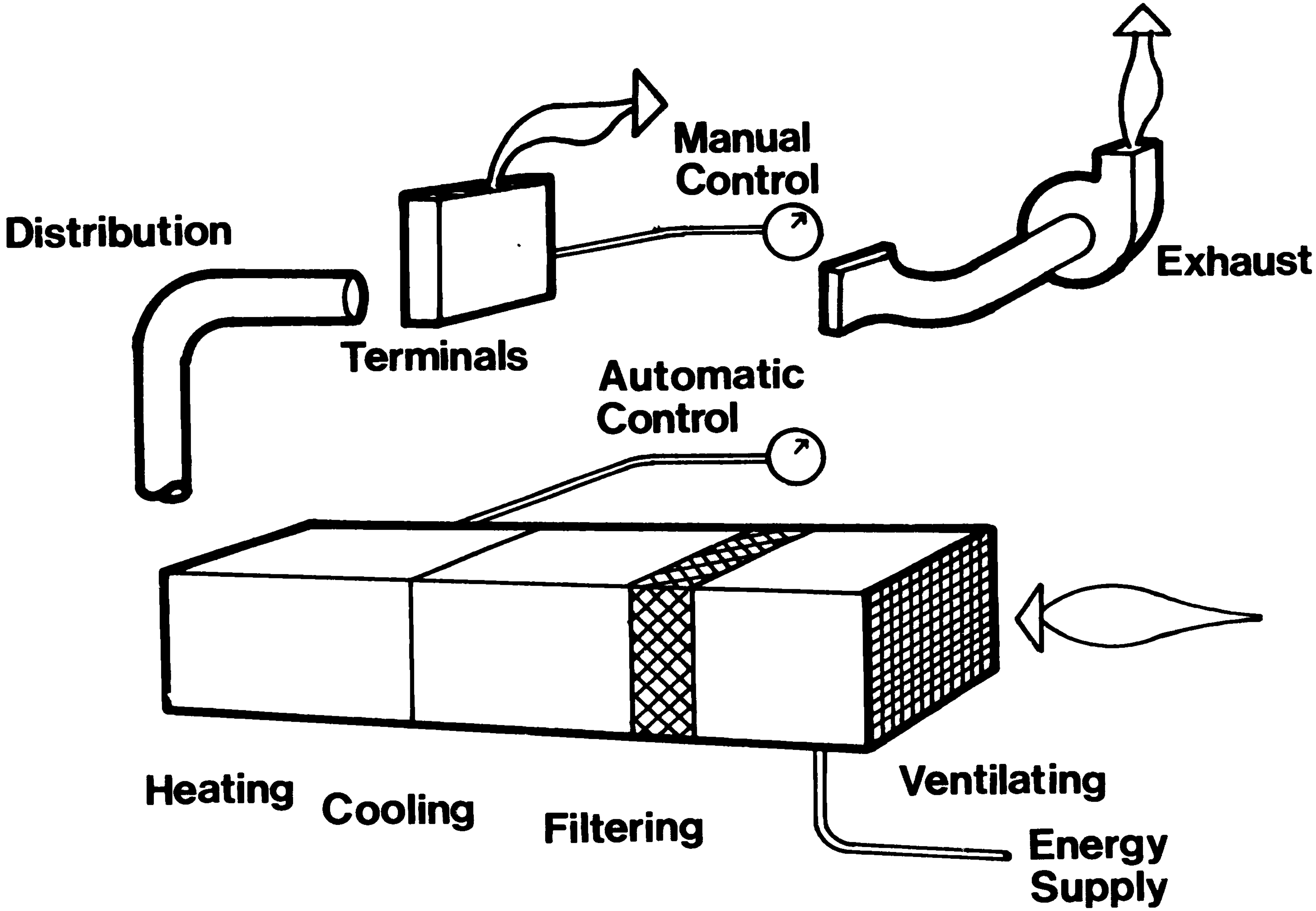


Scope
STRUCTURE-CEILING

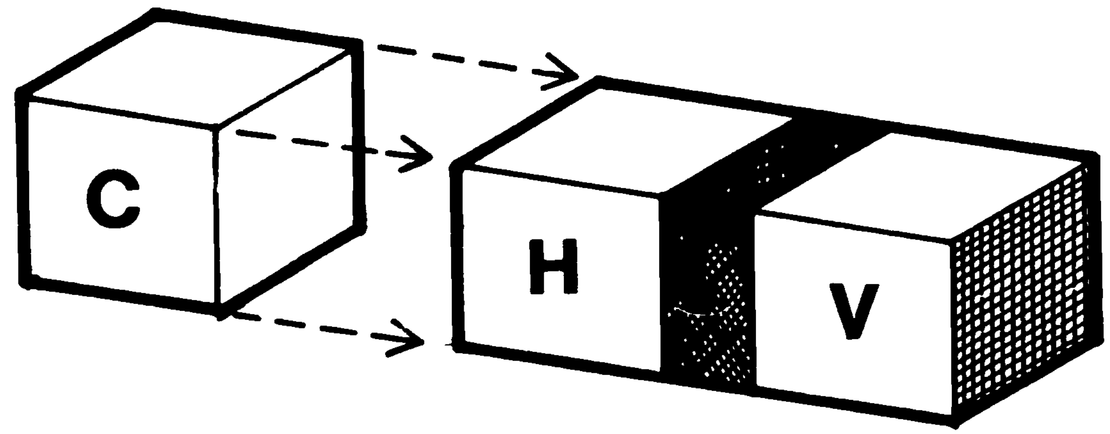
Structure-Ceiling



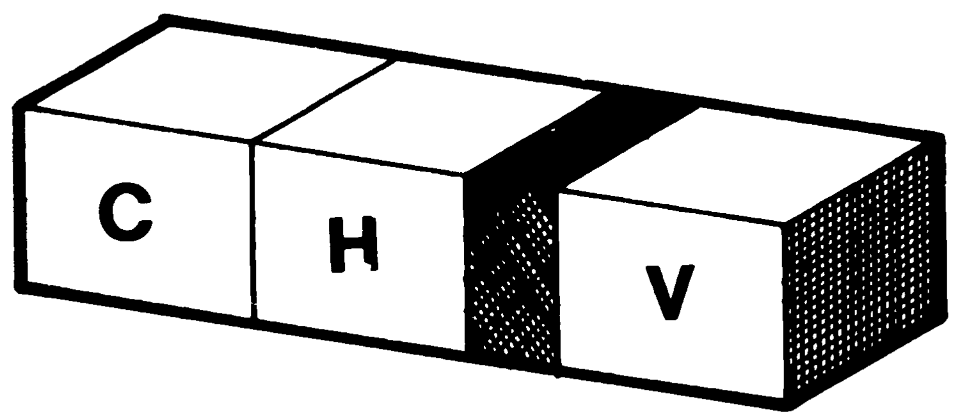
Acoustic Isolation
Fire Protection
Low Maintenance



