PLEASE NOTE:

Page 138 is not available
for photography.

UNIVERSITY MICROFILMS.

ADAPTABLE USER SYSTEMS IN THE OFFICE LANDSCAPE

by

Carroll Clinton Skinnell

Thesis submitted to the Graduate Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

MASTER OF ARCHITECTURE

APPROVED:

Walter Butke, Chairman

Pascal Malassigne

Leonard Olson

April 20, 1976
Blacksburg, Virginia

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

Through the two years that this thesis was in the works, a number of individuals stand out who deserve special recognition for their influence in shaping and forming this work.

Walter Butke - For four years has given the freedom to explore, encouragement when necessary and valuable help when needed. He is as much responsible for this thesis as the author.

Pascal Malassigne - When nuts and bolts questions were raised, he usually had the answers.

Len Olson - Just when we think we have all the answers about people, someone changes all the questions.

Jo Anne Kirst - She has made this past year one of my most interesting and happiest. Her timely help in putting this book together are very much appreciated.

My parents - Though the time got long they stood by me. They, more than I, recognize the benefits that education can bring to a person. I thank them very much.

Charles Hildebrand - Collaborating on projects has been an aid to us both. Additional thanks for the computer assistance.

Barbara Moore - My typist. Her patience were remarkable considering she was dealing with someone who didn't always know what he wanted.

LIST OF FIGURES

INTRODUCTION

Many of today's offices resemble the offices of 1890. Despite the development of the steel frame and the elevator, which resulted in the skyscraper, despite the contemporary lighter, stronger, more colorful furniture, despite the electronic communications and automatic environmental controls, little evolution in the nature of the office has occurred. Changes have been primarily the result of economic and esoteric objectives and not primarily the result of efforts to make the office a better place for purposeful human relationships and to make the office a better place for humans to function.

After World War II one of the first steps in that direction did however emerge. Due to the shortages of office space in Europe it became necessary to optimize the office. The functions and purposes of the office were examined closely. Out of this came the Burolanschaft or "office landscape" concept. Emphasis was placed on the office as a communications and data handling facility controlled by human aptitudes and tolerences. The office was

recognized as a place where change over time is a natural evolutionary process. This thesis is an inquiry into methods and technologies with which that process can be better accomodated.

The objective in this thesis is to describe a more flexible office system that enables the user to make changes more quickly and easily in response to new requirements, providing the office employee with autonomy over his work environment.

chapter 1

page 3

adaptable technology at the user level

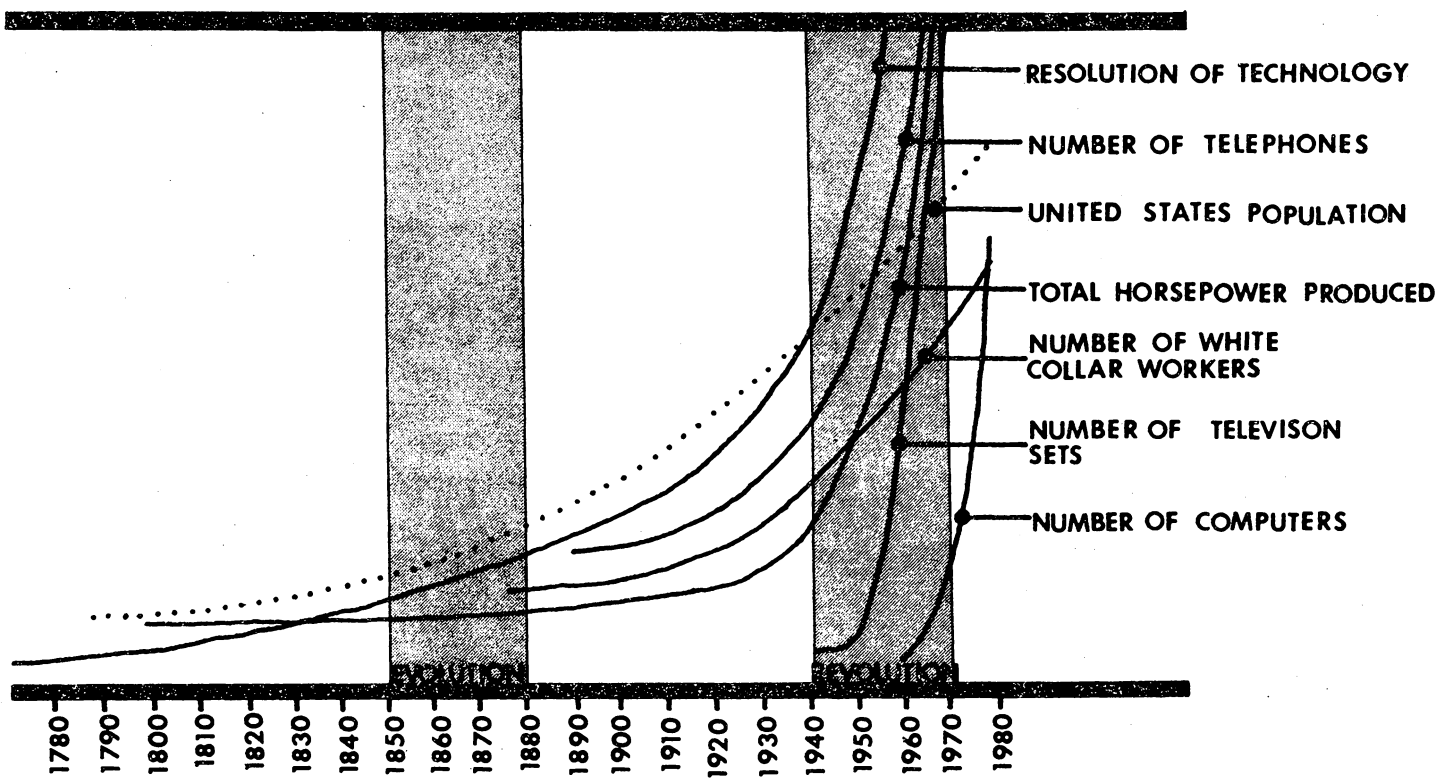
"The medium, or process, of our time - electric technology - is reshaping and restructuring patterns of social interdependence and every aspect of our personal life. It is forcing us to reconsider and re-evaluate practically every thought, every action, and every institution formerly taken for granted. Everything is changing - you, your family, your neighborhood, your education, your job, your government, your relation to "the others." And they're changing dramatically."
Marshall McLuhan - "The Medium Is the Massage"

