

ROCHESTER INSTITUTE OF TECHNOLOGY

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In Candidacy for the Degree of  
MASTER OF FINE ARTS

**Interior Design and Multipurpose Furniture  
For The Collegiate Apartment at RIT**

By

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## **SECTION 1**

### **THESIS INTRODUCTION**

TITLE: Interior Design and Multipurpose Furniture for the Collegiate  
Apartments at Rochester Institute of Technology

Due to the increased demand for on-campus housing at Rochester Institute of Technology in Rochester, New York, the RIT Facility Planning Department has accepted the new facility plans, designed by Macon Chaintreuil Jensen & Stark Architects, and selected The Capstone Development as the developer and Wilmorite, Inc. as the contractor. The project is the first part of a new living center that will eventually replace the old apartment complexes at both Riverknoll and Racquet Club, two existing facilities on or near the campus. The new living center, The Collegiate Apartments, which opened in September 1998 (refer to map on page 5), consists of eight two-story apartment buildings. Each building houses thirty- two students, accommodating approximately 288 total residents. Within The Collegiate Apartment Complex, there are recreational areas, ample parking, and a picnic area with grills. All apartments are approximately 1,128 total square feet, offering four private bedrooms for each student and two shared bathrooms. Each apartment has a living room, dining area, kitchen, and storage closet.

RIT students have two primary places on campus that they can stay while attending RIT, which are residence halls, and on campus apartments. The residence halls are located on the East campus and have many conveniences, while the apartments allow the student to have more freedom and responsibilities. The first year students always have been assigned to live in the residence halls, where they can most easily communicate with other students. They also have the freedom to create their own special niche and decide which living environment best complements their academic pursuits, whether by choosing special interest housing or a special lifestyle option, or by creating a family-like atmosphere on a coed floor that attracts people of different interests.

Undergraduate and graduate students who must live on campus (as opposed to off campus housing) have an option of living in either a residence hall or apartment housing. RIT has four apartment complexes which are Colony Manor, Perkins Green, Racquet Club, and Riverknoll. In addition, the new Collegiate Apartments opened in September 1998. Each apartment ranges in size from one to two bedroom units, or a townhouse with two or three bedrooms. Each student will have the opportunity to select his or her living style.

However, students living in either a residence hall or an apartment, always have to share living rooms, dining areas, kitchens, bathrooms, and storage closets. Most students must confront problems regarding space limitation, and furniture arrangement, as well as privacy.



The purpose of this thesis is to develop an efficient interior space planning concept as well as design multipurpose furniture for the Collegiate Apartments, as a result of studying the relationship between space and dwellers' behaviors. The challenge is "how to control a limited space while achieving the maximum use of that space, and maintaining aesthetic value."

The design will also be based on the concept of logical space planning, the reduction of the number of fixtures, the relationship of each piece of furniture, and the harmony of the context. Due to the main problem of size limitation of the apartments, and enhancing dwellers' privacy, it seems ideal to propose multi-functional furniture, which will help reduce the amount of space devoted to furniture. When designing multipurpose furniture, physiological requirements are the important basis of the design. The consideration of ergonomics, cultural influences, and psychological needs will be basis of as criteria of design to achieve functional goals.

Lastly, my goal is that the design will be environmentally responsible, as well.

## **PROBLEMS**

The most challenging problem is caused by the *limited space* available. Adopting this limitation is necessary in generating both space planning and furniture arrangement solutions. The intention is to maximize space by designing furniture with multiple uses taking up minimal space. Other goals are furniture arrangement *flexibility* and *aesthetics*. Relationships between each piece of furniture as indicated by the architects on preliminary floor plans does not currently provide logical circulation, convenience, or *privacy for dwellers*.

*Light and air ventilation* is also a factor to be considered. Due to the different weather conditions of each season, both insulation and controlled ventilation will be integrated into the design.

## **OBJECTIVES**

The objectives of the design are to minimize the effect of the space limitations, maximize furniture arrangement possibilities, provide adequate light and air ventilation, and enhance dwellers' privacy by providing aesthetically pleasing, and multipurpose furnished units. The modular furniture will be adaptable to environments that can serve a number of purposes, including sitting, sleeping, working, dressing, eating, washing, and storage, and provide appropriate lighting for these functions. The design will support self-expression of occupants by permitting flexible uses of space and great freedom of furniture arrangements.

## **METHODOLOGY**

The initial explorations will include analysis of circulation patterns within limited available space. Further, the study will explore methods of separating private and public spaces, analyze space planning with essential furniture, study furniture arrangement alternatives, and design modular, multipurpose furniture to support both convenience and privacy. Modular design will permit both choice and replacement. The furniture will offer strength, durability, aesthetics, and ecological responsibilities.

## **USER CONSIDERATIONS**

RIT students represent a variety of social and cultural backgrounds, ages and marital status, are engaged in a variety of fields which require different study, work, and space needs. The design must include flexibility which will support lifestyles, tastes, and needs for self-expression. Moreover, the design will offer the special needs for populations such as deaf / hard of hearing students, and students with other disabilities.

## TYPICAL FLOOR PLAN

The New Collegiate Apartment Complex is located on the west of campus, behind Riverknoll Apartment Complex (see map, page 5). As proposed, each apartment has four-single bedrooms with two bathrooms, living room, dining area, kitchen, pantry, and storage closet. Each single bedroom has approximately 99 square feet. There are 2 bathrooms, one is a 52 square-foot bathroom and the other is a 82 square-foot handicapped accessible bathroom. All apartments will be furnished with essential furniture including washer and dryer in a 34 square-foot pantry. A small amount of storage space is provided for residents' personal belongings, which may be shared space with other residents.

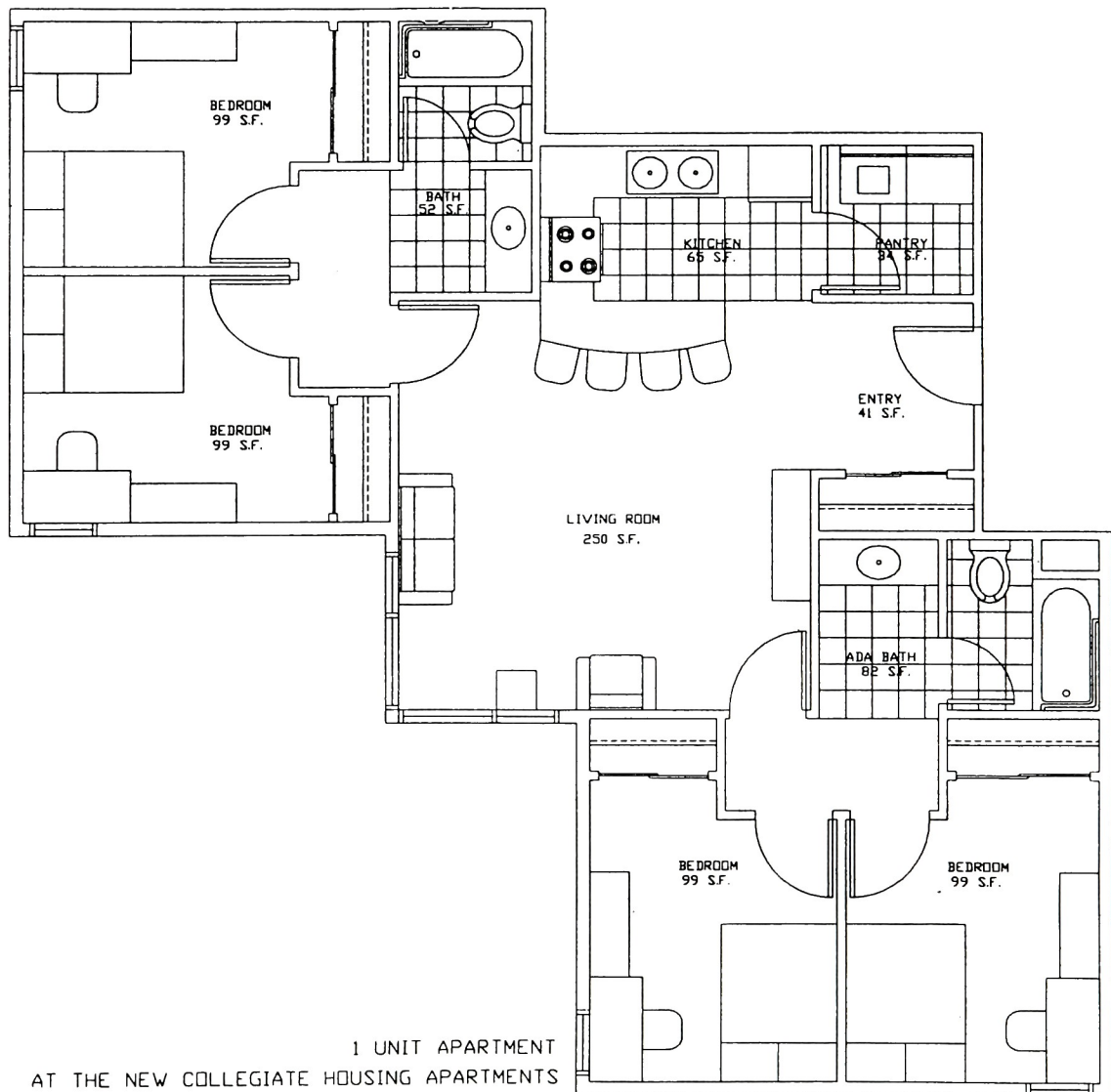


Fig. 1. Typical Floor Plan at Collegiate Apartments,  
Designed by Macon Chaintreuil Jensen & Stark Architects,  
Rochester Institute of Technology. Online. 4 Jan. 1997.



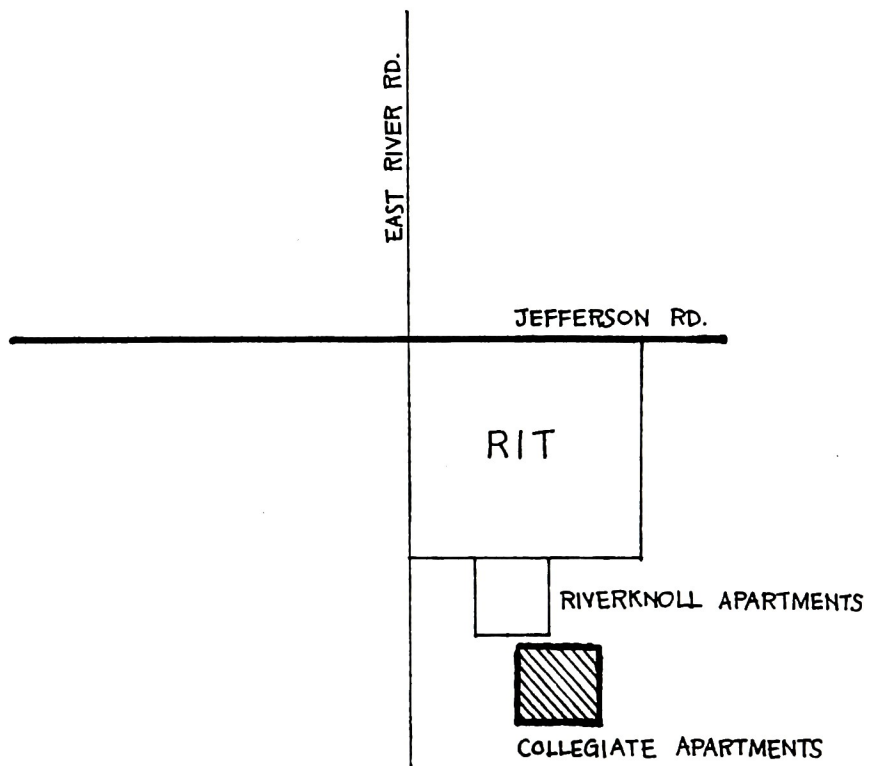


Fig. 1.1. Site Location Map of Collegiate Apartments Complex,  
Designed by Macon Chaintreuil Jensen & Stark Architects,  
Rochester Institute of Technology. Online. 4 Jan. 1997.

## SECTION 2

### RESEARCH

#### 1. LIVING AT RIT

RIT students who choose to live on campus have two primary places that they can stay while attending RIT. The residence halls are located on campus and have many conveniences, while the apartments allow the student to have more freedom and responsibilities.

- RESIDENCE HALLS

RIT residence halls are places where students from different fields, different countries, different experiences can experience each other's cultures. Our residence halls are characterized by the diversity of students living there.

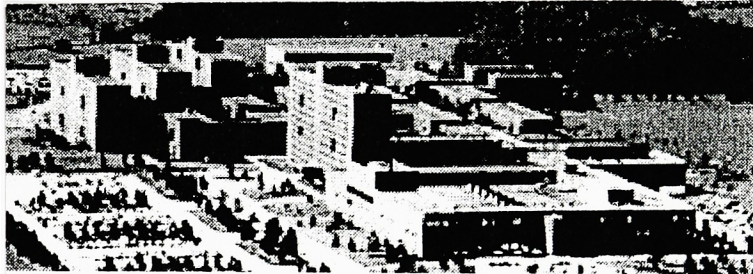


Fig. 2. Residence Halls at RIT,

Fig. 3. Student's room in Residence Halls,

Rochester Institute of Technology. Online. 4 Jan. 1998.

The existing residence halls were designed with all of the residence buildings clustered together on the east of campus. The halls are joined to the academic side of campus by a ten-minute walk. Each residence hall is connected to each other by underground tunnels, which also include laundry facilities, nightclub, video arcade and a convenience store. The first year students are assigned to live in residence halls, while other undergraduate and graduate students have an option of living in either a residence hall or apartment housing. RIT also offers several living options designed to suit each student 's lifestyle.

There are a variety of room sizes in the Residence Halls, but the majority are double rooms. Rooms in the halls come in two size and in one basic shape: rectangular. A rectangular room measures approximately 18 feet long by 10 feet wide, or approximately 12 feet long by 14 feet wide. Average space is 174 to 180 square feet.

Each double room has two single beds, a detachable bunk bed or two loft units, two desks and chairs, two dressers, two closets or wardrobes and two wastebaskets. All rooms are carpeted and have drapes or window shades. Most rooms also have two shelves on the wall. All rooms are also supplied with an overhead light, a basic cable television hook up, and telephone.

Because of fire and safety regulations, RIT does not permit cooking appliances for students living in the Residence Halls. All students living in the Residence Halls are required to sign up for one of the meal plan options. Recognizing the different needs students have, RIT food service also offers several flexible plans.

RIT also provides essential facilities for residence hall students such as computer connection, special needs for deaf / hard of hearing students, and accommodations for students with disabilities.

- **VALENTINE HALL**

Valentine Hall is located on the edge of the University of Rochester Campus approximately four miles from RIT. All suites in Valentine Hall offer two and three bedroom units equipped with full size kitchens and baths.

- **COLONY MANOR APARTMENTS**

Colony Manor Apartments is located on John Street across the road from Perkins Green. Colony Manor is within walking distance of the center of campus.

Colony Manor offers four types of apartments. The first two types are one bedroom and two bedroom apartments with kitchens, living rooms, and full baths. The other two types are two bedroom and three bedroom townhouses with kitchens, living rooms, one and a half baths, and basements.

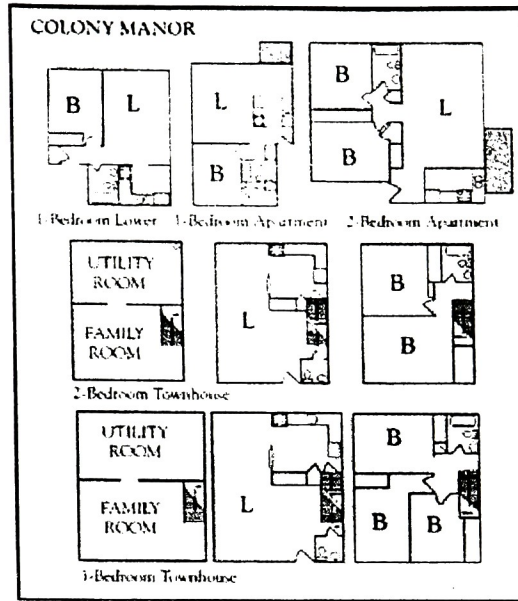


Fig. 4. Colony Manor Apartment Plans, [Rochester Institute of Technology](#). Online. 4 Jan. 1998.

#### • RACQUET CLUB COMPLEX

Racquet Club is located three miles from campus on East River Road in a country-like environment. Racquet Club is also on the RIT shuttle bus route and offers the convenience of its own computer center.

Racquet Club has both townhouses and midrises available. The townhouses include three bedroom townhouses with one and a half bathroom, kitchens, and living rooms, and three bedroom townhouse plus units with two and a half bathroom, kitchens, and living rooms. Utilities are not included at racquet Club. The midrises include one bedroom apartments with kitchens, living rooms, and one and a half bathrooms.