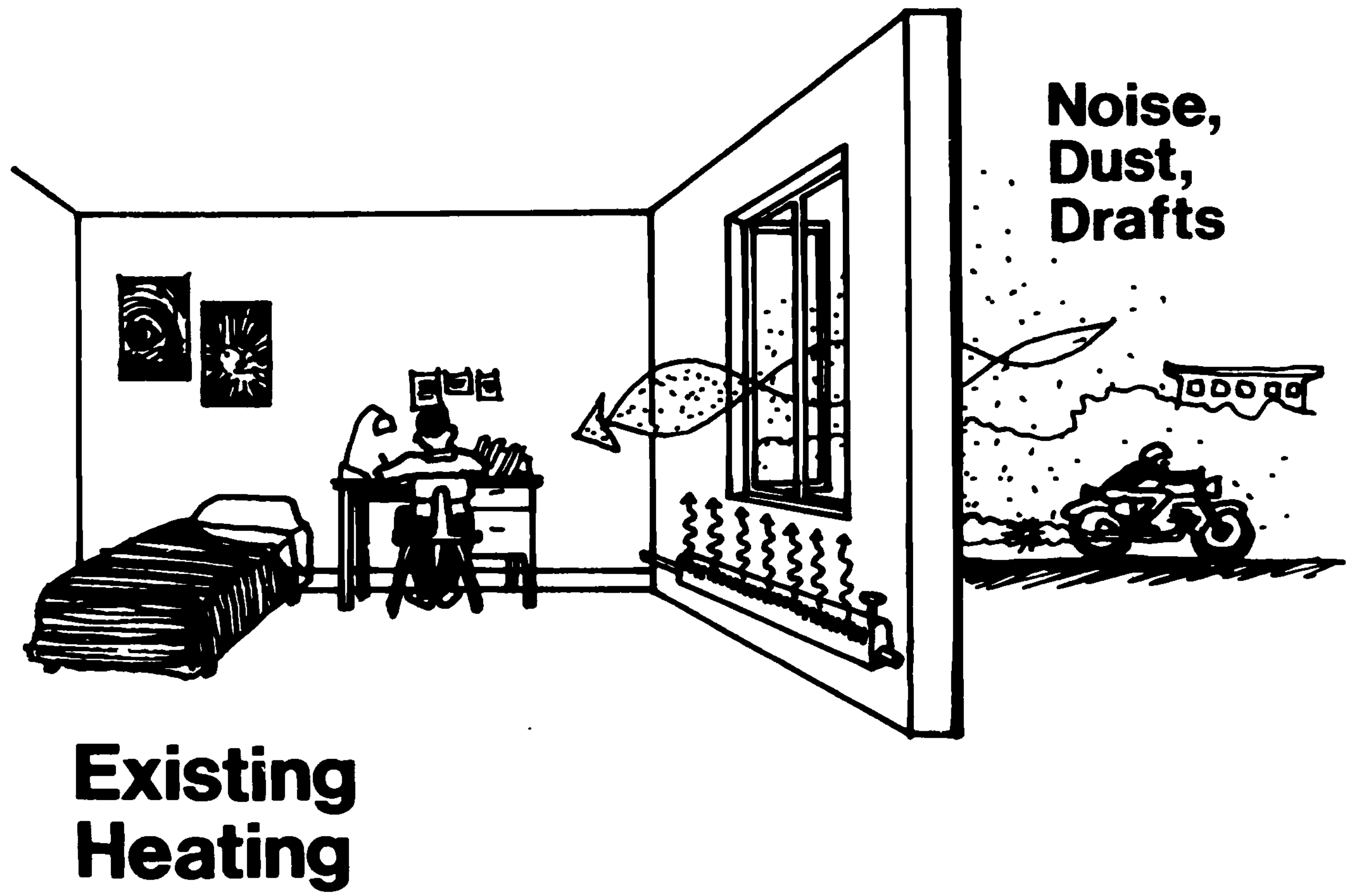
Scope
Heating, Ventilating, Cooling



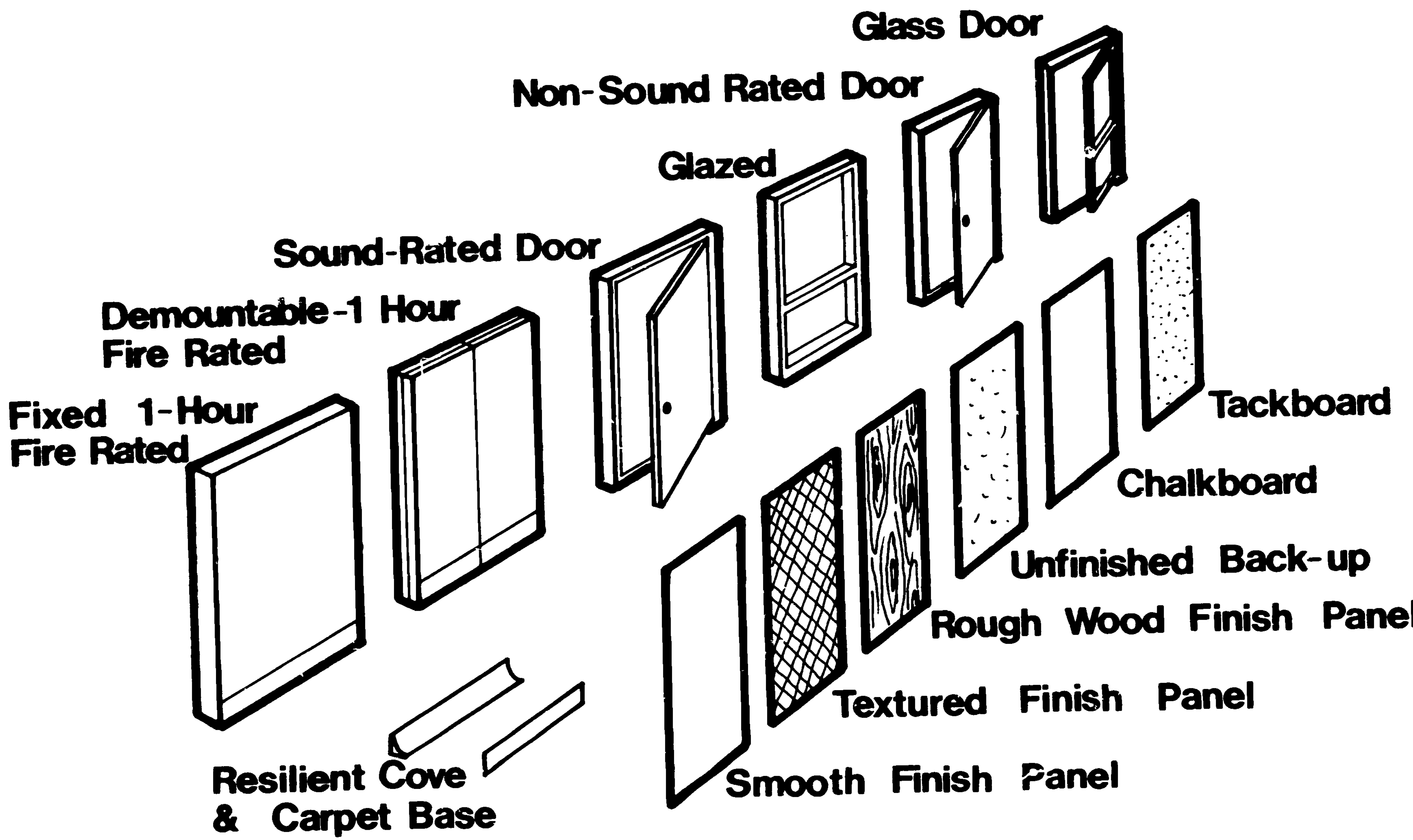
Heating, Ventilating Option (Future Cooling Capabilities)