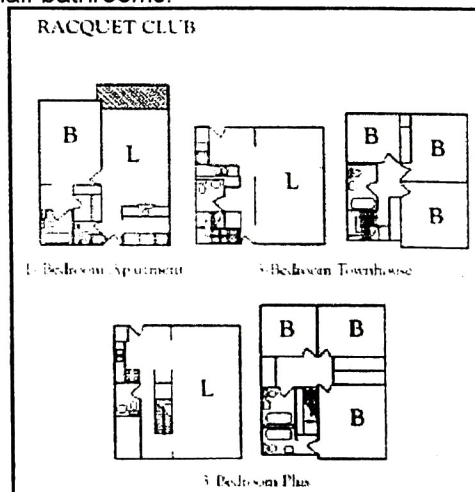


Fig. 5. Racquet Club Apartment Plans, [Rochester Institute of Technology](#). Online. 4 Jan. 1998.



- RIVERKNOLL APARTMENTS

Riverknoll Apartments is located on the West campus and offers one bedroom apartments, and two and three bedroom townhouses with kitchens, living rooms, and full bathrooms. Riverknoll Apartments offer free utilities and are the closest apartment complex to the academic buildings in the center of campus.

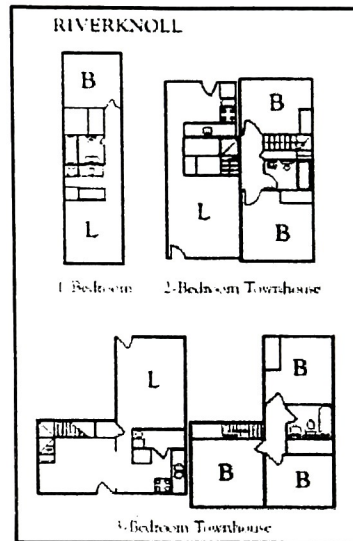


Fig. 6. Riverknoll Apartments Plans, [Rochester Institute of Technology](#). Online. 4 Jan. 1998.

- PERKINS GREEN APARTMENTS

Perkins Green Apartments is located on the East campus and offers one and two bedroom apartments including kitchens, living rooms, and bathrooms. Perkins Green also provides free utilities.

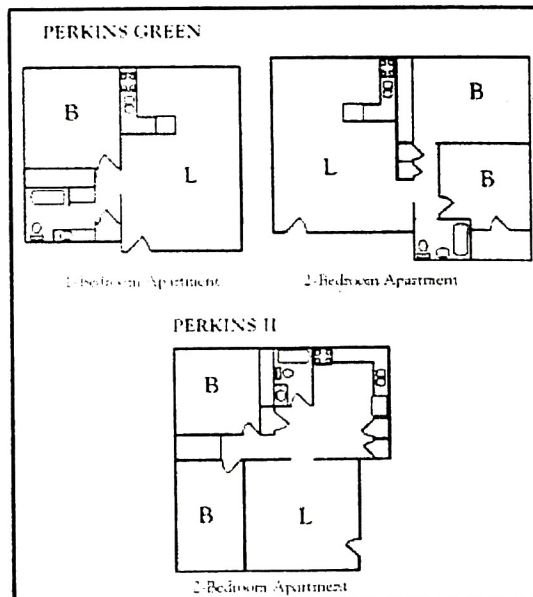


Fig. 7. Perkins Green Apartment Plans, [Rochester Institute of Technology](#). Online. 4 Jan. 1998.

## **2. DESIGNING RESIDENTIAL SPACES**

The first step in designing residential space is to consider the occupant's character and demands of specific activities. From the different functions of spaces, space divides itself into zones that group similar kinds of activities and separate incompatible uses according to the degree of privacy or social interaction each requires. The three primary zones in the residence consist of social, privacy, and transitional zones or semi-public and semi-private zones. Transitional zones, including entries, exits, and circulation routes, are used as control points and buffers between major zones.

Traditionally residential space contains private and social space; living room and dining areas serve as social or public zones, while bedroom and bathrooms serve as private zones. The character and functions of those private and public zones are totally different, even though there are relationships between private and public zones, called transitional, semi-public, or semi-private zones. These include entries, exits, and circulation routes. Nowadays some private spaces are used as both private and public areas. Bedrooms may be used for reading, dressing, studying, working, relaxing, or entertaining, in addition to sleeping. Living rooms may serve as a hobby room, a study room, a dining room, an entertaining room, or an exercise room. Most spaces are used for multiple purpose today because of the diversities of culture, the increasing of population as well as the demand of living spaces to provide for specific functions. Efficient space planning should provide multifunction and flexibility for the occupant to accommodate a variety of functions.

### ***PRIVATE SPACES***

For personal space, the most important factor to be considered is the occupant's privacy. Privacy is a basic necessity for well-being. Individuals require different degrees of privacy both physically and psychologically. Typically, spaces in the private sectors of the residence contain bedrooms, dressing rooms, and bathrooms.

For a bedroom, there are several factors to consider such as the number of people who will occupy the room, their ages, the various functions of each room, which varies with individual occupants, and the amount of space that can be utilized. Particularly when space is very limited, the amount of room available may be a major determining factor in planning a private area. Since most students use their bedrooms as multi-duty spaces for sleeping, relaxing, studying, reading, working, dressing, or exercising, the ideal bedroom should be a multipurpose, flexible, and separated space. Among many methods of maximizing usable space in the bedroom, are to use built-in and multipurpose furniture. Both built-in and multipurpose furniture can produce an illusion of making a space wider and larger, particularly if it is composed of related modular units.

## • BEDROOM

The minimum bedroom furniture for one person normally includes one bed, one closet or hanging storage area, one dressing station, one comfortable chair, and one light. Individual needs may include a desk, a bookshelf, or a task light for reading. Children may need more space for playing and storage for toys. Moreover, some bedrooms may include a dressing area as part of the room.

Nevertheless, since people spend almost one-third of their lives in bed, provision for sleep is the first consideration in planning a bedroom. The requisites for a bedroom are as follows.

- *Bed* or *Beds* should be long and wide enough for one or two people.
- *Bedside table* or built-in storage units used to hold necessary items within convenient reach.
- *Light source* next to or over the bed for reading and emergencies.
- *Control of natural light* by draperies, blinds, or shades.
- *Ventilation* from windows or other air sources. The best solution calls for cross ventilation with windows on opposite walls, next best on adjacent walls but away from corners, minimum on only one wall with an open door to draw air from another part of the house. High strip windows allow the escape of hot air to reduce summer heat in many climates. Mechanical heating and cooling vents should be located to avoid causing a draft near the bed or being partially blocked by large pieces of furniture.
- *Quietness* achieved by locating bedrooms away from or insulating them against noisier parts of the house and by using sound buffers such as closets, halls, and absorptive materials.

Table 1

Bedroom Furniture Sizes and Clearances

Sizes	Small		Large	
	Depth	Width	Depth	Width
Twin bed	6'-6"	3'-3"	7'-6"	3'-8"
Full bed	6'-6"	4'-6"	7'-6"	6'-0"
Nightstand	1'-0"	1'-3"	2'-0"	2'-0"
Wardrobe or closet	2'-0"	3'-0"	2'-6"	5'-0"+
Easy chair	2'-4"	2'-4"	2'-8"	2'-8"



Clearances		
Space for making bed	1'-6"	to 2'-0"
Space between twin beds	1'-6"	to 2'-4"
Space for cleaning under bed	4'-0" (on one side)	
Space fronting closet	2'-9"	
Space for dressing	3'-6"	to 4'-0" (in both directions)

Source: *Inside Today's Home: Sixth Edition, 1988* table 276.

## • BATHROOM

Determining the location of bathrooms is primarily a matter of convenience and privacy. Bathrooms should be accessible from all bedrooms without visibility from group spaces. Bathrooms located between two bedrooms normally can be accessed from each bedroom. Although this configuration is convenient, it permits leaks of both noise and light to adjoining spaces through and under the doors. For soundproofing, fixtures backed against closet walls are most efficient and economical.

Because of the bathroom's restricted area and need for light, heat, ventilation, and humidity control, the design of the bathroom, its layout, and finishes take careful thought. The following criteria can be of help in evaluating a room:

- *Minimum size* is 5 by 7 feet for a full bath, but these dimensions preclude use by more than one person at a time and seriously limit storage space. Other clearance is a two-foot-wide traffic path. For wheelchair access, a small bath should be approximately 6 ½ by 10 ½ feet.
- The *door* should be located so that, when opened, it will swing into the bathroom without hitting anyone using any appliance, and can be left partially open for ventilation without giving full view of the room, most particularly the water closet. It should be equipped with a device on the outside to permit emergency entry or, for use by someone in a wheelchair, it should swing outward and provide a minimum clear opening width of 32 inches to allow passage. Sliding or folding doors may also be used, although they provide a less soundproof closure.
- The *Window* is one of the important considerations. It is used to include light, ventilation, needs to be easily operated, and provides privacy. The bathroom requires heat and the best ventilation of any room in the house. Windows should not be located over the tub or toilet because of the danger of uncomfortable drafts, moisture deterioration of window frames and treatments, and difficulty of operation and cleaning.



For privacy, windows should be 48 to 60 inches above the floor. High windows, skylights, and vented fans can illuminate and/or ventilate inside bathrooms.

- *Storage space* usually needs to be at least 1 square foot of storage per user and should be located near the washbasin.
- *Finishes for walls* needs to be a water-resistant paper. Nearly every material can be made to withstand moisture and mildew.
- *Flooring materials* range from practically impervious tile through the more resilient vinyl to the warmth of carpet. Nonskid flooring is recommended.
- *Lighting*, both natural and artificial, is critical to provide good illumination for shaving and cosmetic application. In type and placement, lighting must avoid glare and harsh shadows.

Table 2

Standard Bathroom Fixture Sizes and Clearances

Sizes	Small		to	Large	
	Depth	Width		Depth	Width
Bathtub	37"	x 42"		42"	x 66"
Lavatory	15"	x 18"		24"	x 30"
Water closet	26 ½"	x 19"		30"	x 22"
Shower	30"	x 30"		42"	x 60"
Vanity cabinet	18"	x 24"		22"	x 60"
<b>Clearances</b>					
Space between front of tub and opposite wall			30"	to	42"
Space in front of water closet			18"	to	36"
Space at sides of water closet			12"	to	18" (on one side)
Space between fronts of fixtures			24"	to	36"
*Luxury fixtures are available in large sizes.					

*Source: Inside Today's Home: Sixth Edition, 1988 table 279.*

### **PUBLIC SPACES**

The social zone or activity zone is the area where occupants gather and entertain. It should provide a congenial atmosphere for such activities as general conversation, games, parties, meals, listening to or making music, watching television, pursuing home crafts or hobbies, and even working. Because of this, the social zone is the most intensely used area in

the residence, as well as the most attractive zone to visiting people. It should be pleasant in order to encourage interaction between people or with the environment itself.

When designing public space, a logical first step is to consider specific group activities, as well as the environment and equipment desirable for each, and then to design the living space so that it will best meet the occupant's requirements. As there are different requirements for different activities happening in the living area, the best solution is to design it to be as flexible as possible so it can serve different functions.

Basically, there are two options for the living space; one large open area or sectioned areas grouped together. The large open area is suitable for a variety of purposes and used intensively by all of the occupants, while a series of smaller spaces grouped together is best for a particular range of activities. For today's lifestyle, a living room as an alternative space seems the only way to meet the needs of differing ages, activity groups, and occupants' lifestyles. Living rooms often adjoin the kitchen and dining area for ease in serving informal meals, snacks, or drinks.

When planning a room, begin with minimum or average room size. The size of living spaces may be strongly effected by the occupants' values in the areas of aesthetics, leisure, and social prestige. Generally, the more occupants in the residence, the more space devoted to personal or leisure activities. However, the arrangement of space is considered more important than the amount of space. Especially in limited space, the best way to achieve the more usable space is to reduce the number of furniture. The use of multipurpose furniture is recommended in order to minimize unnecessary furniture.

Table 3

Furniture Sizes and Clearance Spaces

Living room	Small		to	Large	
	Depth	Width		Depth	Width
Sofa	2'-6"	x 6'-0"		3'-0"	x 9'-0"
Love seat	2'-6"	x 4'-0"		3'-0"	x 5'-6"
Easy chair	2'-6"	x 2'-4"		3'-4"	x 3'-3"
Pull-up chair	1'-6"	x 1'-6"		2'-0"	x 2'-0"
Coffee table, oblong	1'-6"	x 3'-0"		3'-0"	x 5'-0"
Coffee table, round	2'-0" diameter			4'-0" diameter	
Coffee table, square	2'-0"	x 2'-0"		4'-0"	x 4'-0"
Occasional table	1'-6"	x 10"		3'-0"	x 1'-8"
Bookcase	9"	x 2'-6"		1'-0"	x unlimited
Flattop desk	1'-6"	x 2'-8"		3'-0"	x 6'-0"

<b>Clearances</b>				
Traffic path, major	3'-0"	to	6'-0"	
Traffic path, minor	1'-4"	to	3'-0"	
Foot room between seating units and edge of top of coffee table	1'-3"	to	1'-6"	
Floor space in front of chair or sofa For feet and legs	1'-6"	to	2'-6"	
Chair or bench space in front of desk	3'-0"			
<b>Dining room</b>	<b>Small</b>		<b>Large</b>	
	Depth	Width	Depth	Width
Table, square, 4-8 people	3'-0" x 3'-0"		to 5'-0" x 5'-0"	
Table, rectangle, 6-12 people	3'-4" x 5'-0"		to 4'-0" x 10'-0"	
Table, round, 4-10 people	3'-0" diameter		to 7'-6" diameter	
Straight chairs	1'-4" x 1'-4"		to 1'-8" x 1'-8"	
Arm chairs	1'-10" x 1'-10"		to 2'-0" x 2'-0"	
Buffet	1'-6" x 3'-6"		to 2'-0" x 6'-0"	
Serving table	1'-6" x 3'-0"		to 2'-0" x 4'-0"	
China cabinet	1'-6" x 3'-0"		to 1'-8" x 4'-0"	
<b>Clearances</b>				
Space for occupied chairs	1'-6"	to	1'-10"	
Space to get into chairs	1'-10"	to	2'-10"	
Traffic path around table and Occupied chairs for serving	1'-6"	to	2'-0"	

Source: *Inside Today's Home: Sixth Edition, 1988* table 314.

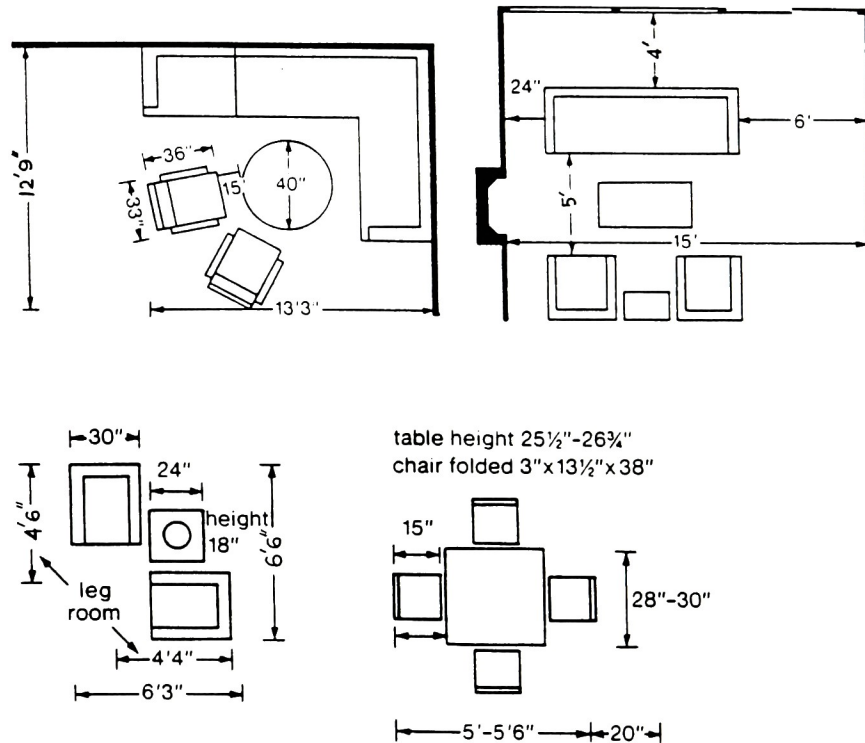
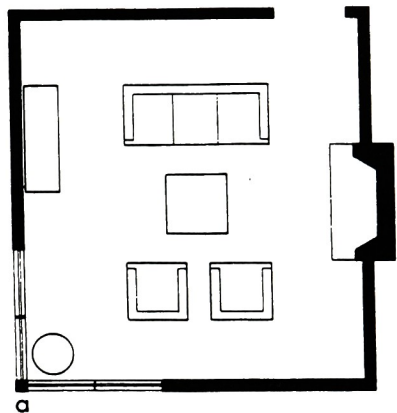
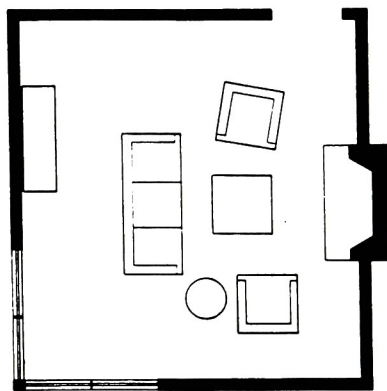


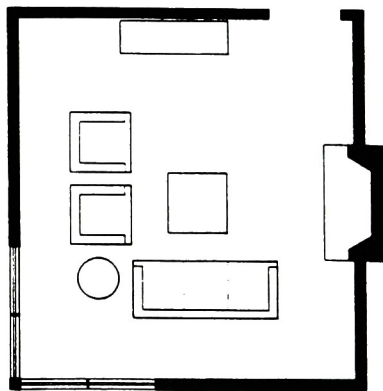
Fig. 8. Examples of the clearance dimensions for living areas, Human Dimension and Interior Space: A Source Book of Design Reference Standards. (New York, 1979) 344.



a



b



c

- a. From this arrangement, the sofa blocks the main view into the room. Although privacy is afforded for conversation, moving around would be difficult.
- b. The sofa in this arrangement is better placed, allowing room for circulation.
- c. A living room should welcome people into the conversation area; this is the best arrangement.

Fig. 9. Furniture placement creates traffic patterns within a room,  
Architectural Detailing in Residential Interiors. (New York, 1990) 24.





### ***CIRCULATION, STORAGE, AND EFFICIENCY***

Circulation areas including entry halls, corridors, and stairways require a minimum width of three feet. Average hallways in the residence area are usually three and a half feet wide (which accommodates a wheelchair more comfortably), with the central hall often four feet or even wider. Generally, the longer the hallway, the wider it should be. Short hallways obviously consume less space. Stairways are part of the circulation system and must be a minimum of three feet wide, but three and a half to four feet is more desirable for heavy traffic and for moving furniture.

In any plan, paths of circulation should use space economically. They should be short, direct, and as free of turns as possible, starting from the principal entrance, and connecting zones without directing traffic through another room, especially bedrooms.

Closets and other storage facilities should be located where needed throughout the residence, and should be abundant. The floor space occupied by all storage areas in one residence, including kitchen cabinets, should amount to at least 10 percent of the total square footage. Well-designed storage makes maximum use of minimum space. Flexible storage such as movable clothes rods or shelves also allows more efficient use of space.

### **3. FURNITURE**

Furniture provides a major transition between architecture and people. Sometimes it also performs as an architectural element by organizing the space within a room, defining conversation areas and traffic paths, or suggesting separation of areas. Furniture always has its own function providing comfort and convenience.

#### **• BUILT-IN FURNITURE**

The first built-in furniture may have been identified as a protected spot consisting of a natural rock ledge used for sitting and sleeping. However, built-in furniture has been known and used world wide by the designers in the early nineteenth century such as Frank Lloyd Wright, Ludwig Mies Van Der Rohe, Le Corbusier, etc. Built-in furniture as a unit or units of furniture integrated with the architectural shell provided comfort and convenience for users. It also promotes flexible usable living space, because it takes less floor space than individual freestanding furniture. Built-in furniture offers a maximum amount of free space around and between itself, gives a feeling of permanence and security, and breaks up the box-like form of typical rooms. At the same time, it also reduces the visual clutter of many isolated separate pieces of furniture.

## • MODULAR FURNITURE

In the Mid to Late nineteenth century, technology existed for mass production of objects. Mechanization yielded more economical and effective manufacturing methods. During the first part of the twentieth century, innovative design experimentation had its roots in the concepts of mass production and adaptive reuse of existing materials. Following World War II, new production techniques and industrial materials, such as aluminum alloys, formed plywood, and plastics, were adapted to domestic uses and became the standards.

Originally, modular furniture or unit furniture, or component furniture has been used for office and industry furniture. Later, it was designed for both storage units and contemporary residential furniture, such as sofa units, shelf units, etc. Modular furniture offers the great advantages of mobility, flexibility, and multiple functions. Component pieces may be assembled into varying units, changed at will, used wherever needed, and replaced when broken. They can be combined to form a single cohesive unit, used individually, or grouped into different configurations of two or three as needs and preferences change.

## • SELECTING FURNITURE

Before selecting furniture, consideration should be given to how much space is available, what scale of furniture will relate well to the room, and possible arrangements. The next step is to determine physical requirements of furniture related directly to the human body-- how and in what situations the furniture will be used, and who will use it. The other important factors for function and economy are the following:

- Convenience is an important factor especially for frequently moved furniture such as dining chairs or Murphy beds that must be pulled out from the wall for making up. The movable furniture usually provides maximum convenience and flexibility for users, and also permits the user to personalize his or her space.
- Comfort relates to pieces of furniture on which we sit or sleep, as well as to the height of tables and desks. It also relates to human ergonomics and the requirements of individual users.
- Flexibility pertains to furniture that can be used in more than one room or for more than one purpose. Multipurpose and flexible furnishings permit greater freedom in adapting to new uses as needs or locations change. Built-in furniture, unless composed of modular units, cannot easily be moved or rearranged.
- Space required is related to the concept of modular and built-in furnishings. By eliminating separate pieces of furniture that must stand alone, modular or unit furniture



requires less floor space. Floor area is also freed when furniture, such as hanging shelves, is built-in or attached to walls.

- Durability is determined by material, construction, finish, especially durability of finish, and ease of refinishing.
- Maintenance includes cleaning, repairing, refinishing, and reupholstering. The choice of appropriate materials can extend a length of use and provide ease of maintenance, as well.
- Aesthetics usually depends on individual purposes and requirements of users. Furnishings can make the room more welcoming, warm, and impressive.

Source: *Inside Today's Home: Sixth Edition, 1988* 476.

#### **4. DORMITORY FURNITURE AND MATERIALS**

Furniture designed for use in dormitory or residence halls has a different purpose and requirement from other furniture. Convenience and flexibility provide students with challenges in furniture arrangements. Many residents must use dormitory furniture for a period of several years. It should offer durability and ease of maintenance in order to extend length of service. The other criteria to consider are aesthetics and price, depending on individual needs and lifestyles.

Basically, minimum dormitory furniture includes a bed, a desk, a side chair, a shelf, and a closet. The standard dormitory furniture is usually constructed from wood for its strength, aesthetic value, durability, and ease of maintenance. Some dormitory furniture consists of welded steel frames and replaceable wood panels. A steel frame provides complete structure, strength, and the ability to easily replace parts, while the contrasting wood panels make a clean and attractive appearance.

Modular furniture or multipurpose furniture is the best solution for dormitory or residence hall furniture, especially a small dormitory or apartment, because modular furniture can be customized and allow for maximum flexibility. Students can have their own furniture arrangements to suit their needs and lifestyles.

For ecological purposes, many furniture manufacturers have produced a new line of furniture made from recycled materials—the extruded material made from recycled milk bottles called HDPE plastic. It is twice as strong as solid oak and comes in many different colors. The system provides flexibility for users to customize their own arrangements, and provides durability, as well. The other new material, used as a laminate for furniture working surfaces, is called Environ Solid Core Tops, which are made from recycled newsprint and soy resin. This recycled laminate has twice the strength of solid wood, and also provides ease of maintenance.



Fig. 12. Example of furniture made from recycled milk bottles, ECOLOGIC, INC.,  
Ecologic. Online. 6 Jan. 1998.

## **SECTION 3**

### **ANALYSIS**

Before designing space, the important criteria to consider are: who are the occupants; what activity occupants conduct related to that space and furniture; what are the special needs or requirements for individual occupants; what are the solutions for furniture arrangements; or which furniture arrangements suit which occupants.

According to my observation, most RIT students are faced with the problems of limited space and insufficient storage space in existing dormitories and student apartments. Students need more space, privacy, convenience, and flexibility. Using the proposed Collegiate Apartments designed by Macon Chaintreuil Jensen & Stark Architects as a framework, my objective is to explore adaptations in space planning, and circulation, as well as furniture design and placement. My intention is to provide for multiple uses of space to accommodate more student needs and lifestyles and increase occupants' privacy, convenience and pleasure, as well as provide durability, ease of maintenance and economy.

**SECTION 4**

**PRELIMINARY SCHEMATIC DESIGN AND CONCEPT DEVELOPMENT**

**1. FLOW DIAGRAM**

My flow diagram indicates the relationships between various spaces and activities organized according to zoning principles and circulation needs. It shows the relative size and importance of each area. It is based upon my analysis of the floor plan of the proposed Collegiate Apartments.

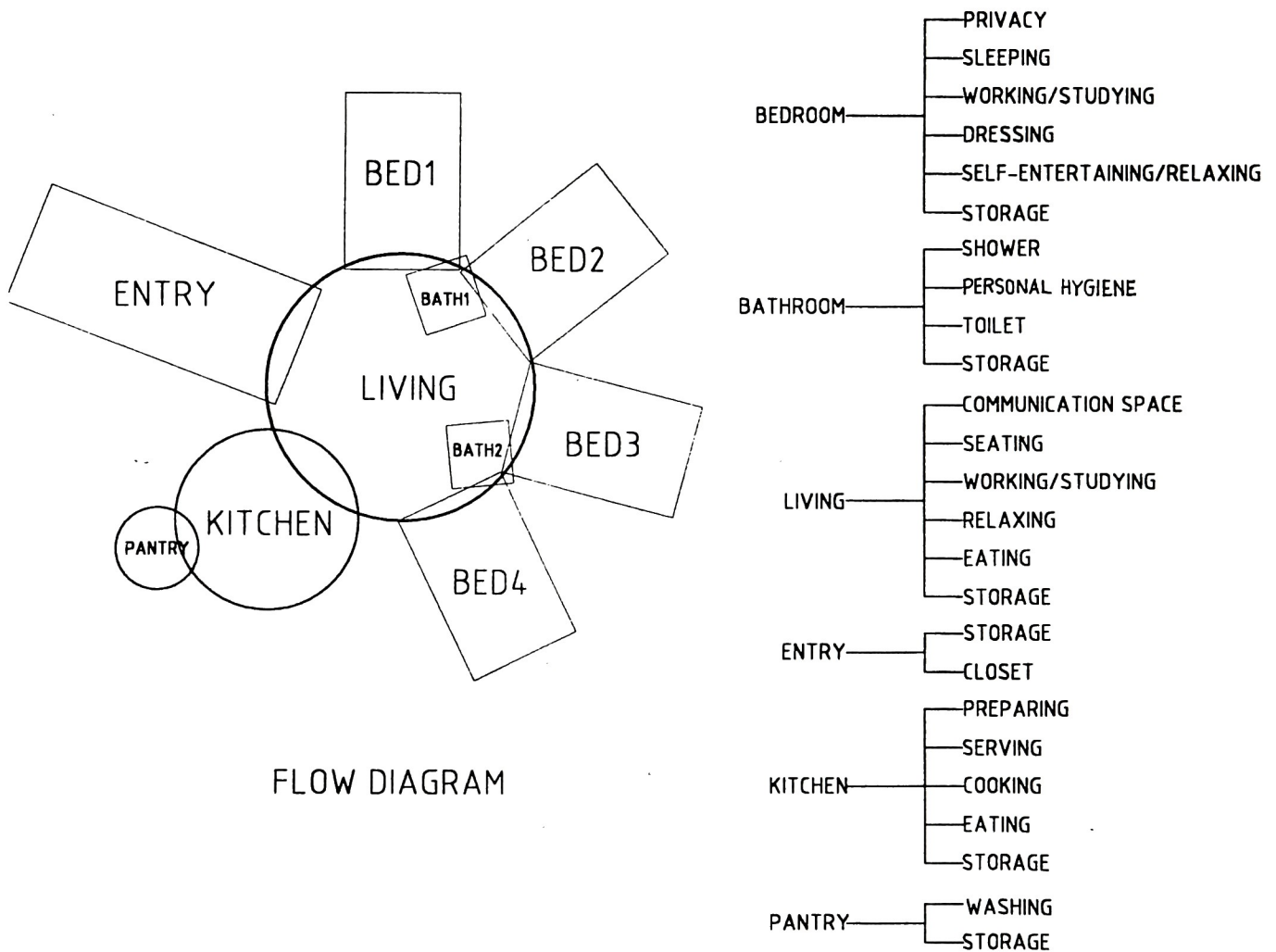


Fig. 13. Flow diagram indicates the zoning principle and circulation spaces.



## 2. SCHEMATICS

My alternate space layouts adapt floor plans (equal square footage) to explore possible variations for maximizing use.

- *Type one* is designed to provide a separation of working space and private sleeping area. This type offers the total space use of ninety-nine square feet per bedroom. It provides approximately thirty-eight square feet for sleeping and sixty-one square feet for working. The extremely private sleeping area and the continuous storage and working space are the great advantages of this type. The continuous L-shape storage and working area makes the room feel wider and well organized. The disadvantage of this type is the loss of usable space in the circulation area in front of the two bedrooms.

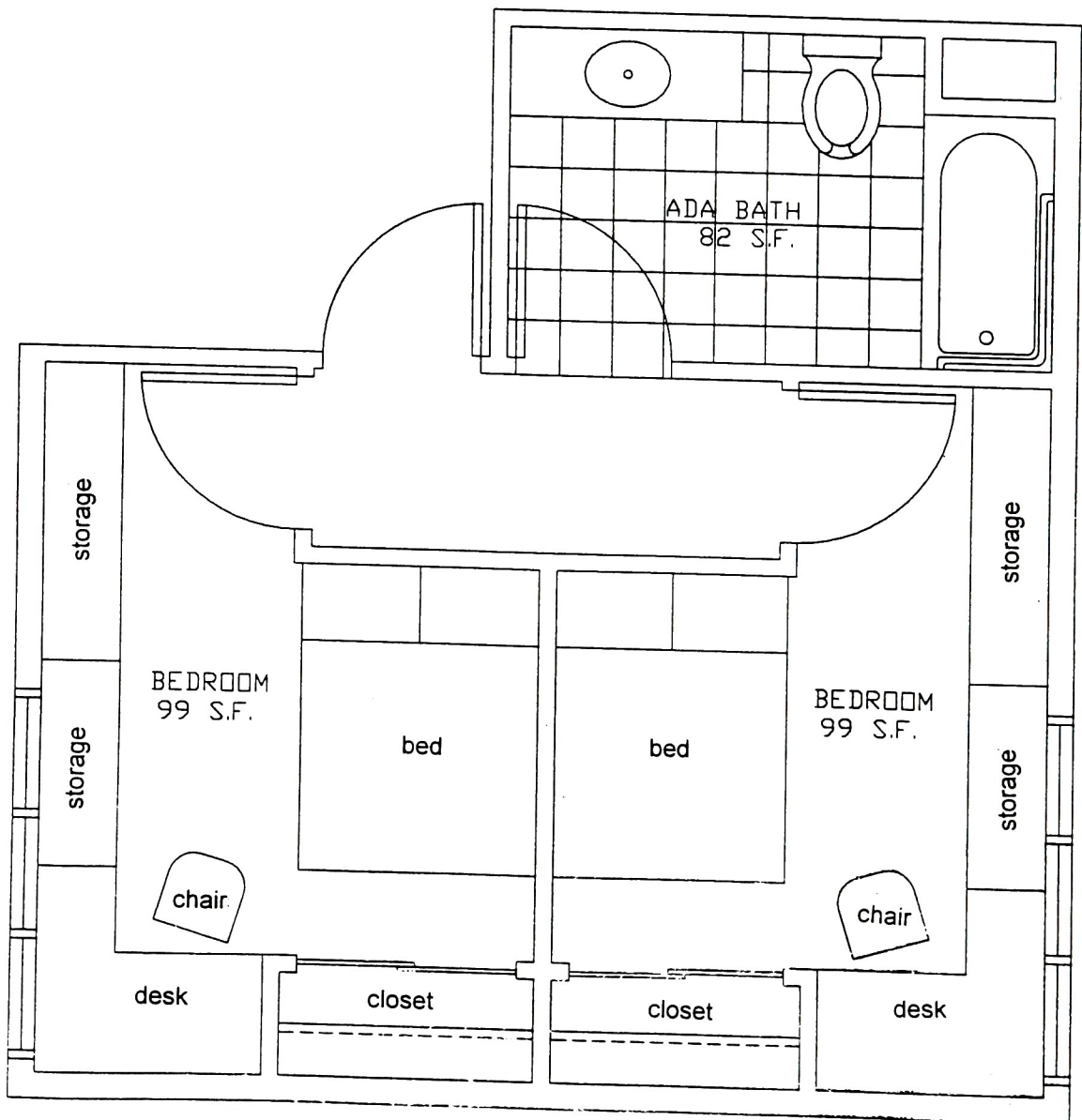


Fig. 14. Bedroom Type One.