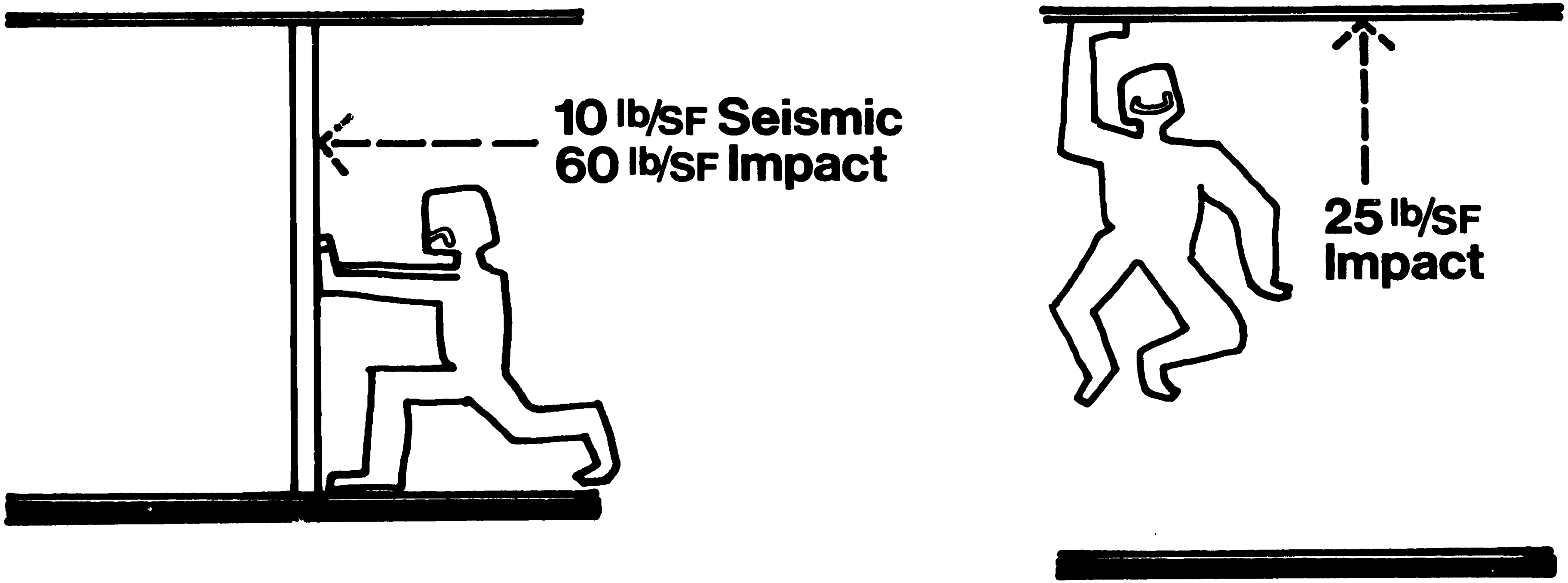
Heating, Ventilating, Cooling Option

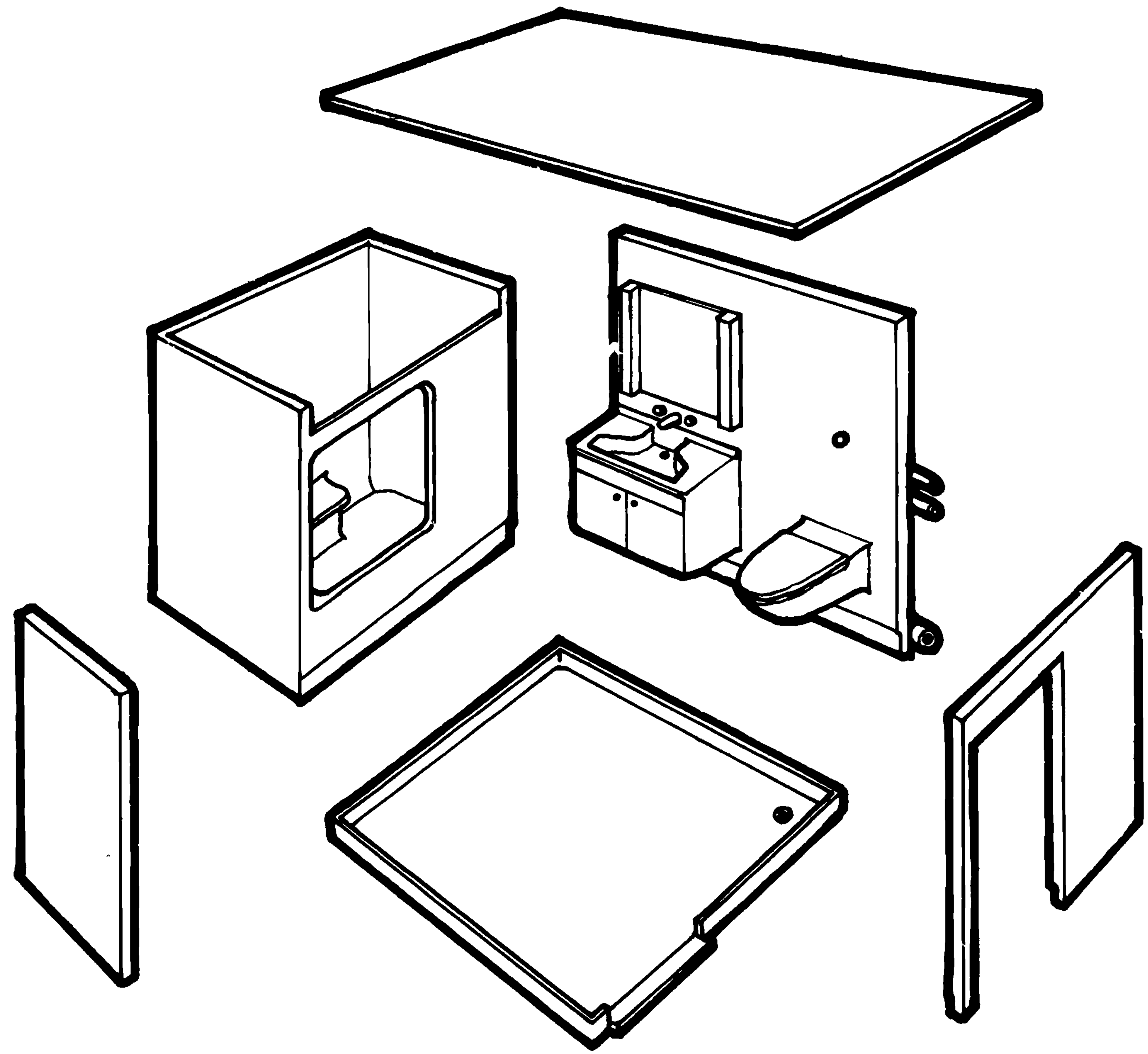

Noise,
Dust,
Drafts
Existing
Heating

URBS