- *Type two* is designed to provide a combination of working space and private sleeping area. This type offers the total space use of 105 square feet per bedroom. The great advantage is that it provides more usable space than type one. It has approximately thirty-two square feet for sleeping and seventy-three square feet for working. The angled walls of the circulation space give a unique functional use of space to this design. The furniture arrangements in both type one and type two are preliminary only. Each student can arrange his or her room by utilizing movable and multifunctional furniture to suit his or her needs.

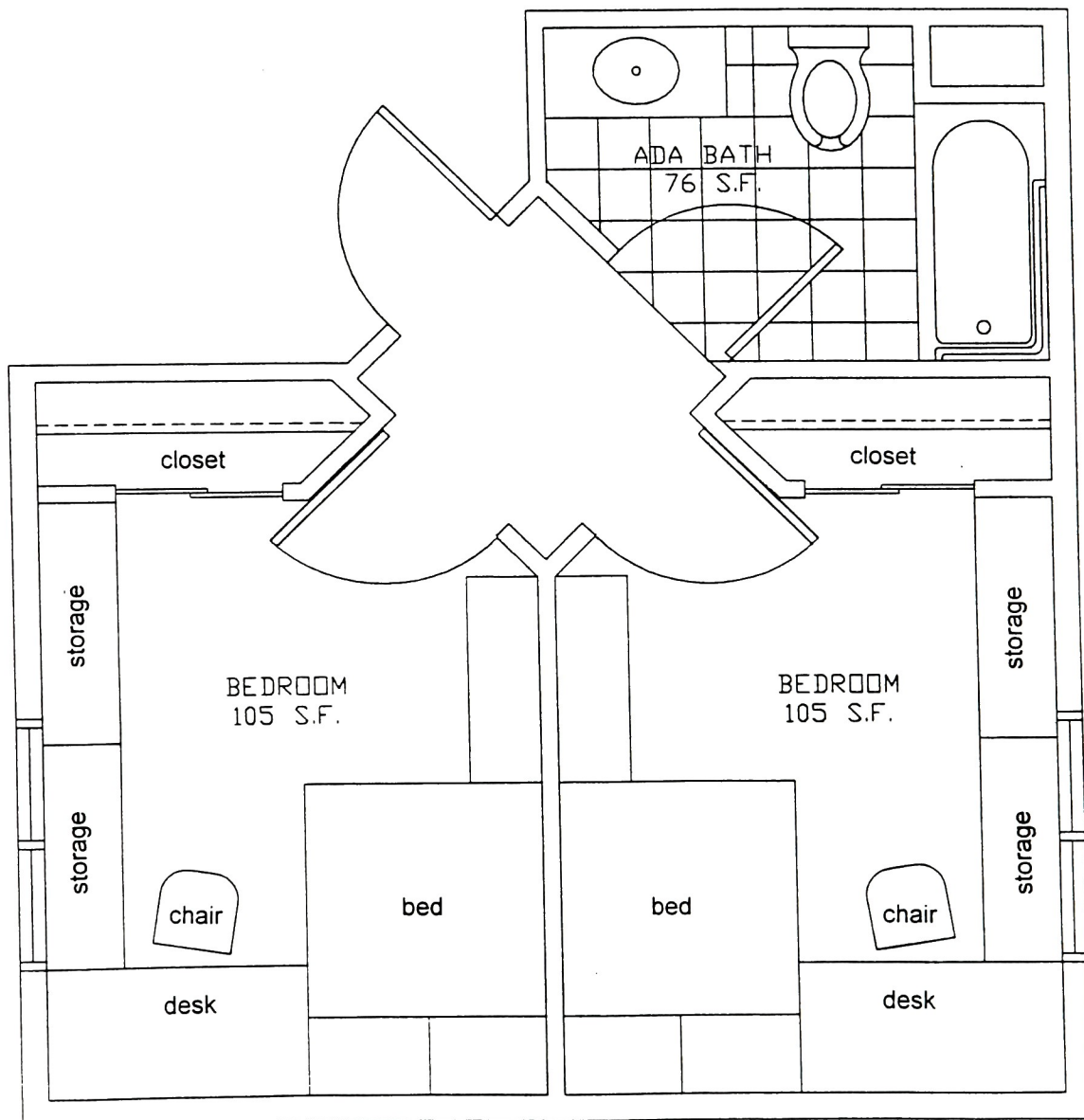


Fig. 15. Bedroom Type Two.

The next step is to combine the multipurpose furniture and the designed space. There are three solutions, each having advantages. The first design shows built-in multipurpose furniture. The advantages are increased floor space and wall space. The second and third designs continue the use of modular and multipurpose furniture and use the wall space, as well.

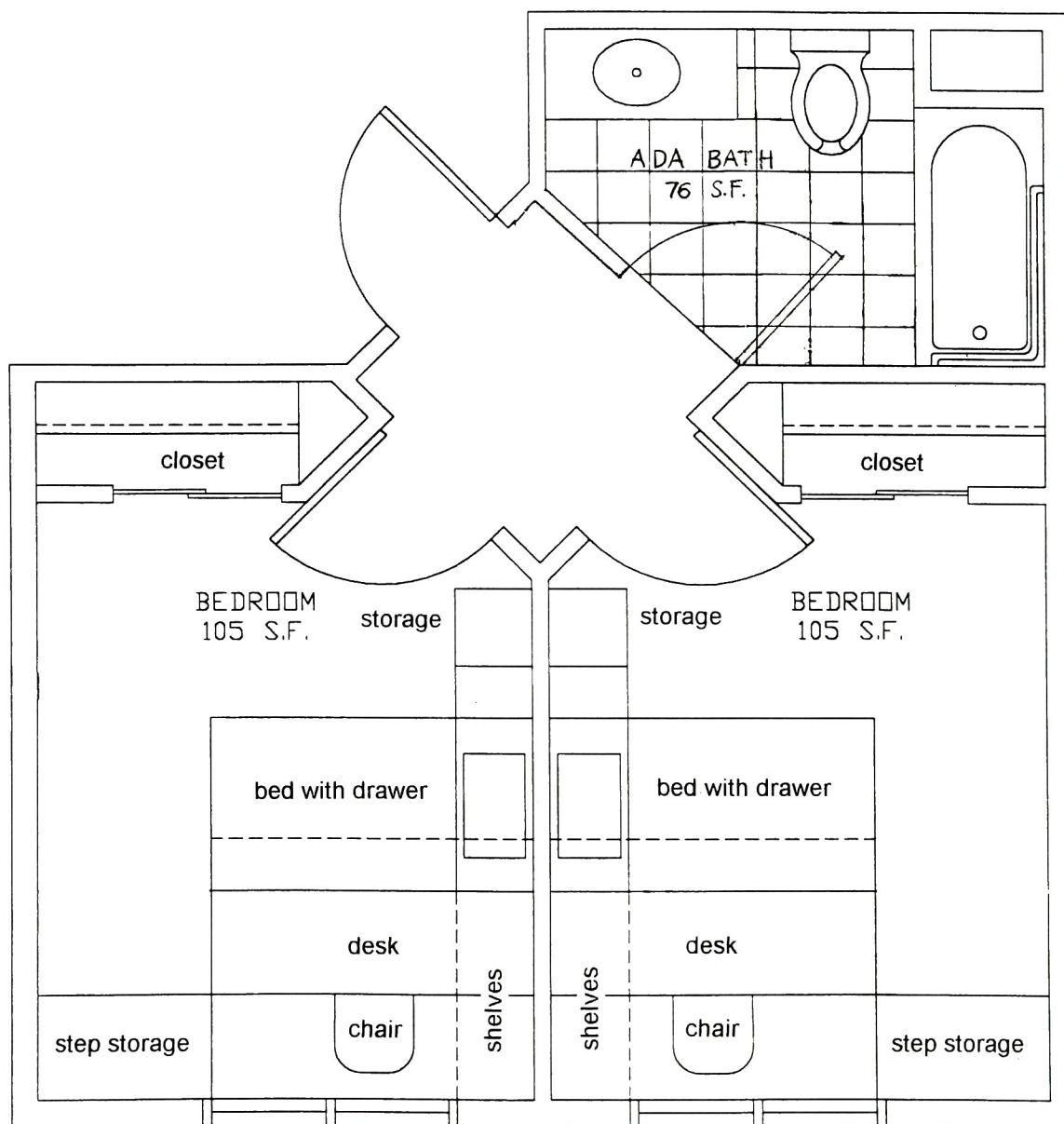


Fig. 16. Furniture arrangement Type One.

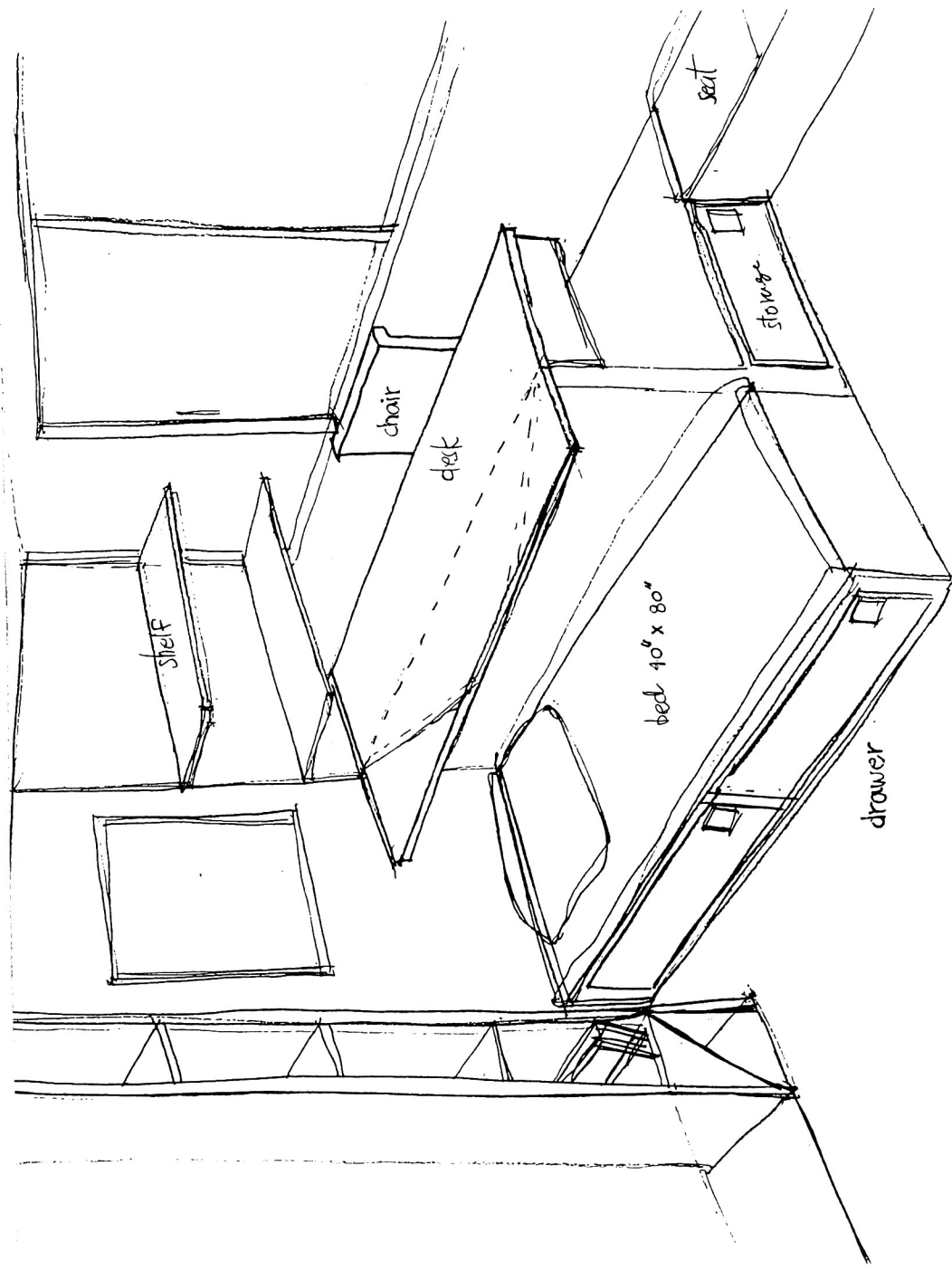


Fig. 17. Type One Perspective.



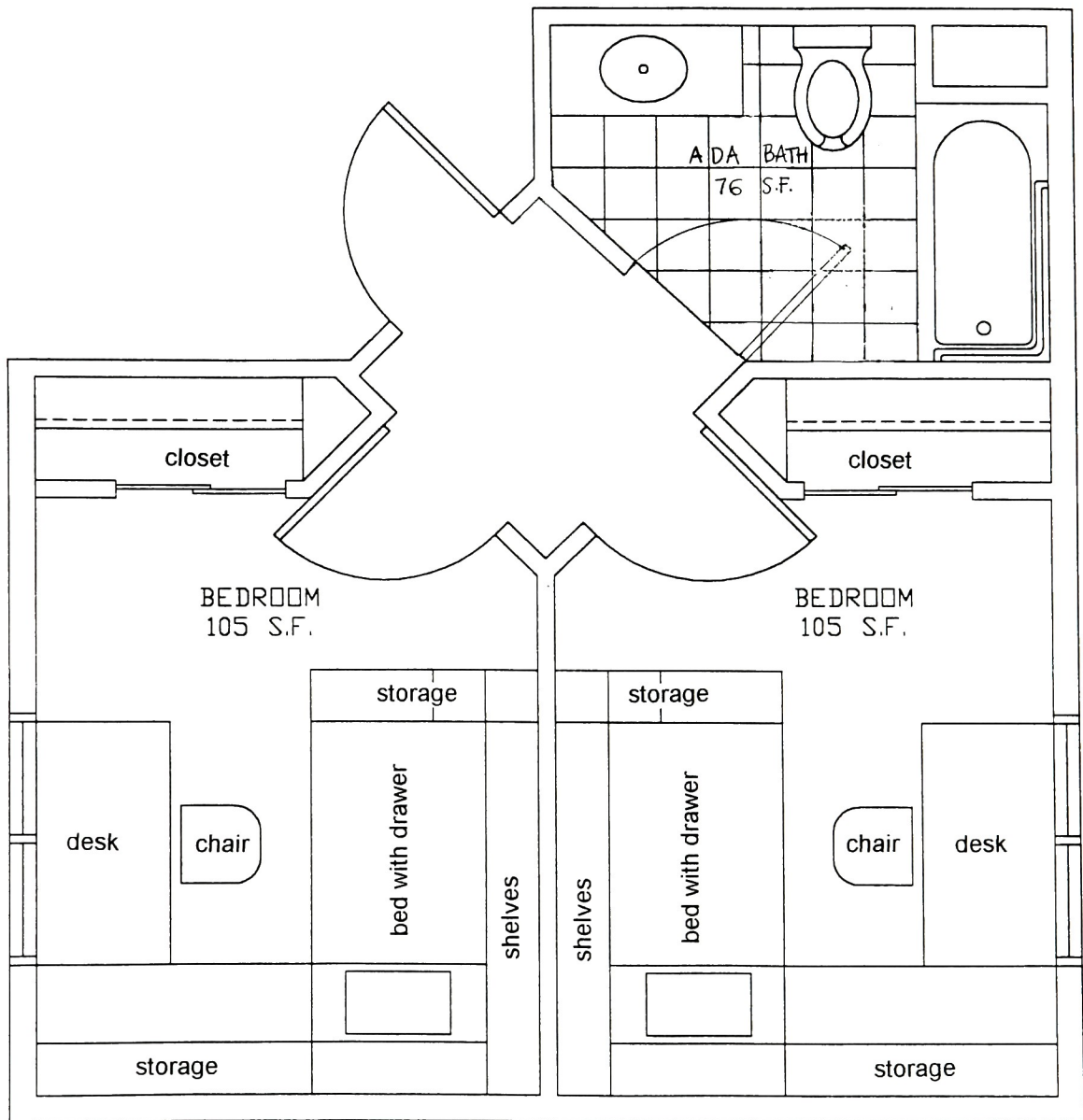


Fig. 18. Furniture arrangement Type Two.

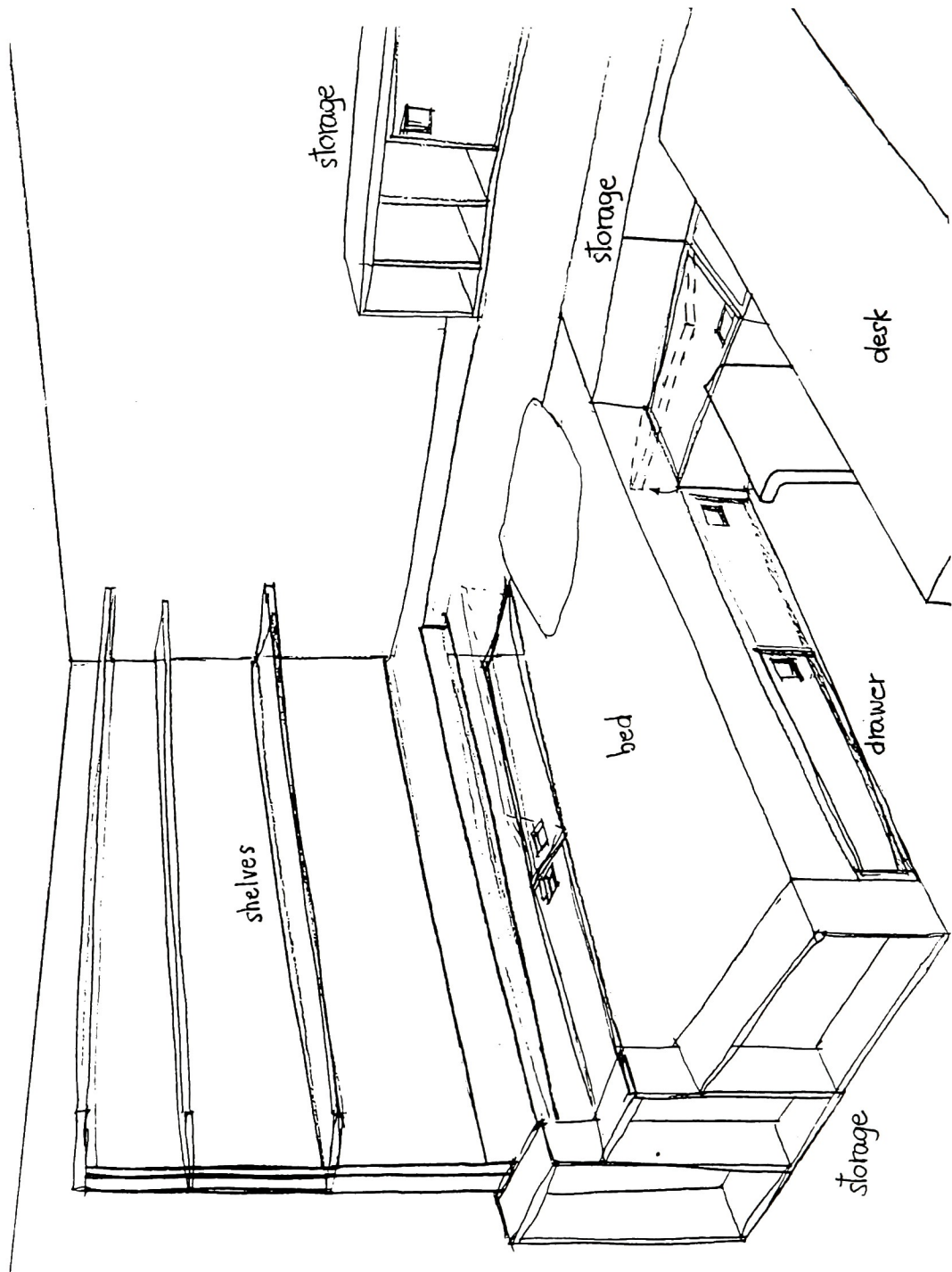


Fig. 19. Type Two Perspective.

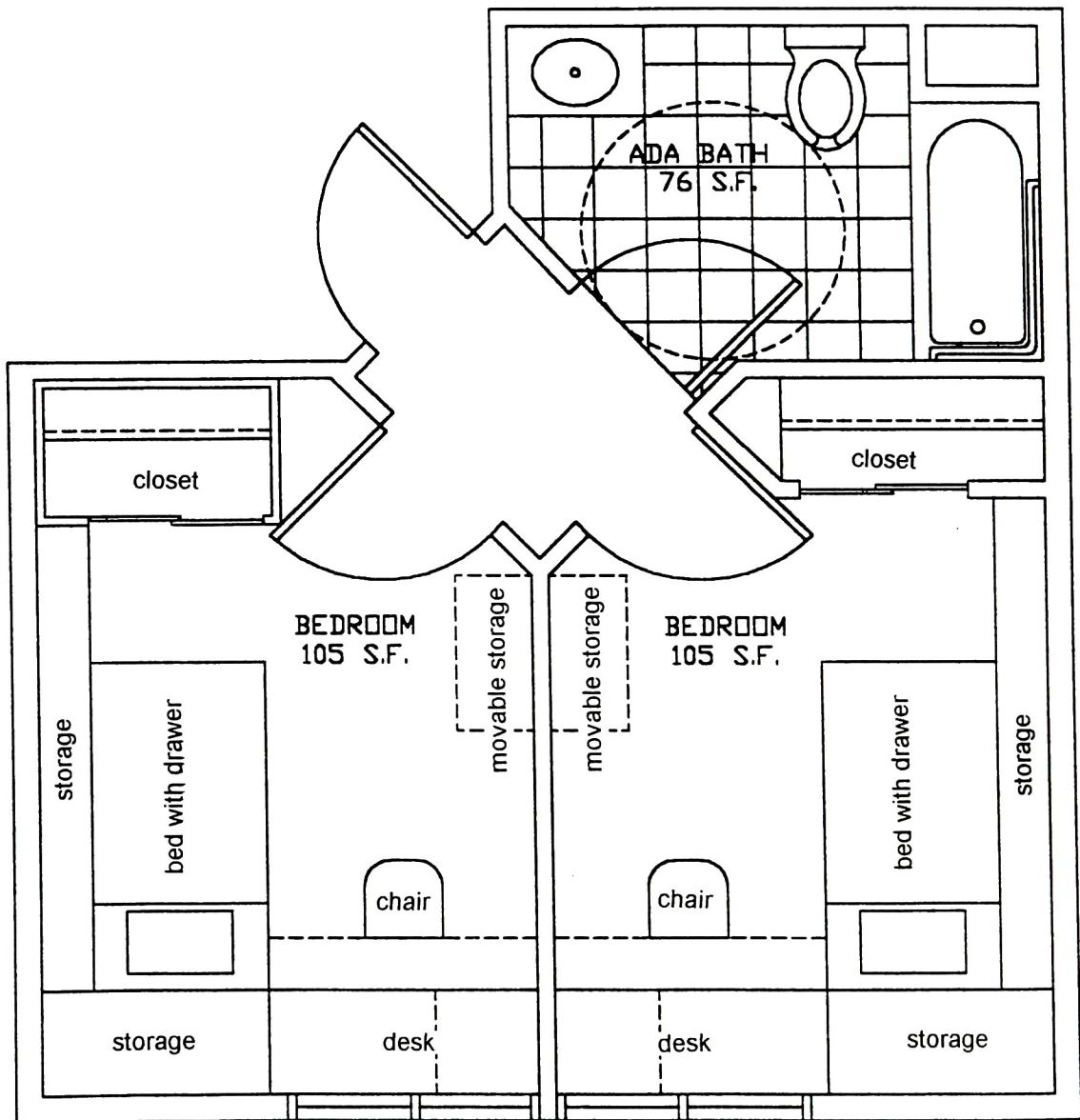


Fig. 20. Furniture arrangement Type Three.

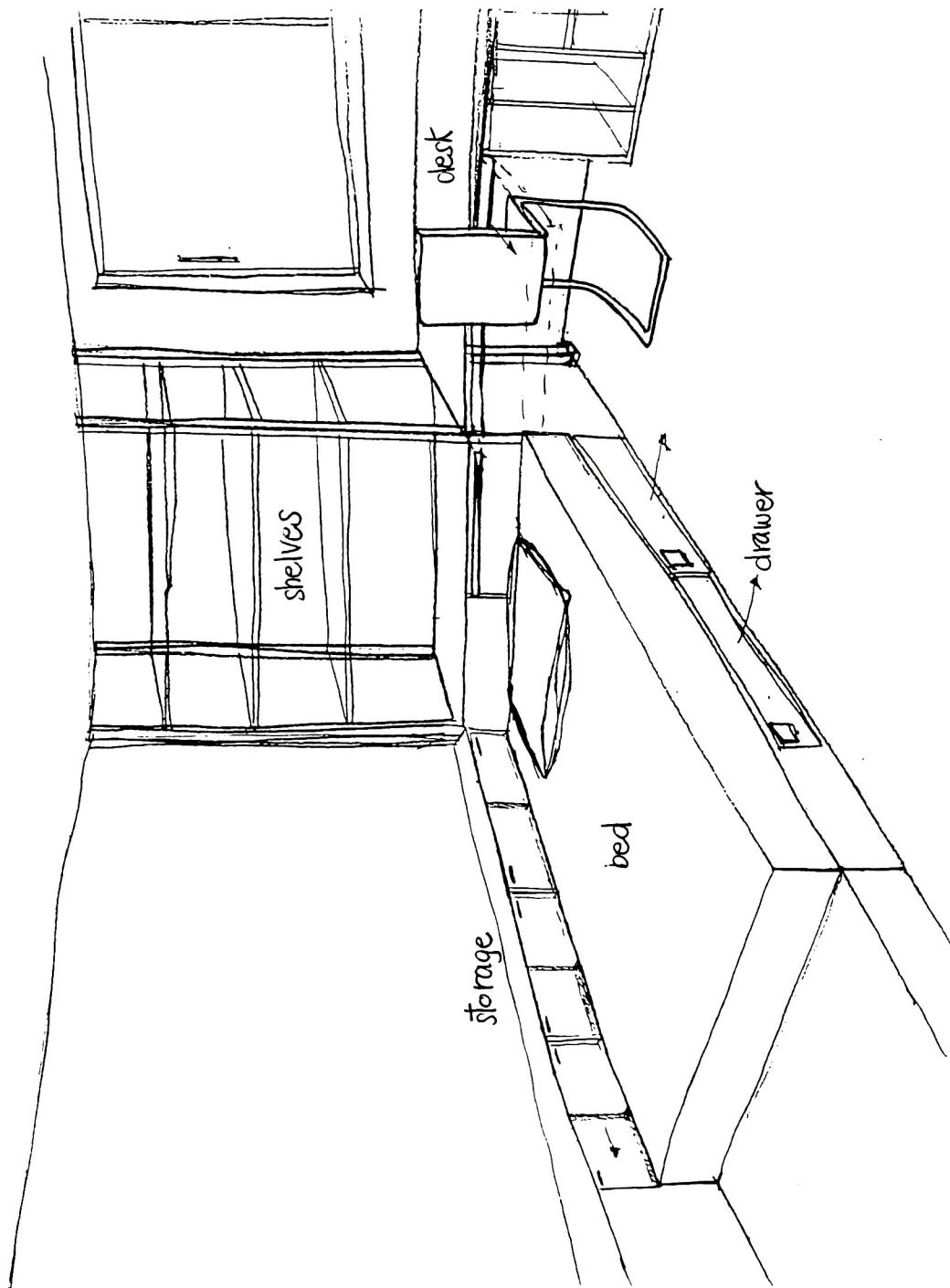


Fig. 21. Type Three Perspective.

### 3. FURNITURE SKETCH AND DEVELOPMENT

The idea of multipurpose furniture is to save usable space as well as provide convenience and flexibility for the occupants. The drawers, or bases, provide storage space combined with a task light, cup holder, and small shelf. The shelving units are also multipurpose. They can reverse (up side down) to perform as paper racks or stools. The off season cabinet is ideally intended for storing off season clothes, blankets, old books, or personal belongings which are not often used. A freestanding closet includes a mirror and a dressing unit. The dressing unit is designed to offer comfort and convenience for users. The study desk serves the multiple functions of a computer desk and storage, including drawer, shelf, and electrical outlet. A side chair has multifunctional purpose. It is a magazine rack on wheels in addition to being a chair. A multipurpose sofa unit includes coffee table, flipped out shelf, under-seat drawers, and storage. It may also be used as an overnight guest bed.

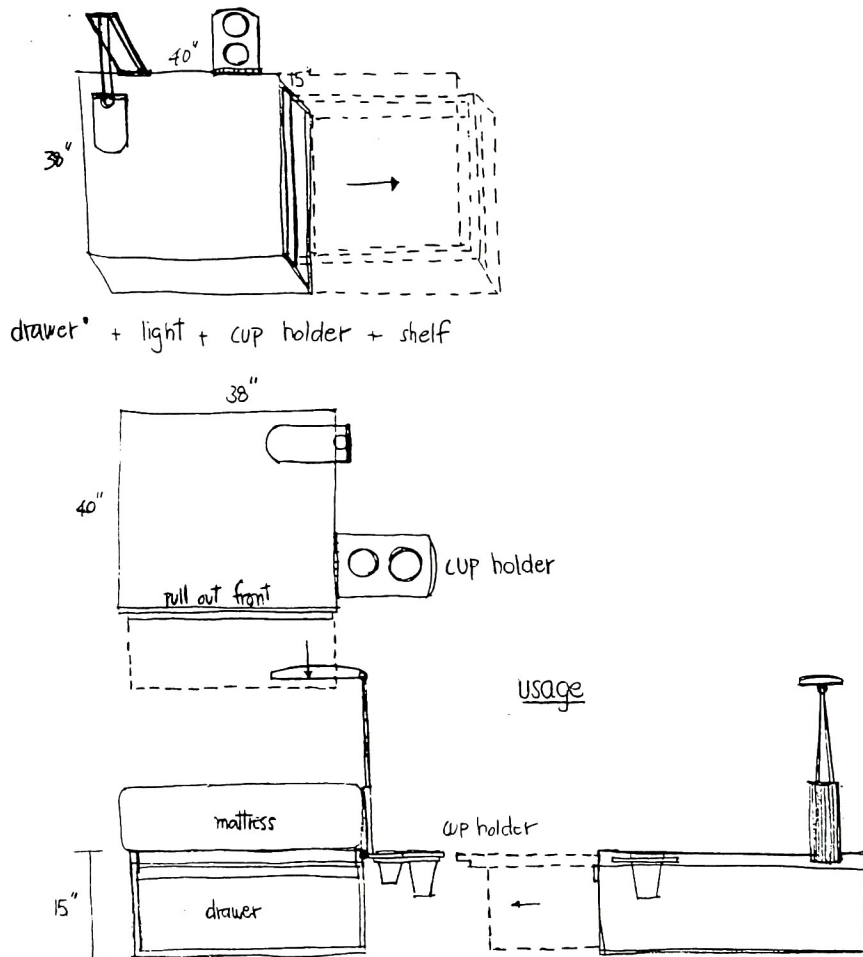


Fig. 22. Furniture sketches and developments: drawers.



use recycled wood as base material. for stackable shelves.

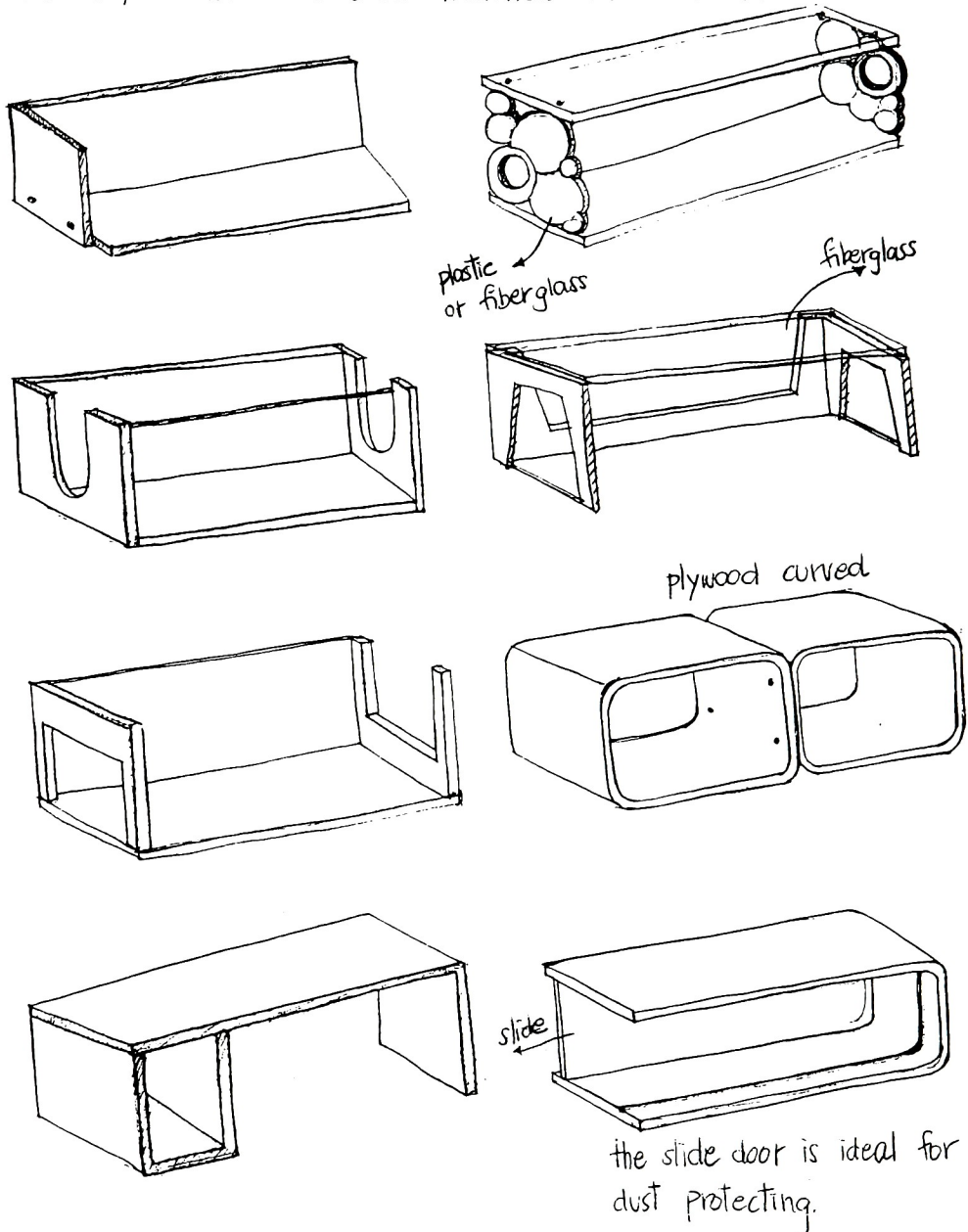


Fig. 23. Furniture sketches and developments: shelving units.