Heating & Ventilating



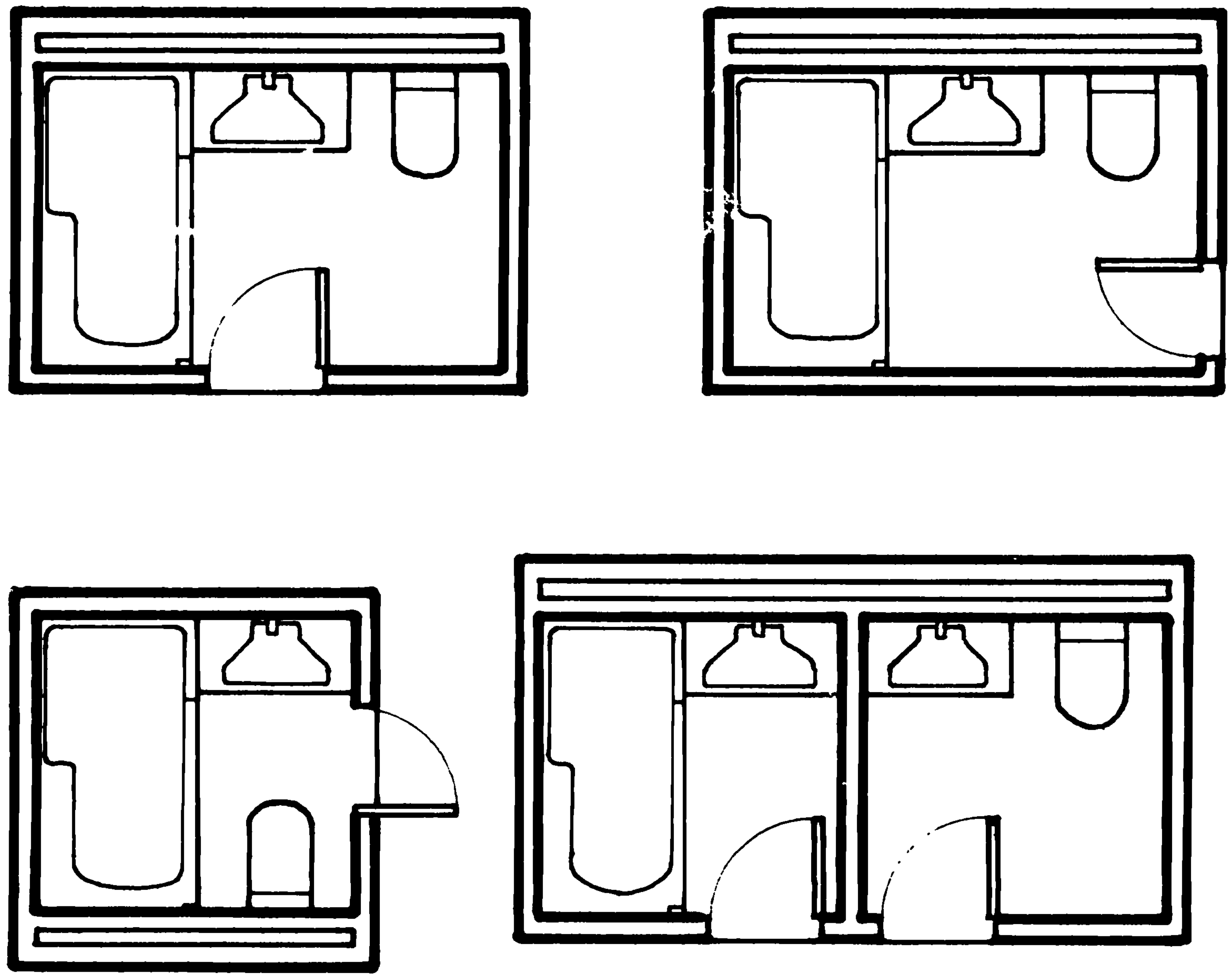
Scope
PARTITIONS


10 lb/SF Seismic
60 lb/SF Impact
25 lb/SF
Impact

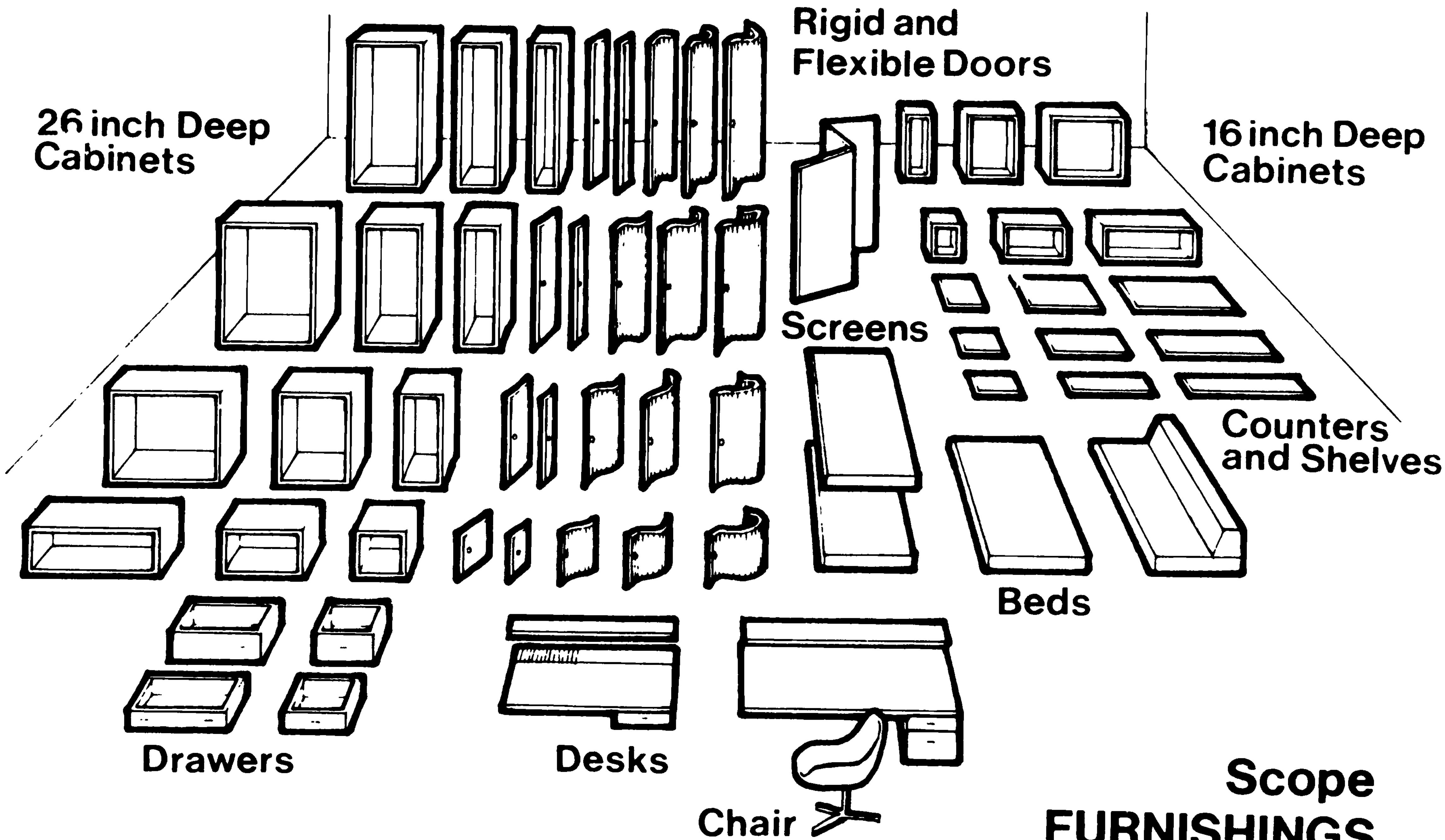