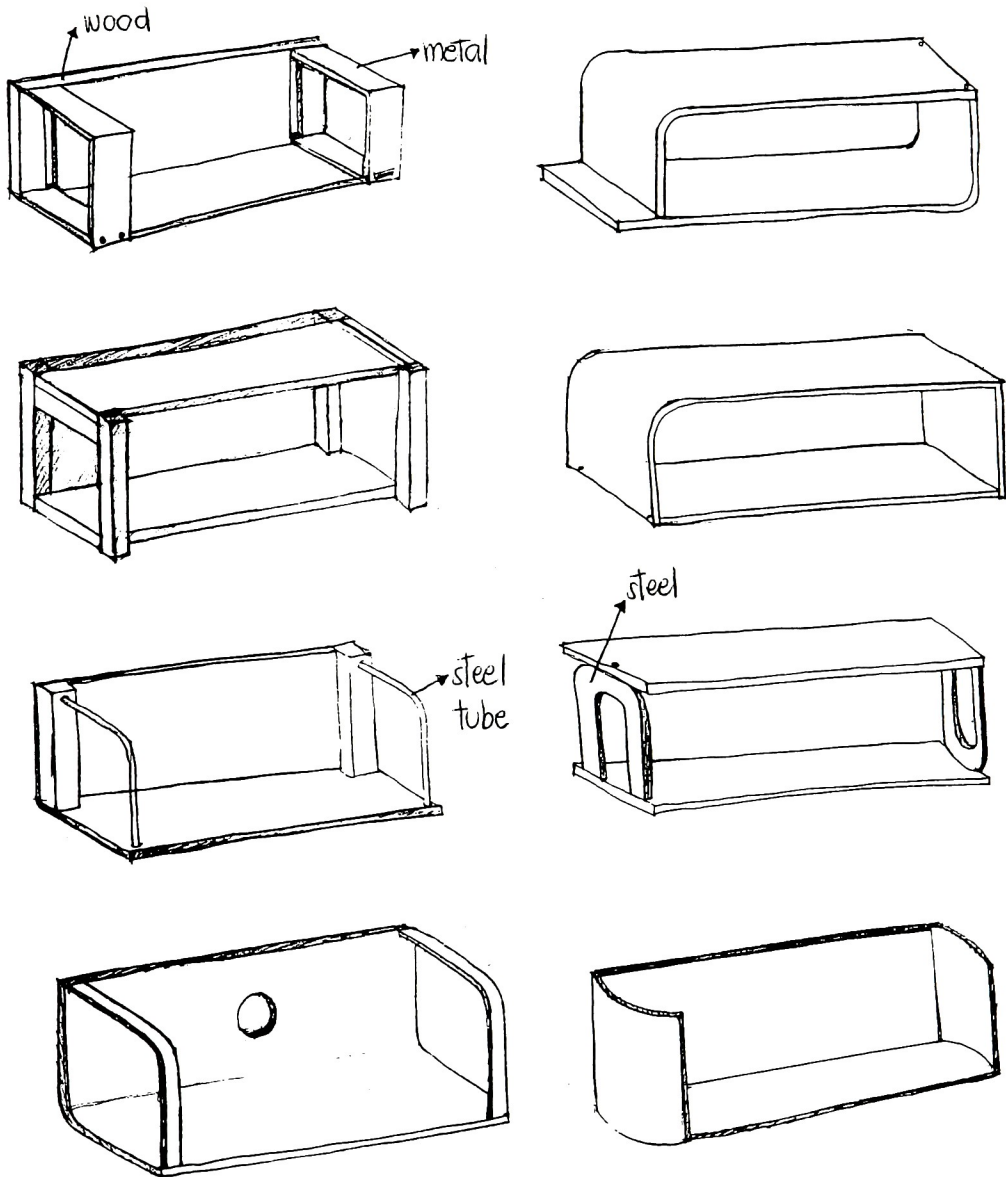
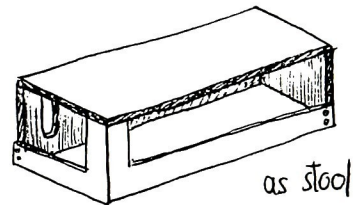
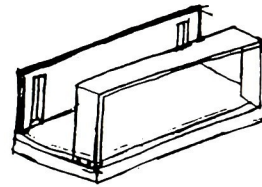
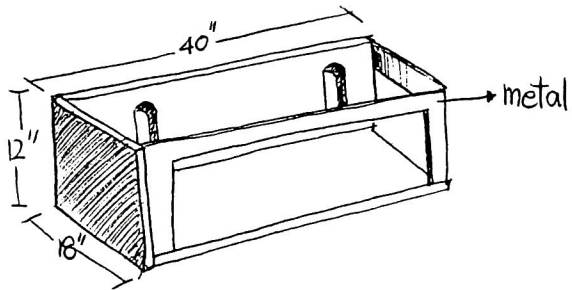
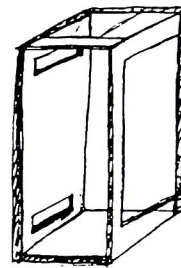
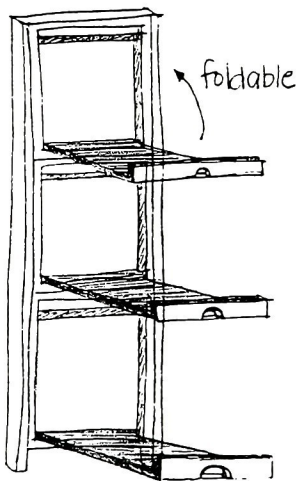


Fig. 24. Furniture sketches and developments: shelving units.

"shelf" = stool + magazine rack  
 can be attached to the wall.  
 can be stack on the top.



"shelf panel" can be attached to the  
 wall and  
 to fold  
 out as a  
 shelf.

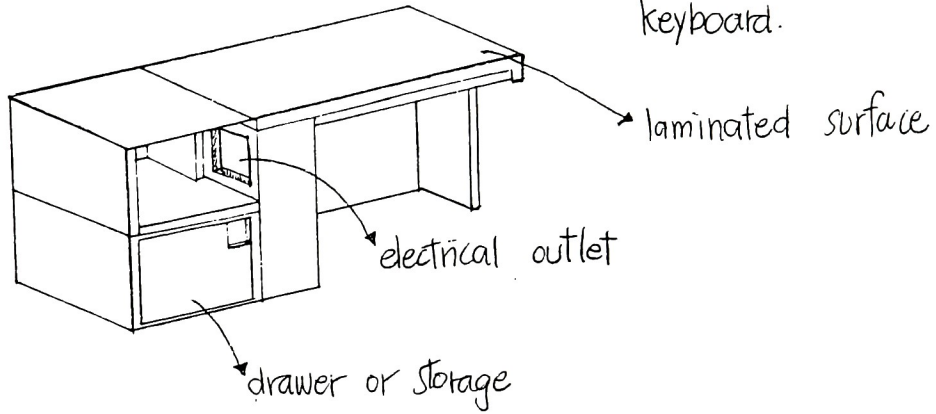


as paper rack

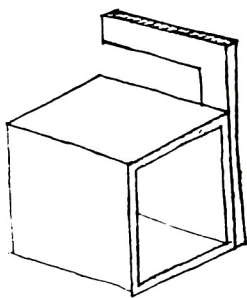
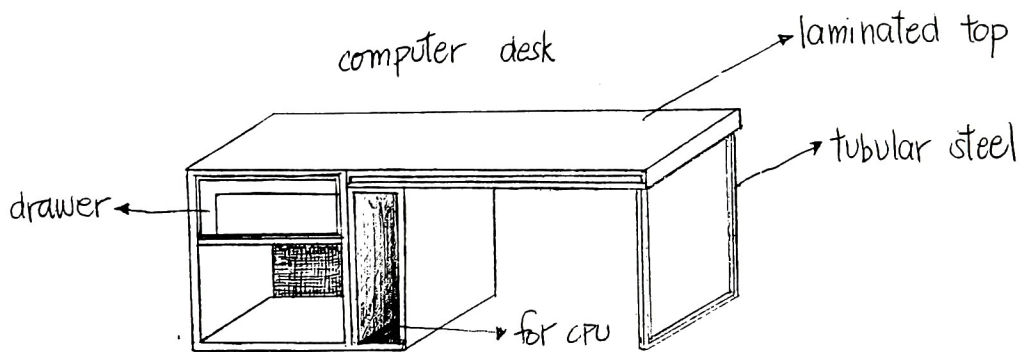
Fig. 25. Furniture sketches and developments: shelving units.

"desk" computer desk with movable shelf for

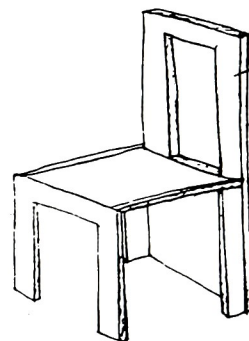
keyboard.



computer desk



chair + storage



recycled wood

chair

Fig. 26. Furniture sketches and developments: chair and desk.

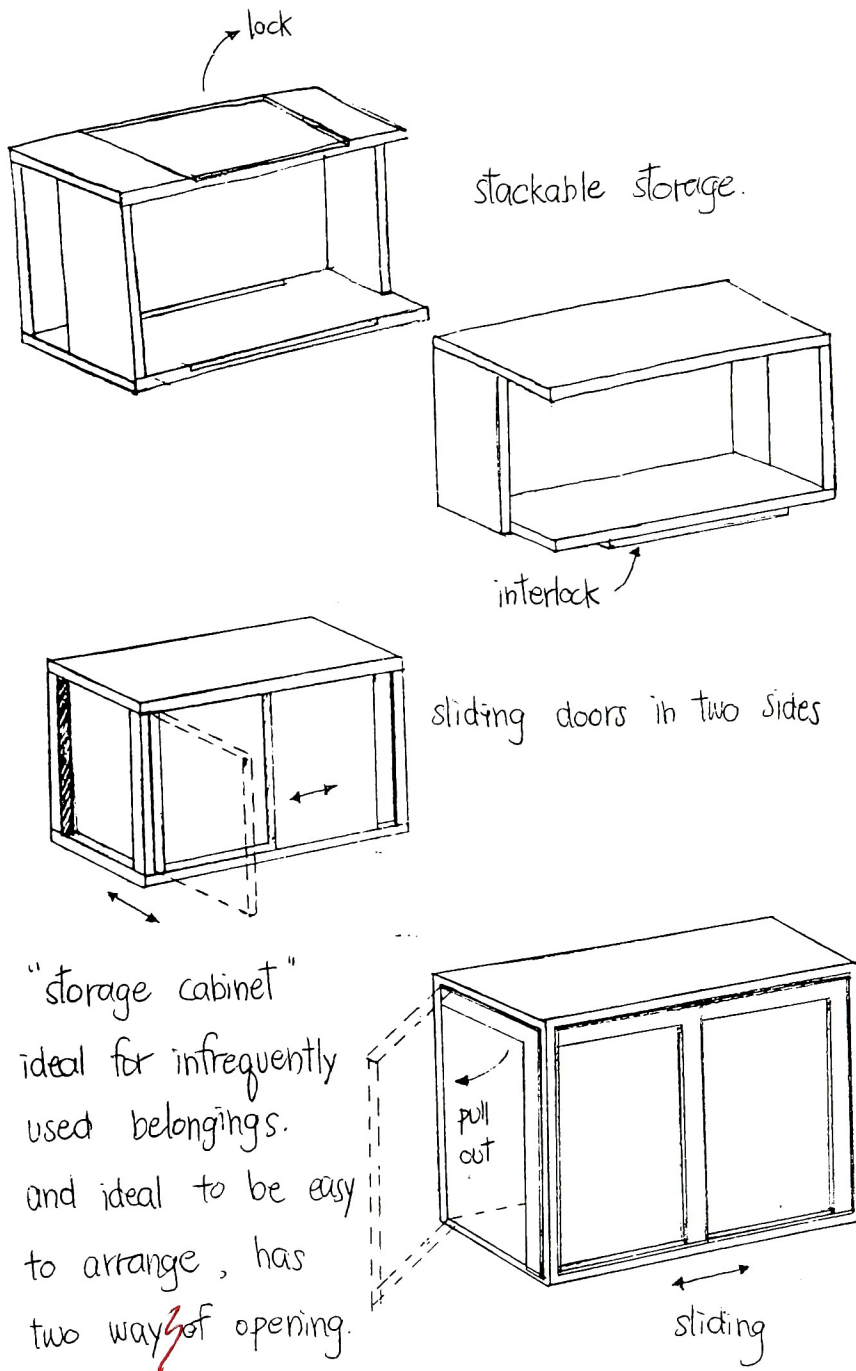


Fig. 27. Furniture sketches and developments: storage units.



"sofa"

• occasional overnight guests.

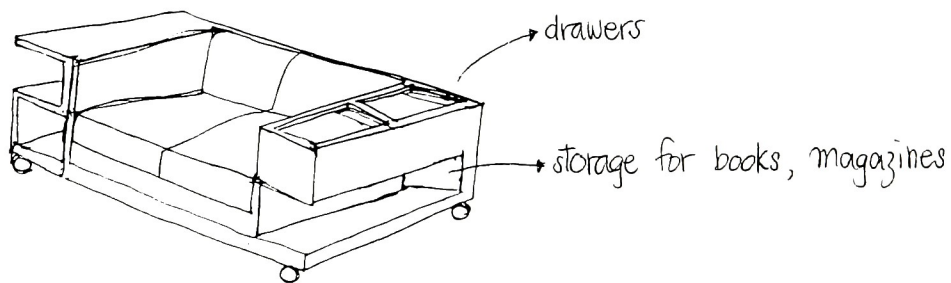
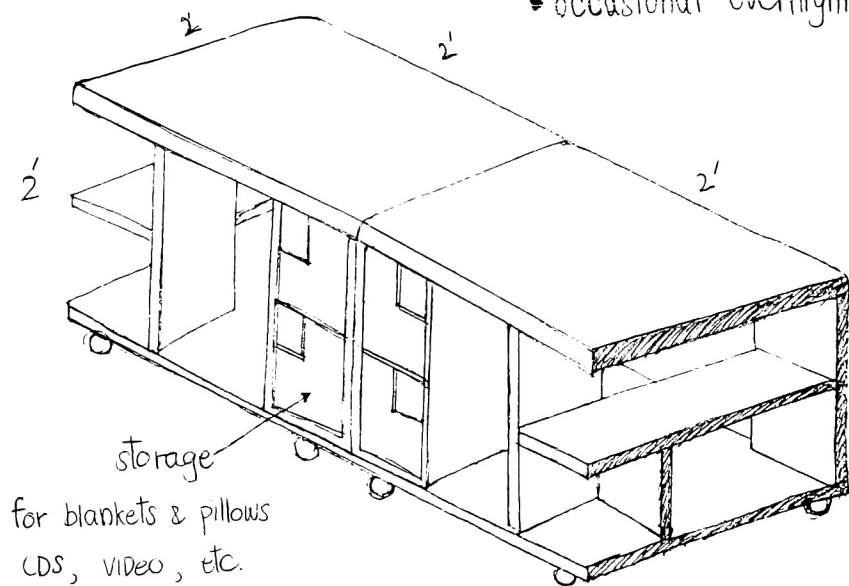
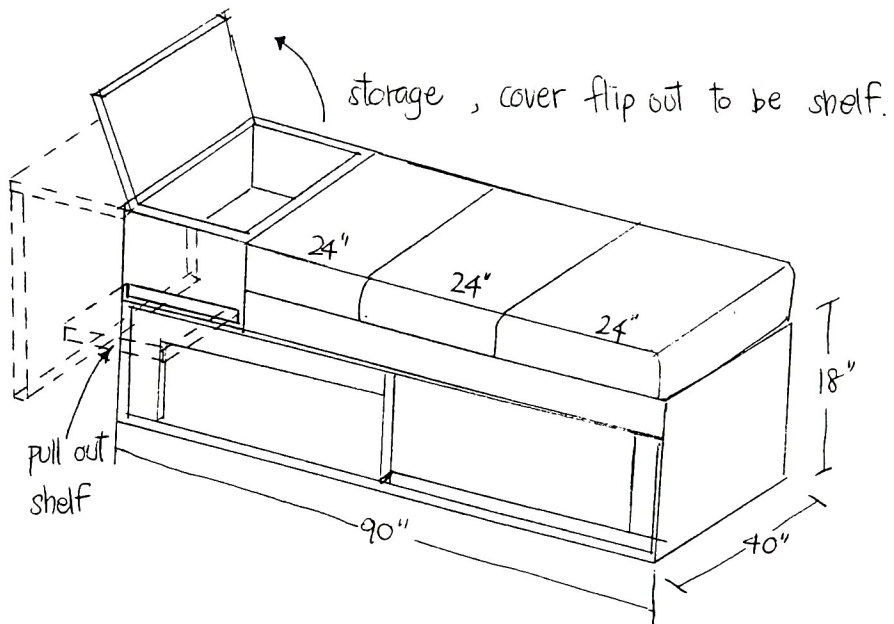


Fig. 28. Furniture sketches and developments: sofa units.