Scope
BATHROOMS

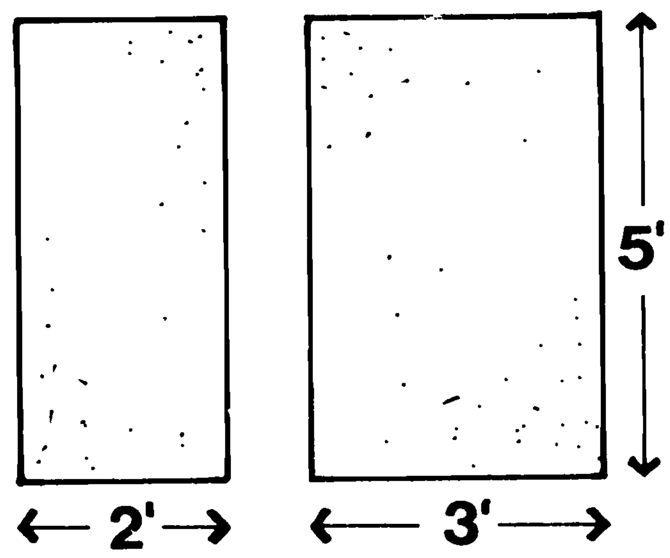
Plan Types
BATHROOMS

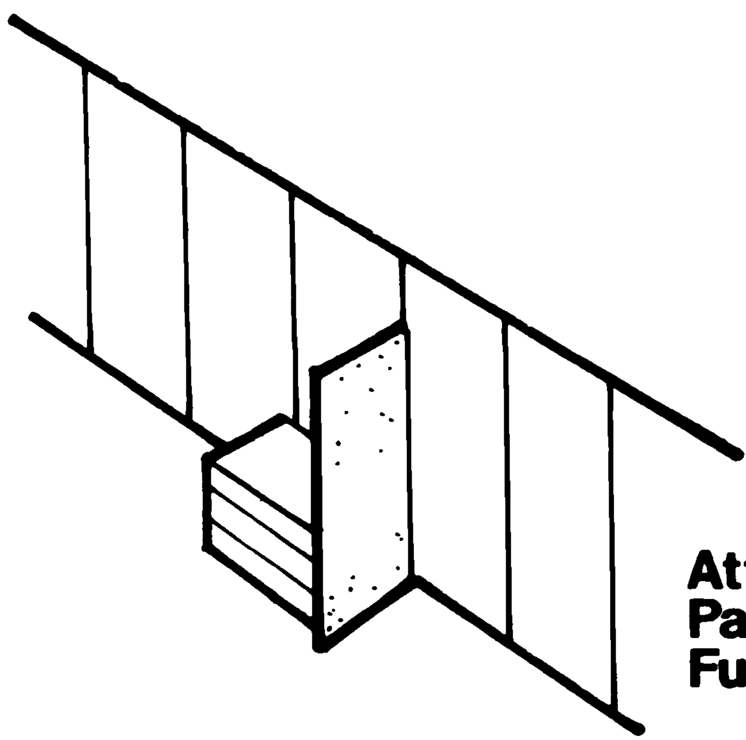


Scope FURNISHINGS