"sofa + coffee table (side table)"



"coffee table" with storage

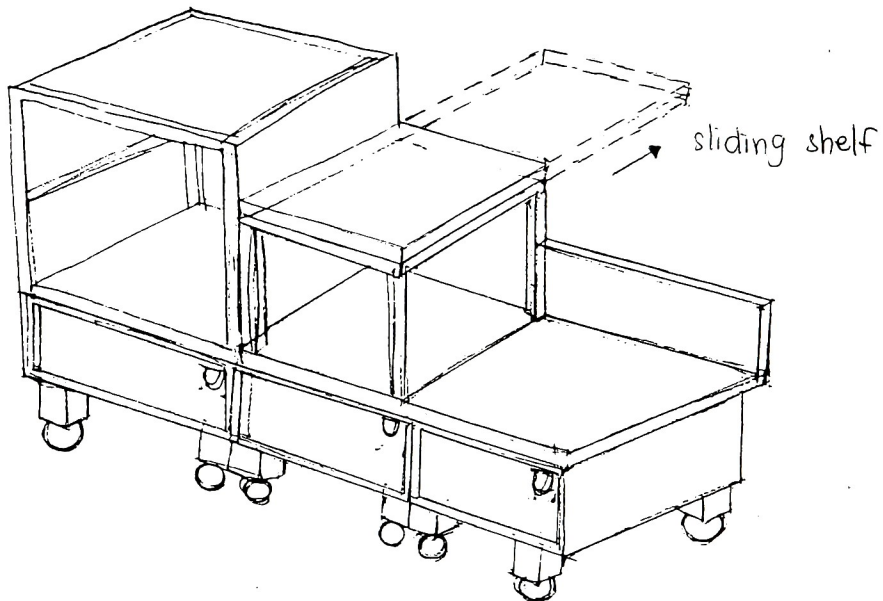


Fig. 29. Furniture sketches and developments: coffee table units.

#### 4. ALTERNATE LAYOUTS

The layouts illustrate the variations possible for furniture arrangements. Each solution has advantages and disadvantages, but indicates the freedom of each occupant to organize space according to his or her requirements.

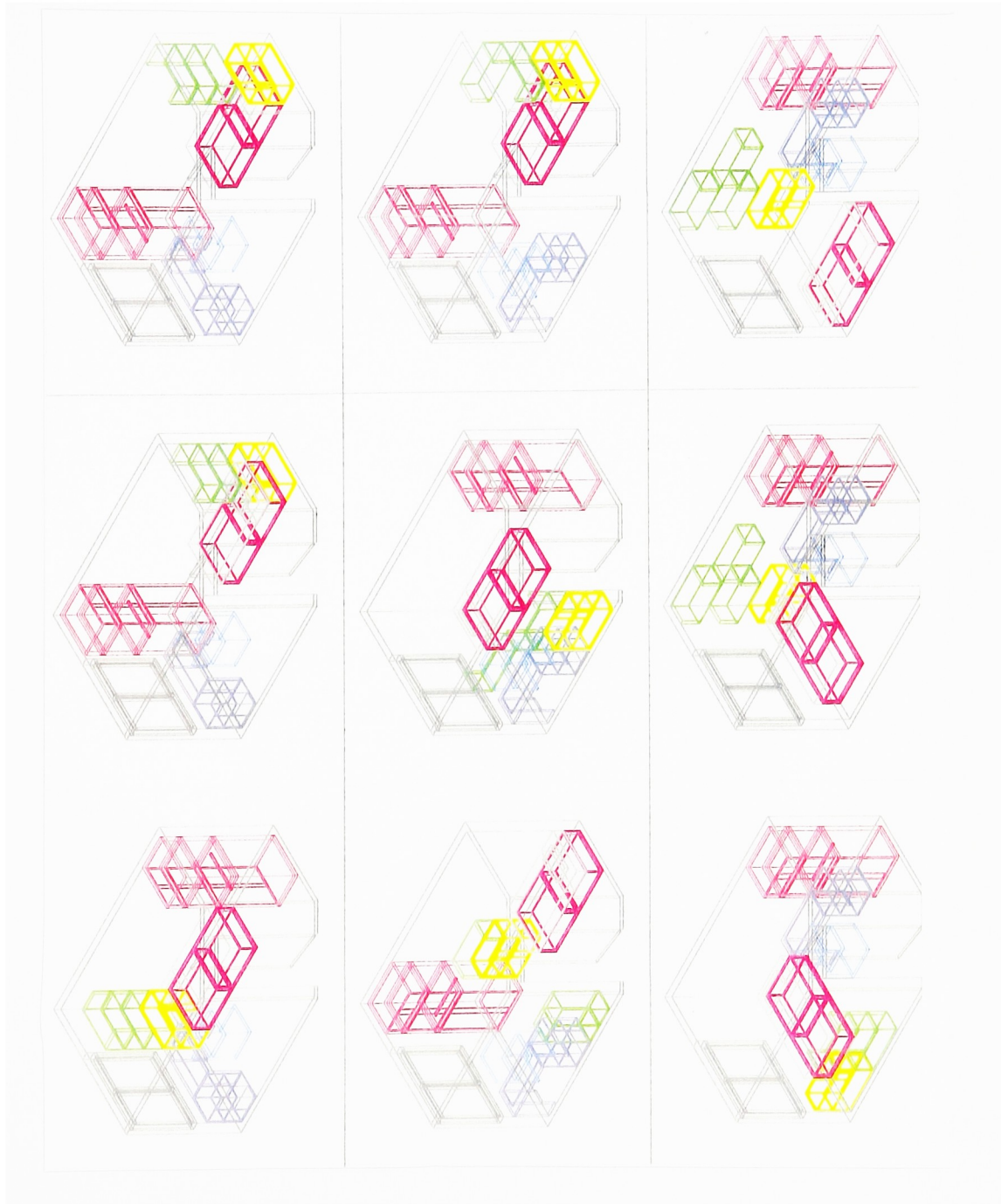


Fig. 30. Alternate layouts for furniture arrangements.

Red=closet, Pink=drawers, Grey=bed, Yellow=cabinet, Green=shelves, Blue=table, Cyan=chair

## SECTION 5

### FINAL DESIGN DEVELOPMENT AND DOCUMENTATION



Fig. 31. "Introduction of thesis" poster.

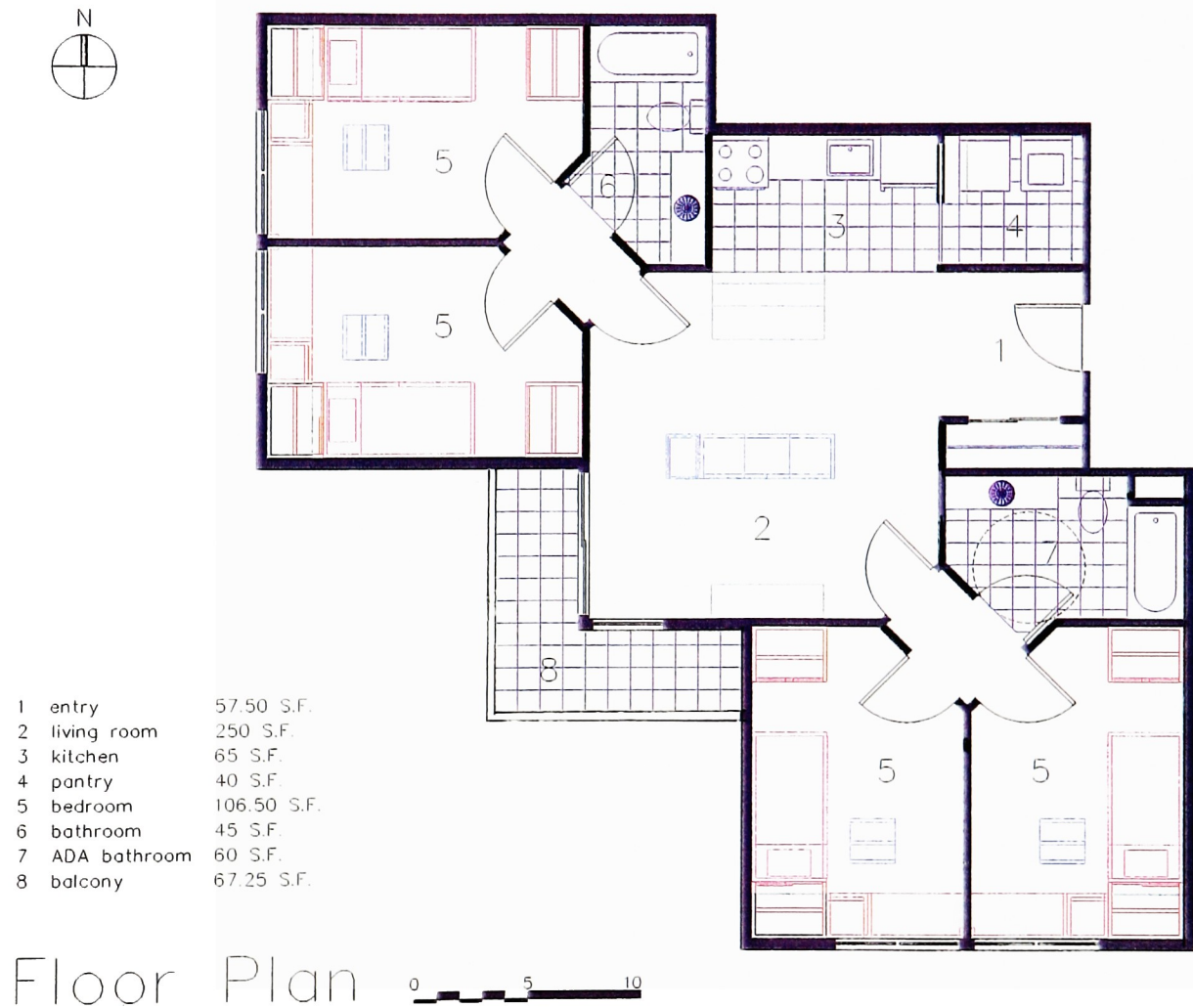


Fig. 32. Final floor plan of Collegiate Apartment.



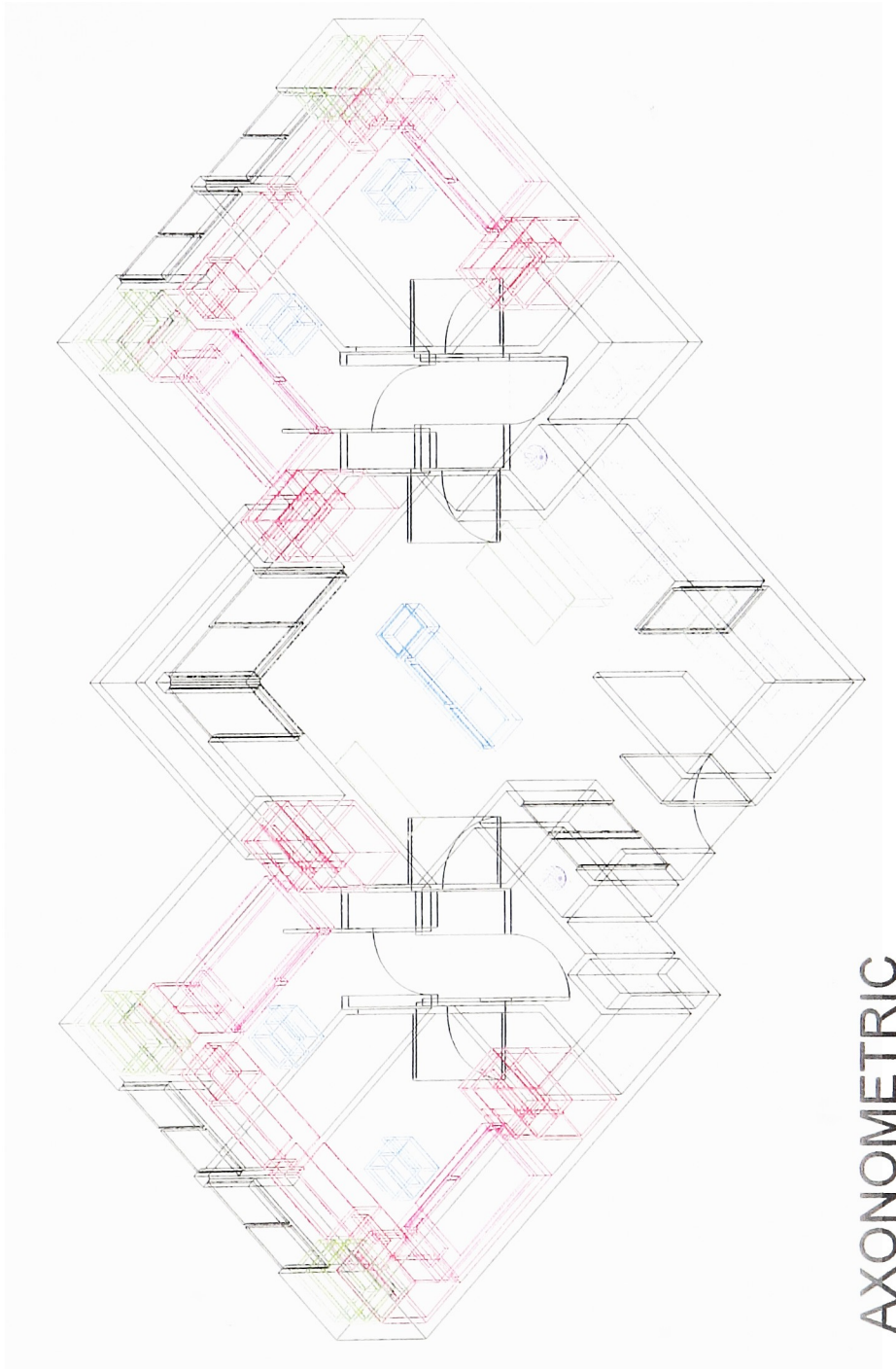


Fig. 33. Axonometric of Collegiate Apartment.