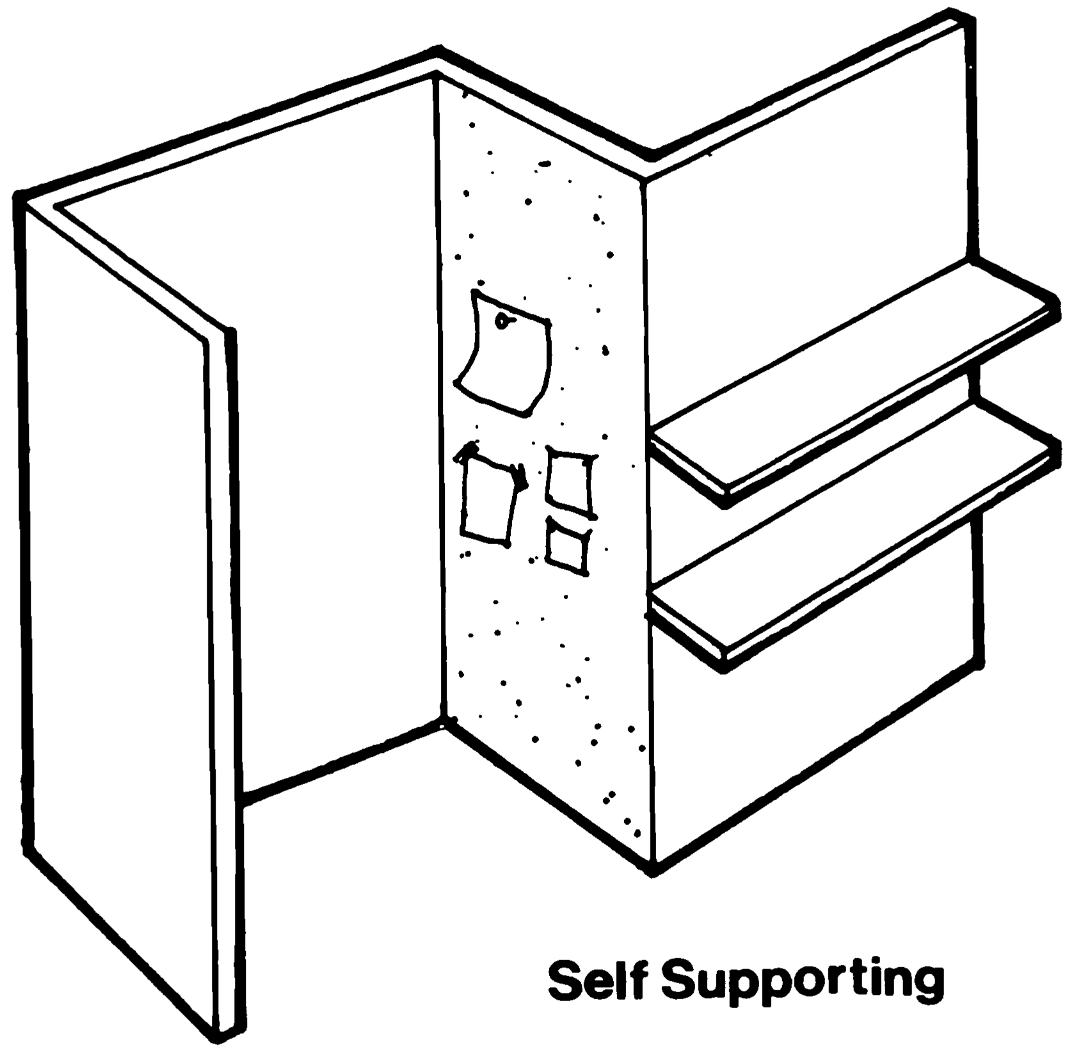


Screens

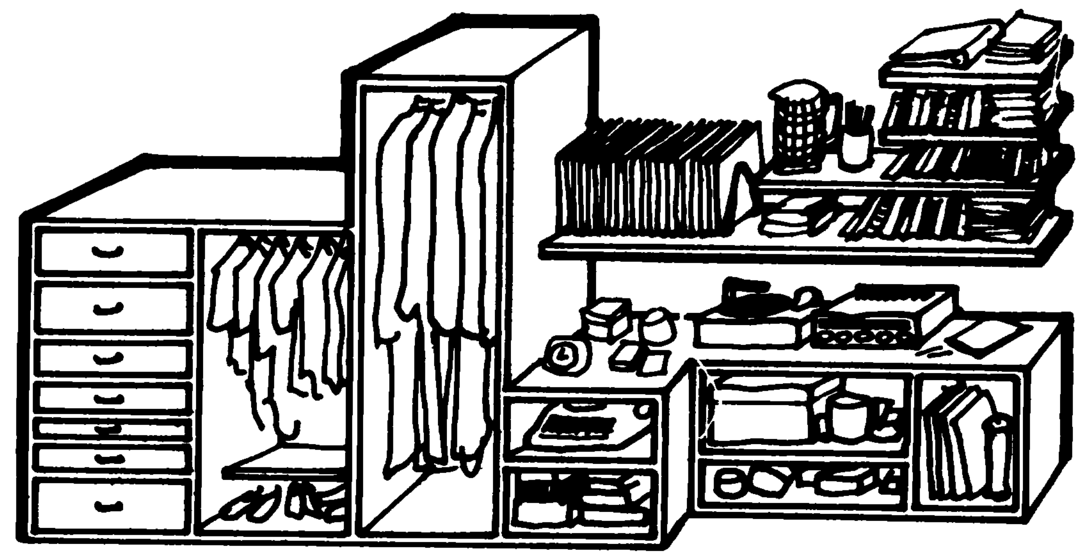




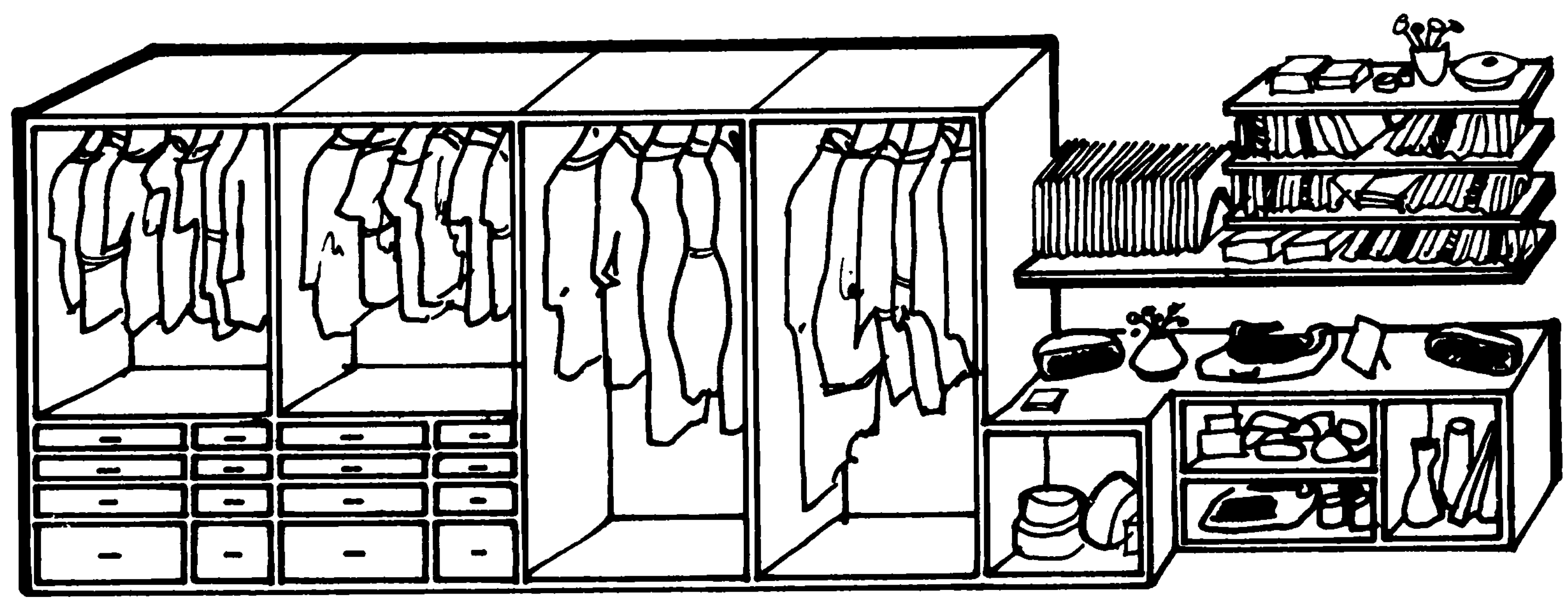
Attached to
Partitions or
Furnishings



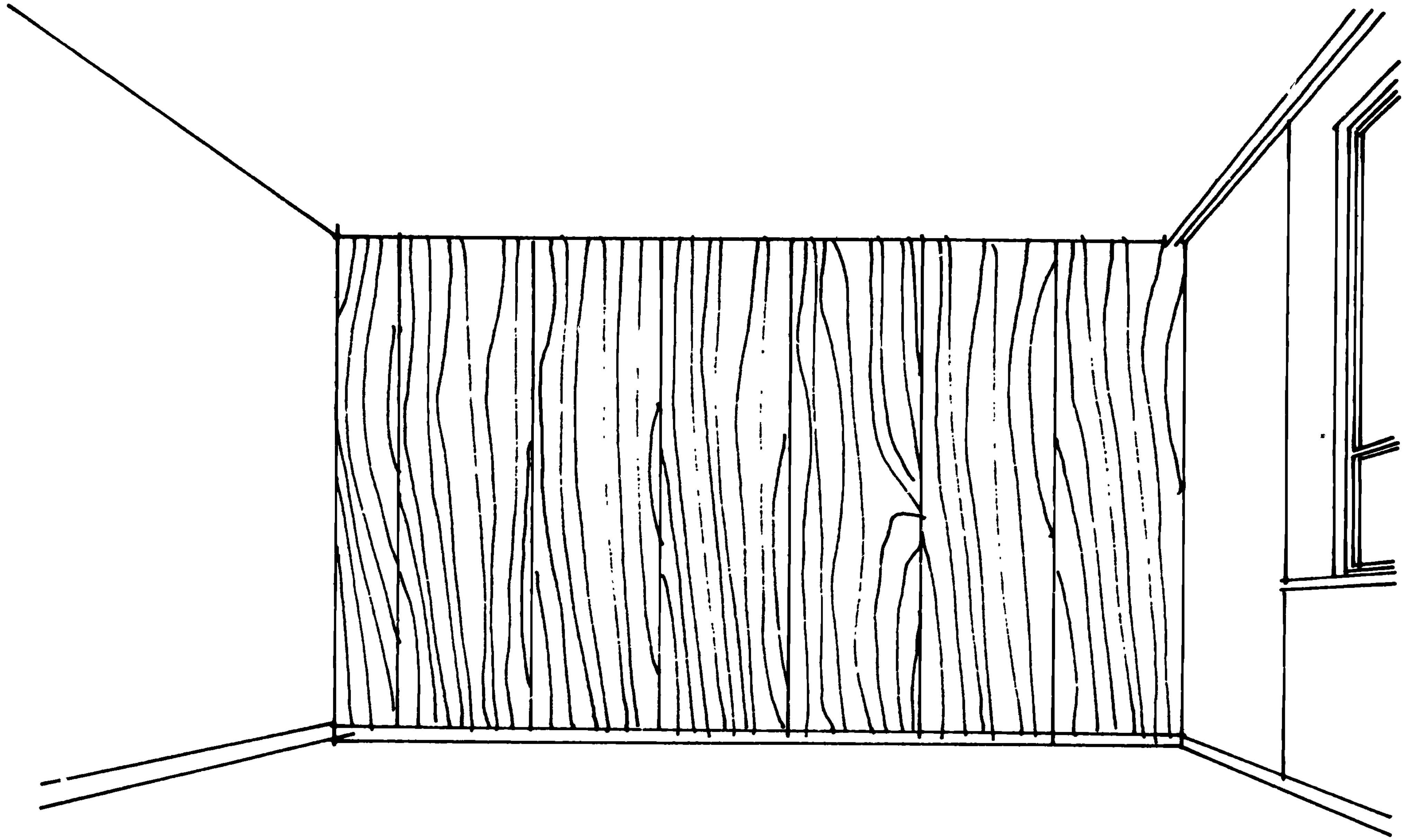
Self Supporting



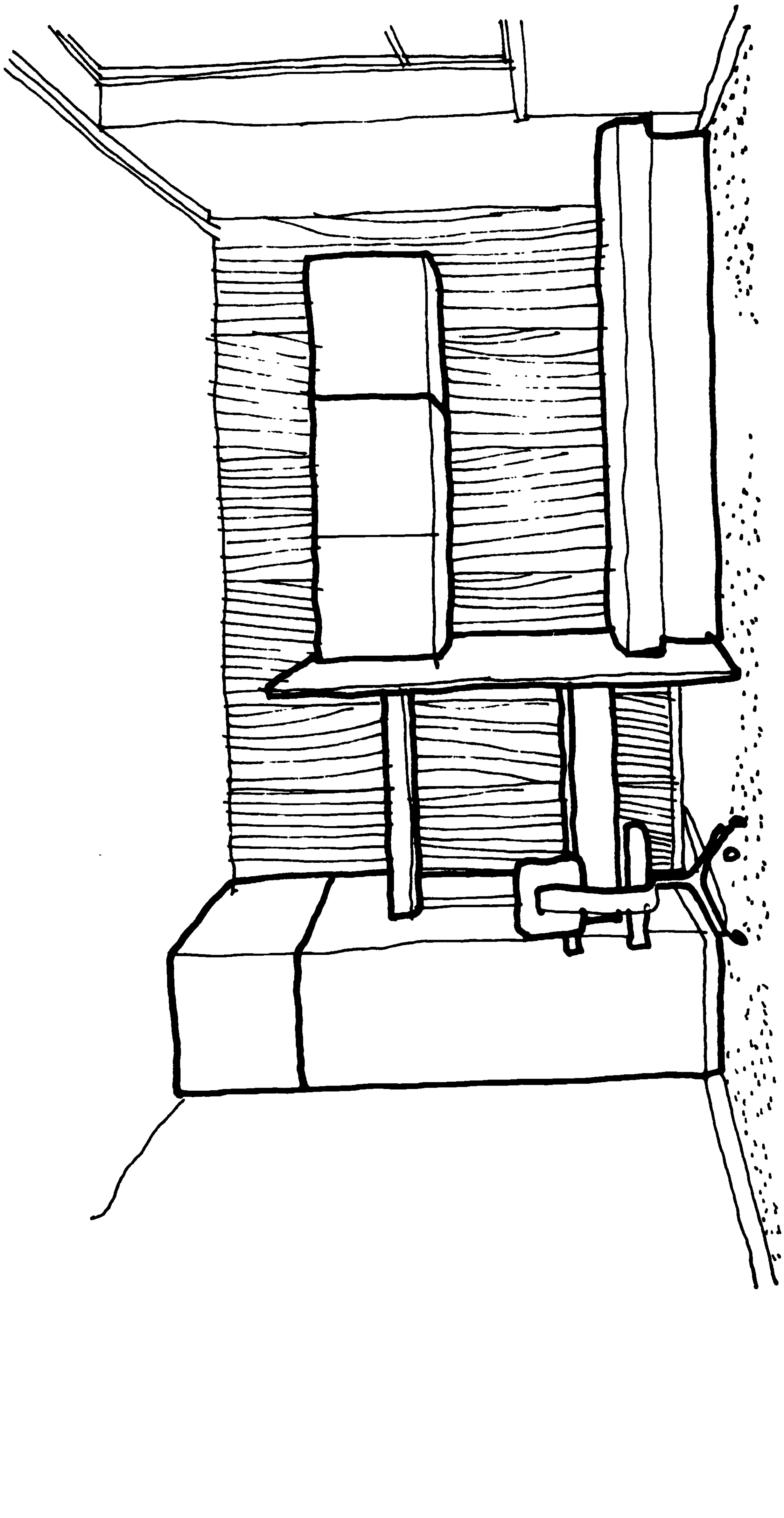
Typical Male
Student Storage Requirements