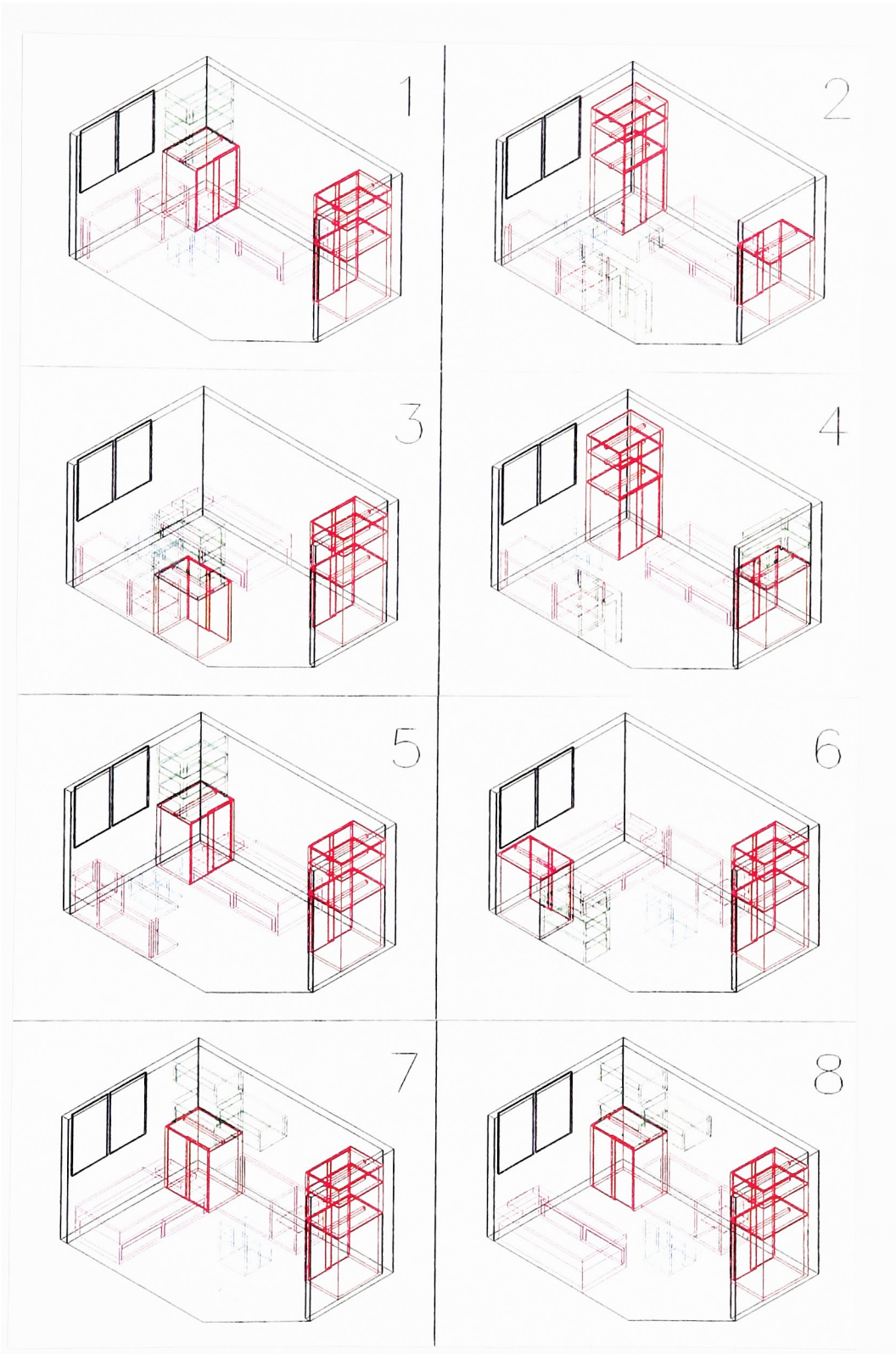


Fig. 34. Final alternate layouts for furniture arrangements.

Red=cabinet and closet, Pink=bed and drawers, Violet=table, Green=shelves, Cyan=chair

## FINAL MULTIPURPOSE FURNITURE DESCRIPTION

The essential furniture for the dormitory includes:

- Off season cabinet = cabinet + bed light

Size = 40"w x 18"d x 30"h

Functions = freestanding cabinet unit with hinged door on one side and sliding door on another side. Intended for storage of off-season clothes or personal belongings, blankets, old books or infrequently used items.

- Side chair = chair + magazine rack on wheels

Size = 25"w x 30"d x 18"h

Functions = movable chair with magazine rack below. Ideal for seating and storing frequently read magazines or books.

- Closet = closet + mirror + dressing unit

Size = 40"w x 28"d x 48"h

40"w x 28"d x 24"h

40"w x 28"d x 12"h

Functions = freestanding closet units with hangers, mirror, and dressing unit. Ideal for storing clothes, blankets, or personal items, etc.

- Study desk = desk + storage + drawer + electrical outlet

Size = 75"w x 18"d x 30"h

Functions = freestanding desk unit with movable keyboard shelf, storage for CPU, printer, and paper, drawer for stationary, and concealed electrical outlet, with a laminated work surface for durability and aesthetic purposes.

- Base drawer = drawer + cup holder + small shelf

Size = 40"w x 40"d x 15"h

Functions = freestanding drawer units with drawer, cup holder, and sliding shelf. Ideal for storing clothes, shoes, pillows, blankets, books, and other personal items.

- Shelf units = shelf + paper rack + stool

Size = 40"w x 18"d x 15"h

Functions = freestanding shelf units or wall attached shelf units with connector. Ideal for storing books, papers, CDs, cassette tapes, picture frames, and other personal items.

- Sofa unit = sofa + futon + coffee table + shelf + storage

Size = 90"w x 30"d x 18"h

Functions = freestanding sofa unit or futon with pulled out coffee table, flipped out shelf, and under seat drawers for storing blankets and pillows for overnight guests. Ideal for storing books, CDs, or cassette tapes.

# VARIATIONS

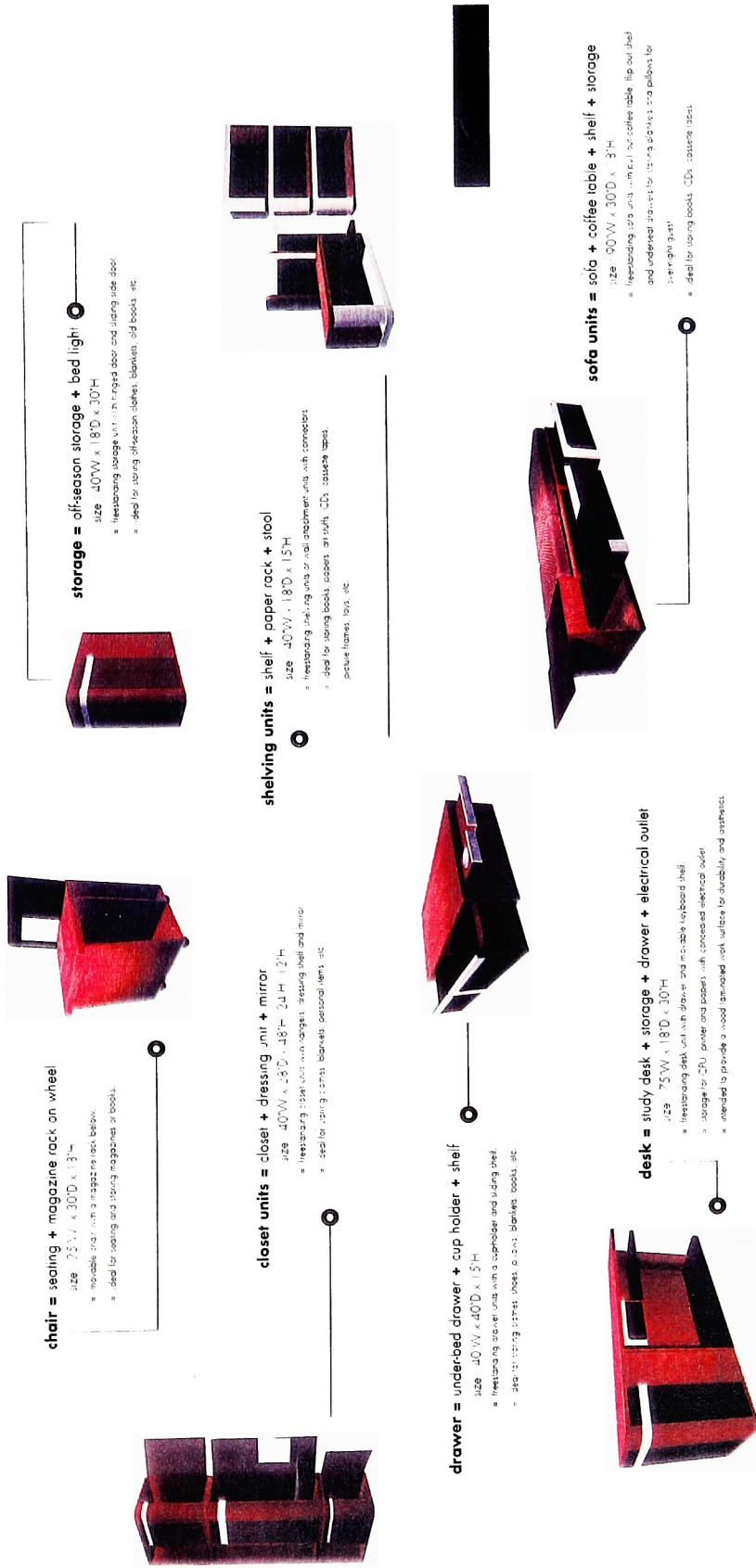
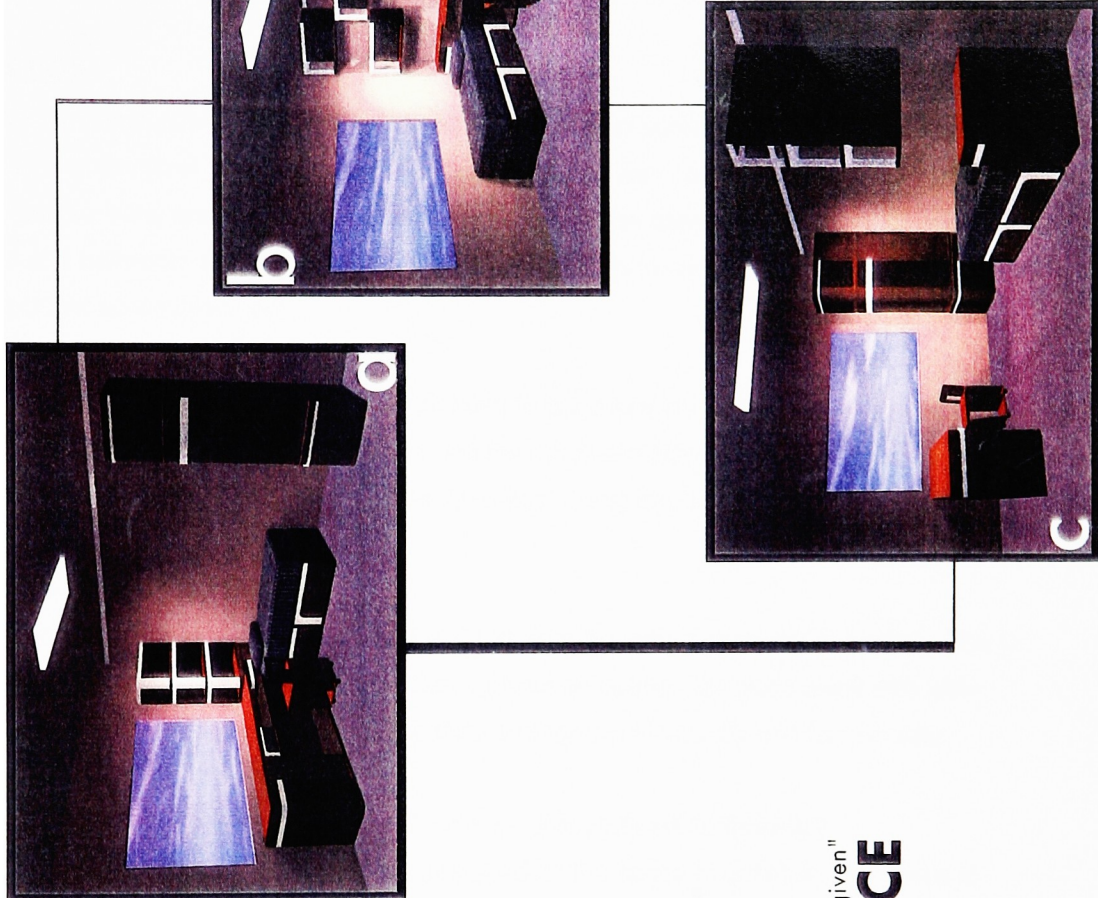


Fig. 35. "Variations of furniture" poster.





**SPACE PLANNING AND  
MODULAR FURNITURE ARRANGEMENT**

- - -the concept of logical space planning
- - -the reduction of space fixture
- - -the relationship of each piece of furniture
- - -the harmony of the context

"What we do inside the space we have been given"  
**FREEDOM OF SPACE**

LOCATION: The New College's Housing Apartments  
Rochester Institute of Technology  
SPACE AREA: 1,128.50 sq. ft. / unit, 4 students

Fig. 36. "Variations of furniture arrangements" poster.



## **SECTION 6**

### **EVALUATION AND CONCLUSION**

#### **EVALUATION**

- Does the space separate private and public area in order to achieve privacy for the occupants?

The space does provide the occupants privacy and also convenient access. The plan offers a flexible living space so that space can be arranged as desired. The personal zone of bedroom and bathroom are secluded and the angled doors provide more usable space that is the most important accomplishment.

- Is the pattern of circulation satisfactory?

From the final plan, short routes from point to point simplify circulation and provide convenience for occupants. Traffic paths on the floor plan are efficient: short, direct, and free of turns. All rooms can be accessed conveniently without going through another room except around the periphery of the living room.

- Are the rooms of suitable size?

The actual square footage of the New Collegiate Apartment proposal is limited. Due to cost and other considerations, increasing size was not an option. My open plans with wide expanses of windows and multipurpose furniture arrangements visually and functionally maximize space in the small room.

- Do the rooms accommodate the required furniture gracefully and efficiently?

Since the furniture was specifically designed for the space in question, the space is adequate for both furniture and traffic. It is obvious that the floor plan is extremely effective and works well to accommodate all furniture and requirements.

- Is the storage space adequate?

There are sufficient storage spaces for personal belongings. Often-used items are ideally stored in the drawers and shelves while seasonal or infrequently used articles can be stored in more out-of-the-way locations. The other achievement is the reduction of the amount of furniture needed, thus providing more living space.

- Is the plan effectively oriented on the site?

The major group spaces deserve the best view, while the private rooms have large windows for ample natural light. Bathrooms are the only places without window or sunlight, although both are pleasant, while respecting privacy needs.

- Does the plan meet the ADA requirements?

The plan does meet the ADA requirements. One bathroom provides a five-foot-diameter turn for a student in a wheelchair. The bathtub includes handrails for a handicapped student.

Handicapped students usually have been assigned to live on the first floor, which provides convenient access.

- Does the multipurpose furniture provide functionality for students?

Designed for multiple purposes, it provides exceptional convenience and flexibility for individual students. For example, science and business students require a lot of storage for books; art students for art supplies. The shelving units perform as storage for books and supplies as well as for display of artwork in progress. Books, supplies and artwork are conveniently and comfortably accessible, and visually organized to eliminate the feeling of clutter. The shelves minimize the amount of floor space dedicated to storage.

- Are finishes appropriate to the function?

Materials made of recycled milk bottles provide longevity, durability, ease of maintenance, aesthetics, and low cost. They provide a warm, homelike environment as well.

## **CONCLUSIONS**

The design and layout of furniture, and the alterations I have proposed to original floor plan, have enhanced the environment by providing each student: functionality, convenience, flexibility and privacy. They have maximized storage and floor space by minimizing the amount of furniture.

Since the design is predicated on an actual project, the new Collegiate Apartments, it could be further improved with additional study based upon the "ideal" space plan and for "specific" occupants.

## **GLOSSARY OF TERMS**

Accessible	Accessible, when applied to a fixture, connection, appliance, equipment, shall mean having access thereto, but which first may require the removal of an access panel, door, or similar obstruction.
ADA	Americans with Disabilities Act.
Area	The two-dimensional measure of a surface; in interior design, usually the square measure of large planar elements—walls, floor, or the whole enclosure.
Balcony	An outdoor space raised above ground level and in the space for human use.
Bathroom	A room equipped with a shower or bathtub.
Building	Any structure used or intended for supporting or sheltering any use or occupancy.
Dwelling	Any building or portion thereof that contains not more than two dwelling units.
Dwelling unit	A single unit providing complete, independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking, and sanitation.
Ergonomics	The science that seeks to adapt the environment to its users.
Environ Solid- Core Tops	A laminated material for furniture made from recycled newsprint and soy resin.
Habitable Space	Space in a structure for living, sleeping, eating, or cooking. Bathrooms toilet compartments, closets, halls, storage or utility space and similar areas are not considered habitable space.
HDPE	Extruded material made from recycled milk bottles, Plastic #2. It has twice strength of solid oak and comes in many different colors.
Laminated	Layers of material such as plastic, paper or lumber; may be either horizontal or vertical layers securely glued together.
Modular	Built of modules or according to standardized sets of measurements.
Module	One of a series of units designed and scaled to integrate with each other in many different combinations to form, for example, a set of furnishings, a system of construction, or whole buildings. In current usage, the term is most often applied to mass-produced prefabricated units.

Multifamily Apartment	A building or portion thereof containing more than two dwelling units and not classified as a one or two family dwelling.
Occupancy	The purpose for a building, or part thereof, that is used or intended to be used.
Paneling	Thin, flat wood boards or other similarly rectangular pieces of construction material joined side by side to form the interior and usually decorative surface for walls or ceilings.
Space Planning	The functional planning of interior space; a design specialty which concentrates on establishing space needs and utilization in the early stages of design.
System Furniture	Furniture that is designed to combine with other elements; component pieces can be chosen and assembled to suit the needs of the user.
Townhouse	Once termed a "row house," a structure two to five stories high that directly abuts those buildings adjacent on either side. Interior space tends to be long and narrow, with doors and windows only at the front and back.
Ventilation	The processes of supplying air to, or removing air from, any space by natural or mechanical means. Such air may or may not have been conditioned (heated, cooled, or filtered).

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