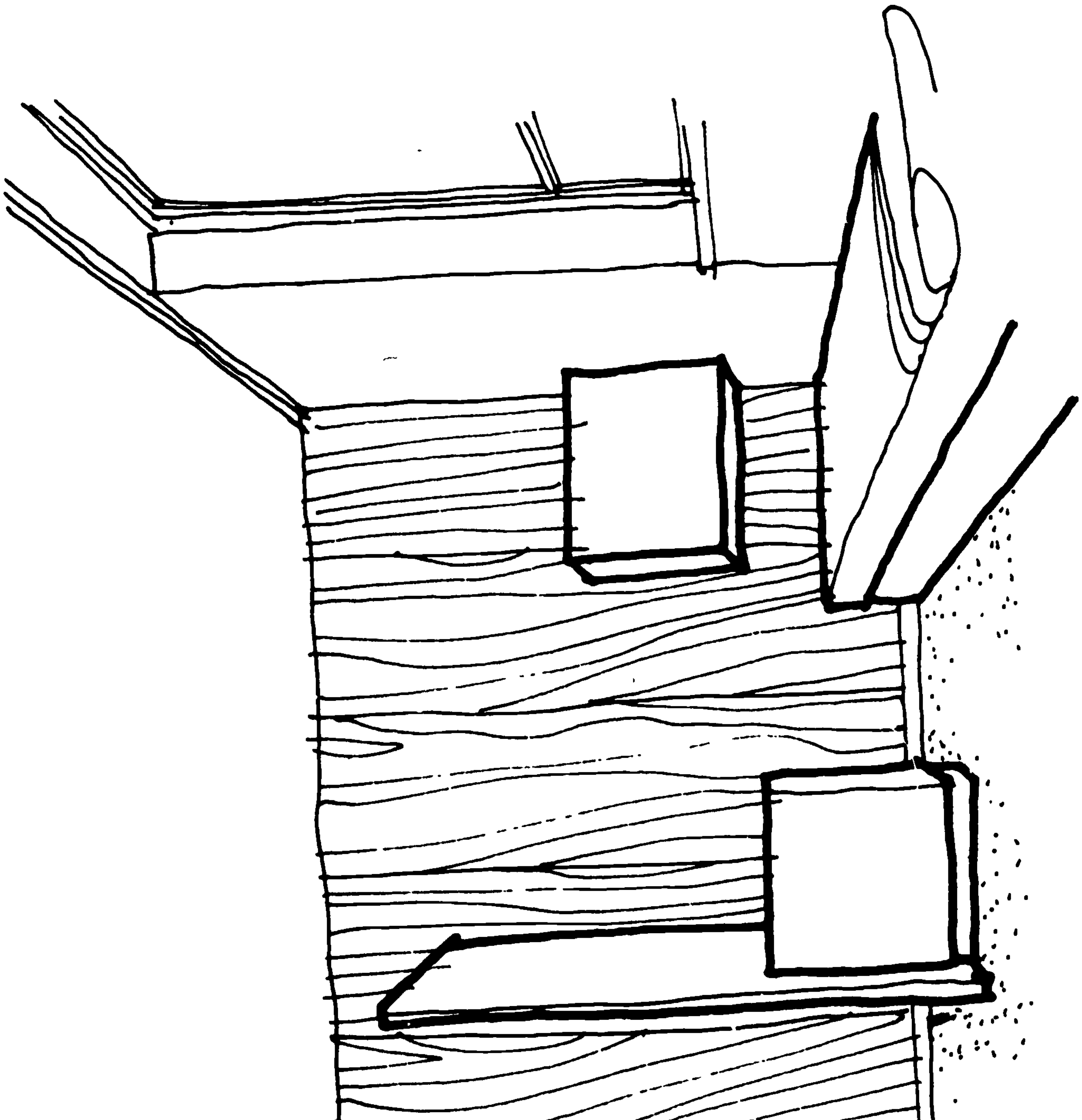
**Typical Female
Student Storage Requirements**



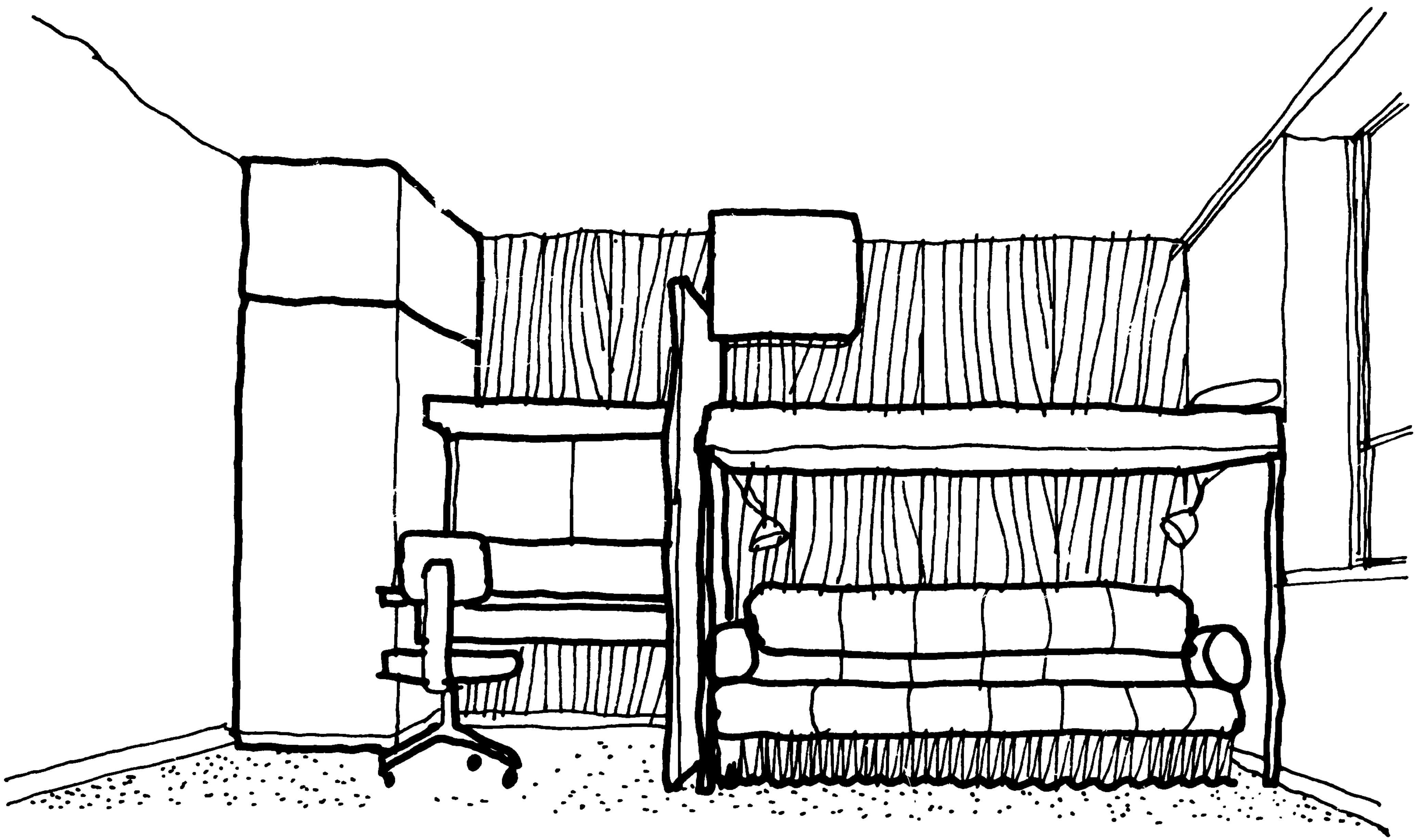
Adaptability 1



Adaptability 2



Adaptability 3



Adaptability 4

Adaptability 5