CHAPTER 1

ADAPTABLE TECHNOLOGY AT THE USER LEVEL

As Marshall McLuhan's quotation on the title page of this chapter says "everthing is changing". The graph on the following page illustrates the rapid increase in change that is occurring today. Before the turn of the century, change was an evolutionary process, operations were time proven. Advances in technology caused by demands of modern society noticeably increased the rate of change, quickening during the Second World War and continuing today. Around us today we see calculators, microwave ovens, computers, jets, nuclear power plants; the list is endless. Scientific and technological information doubles every decade. Change is no longer an evolutionary but a revolutionary process. The way we work, the way we think, the way we have fun, it's all changing radically. What was true and valid yesterday has been replaced by new techniques and answers today, and these will be replaced tomorrow.

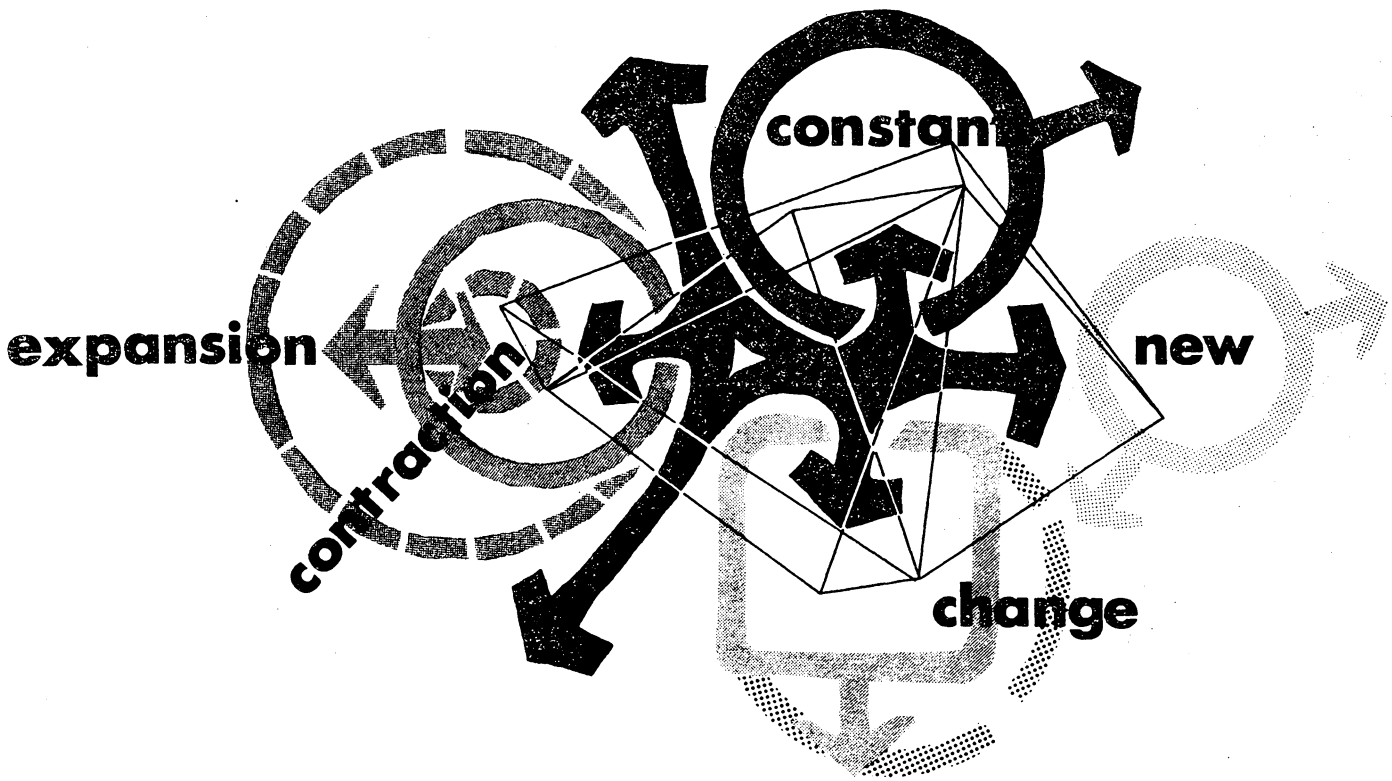
The office too has been affected by these changes. Pressure for innovation and new ideas is exerted on



1 Change rates in the United States

the office through intense competition in the business world. Need for change comes quickly, an upheavel in the stock market, a natural calamity, a major internal reorganization, a technological breakthrough; many factors may call for quick reaction.

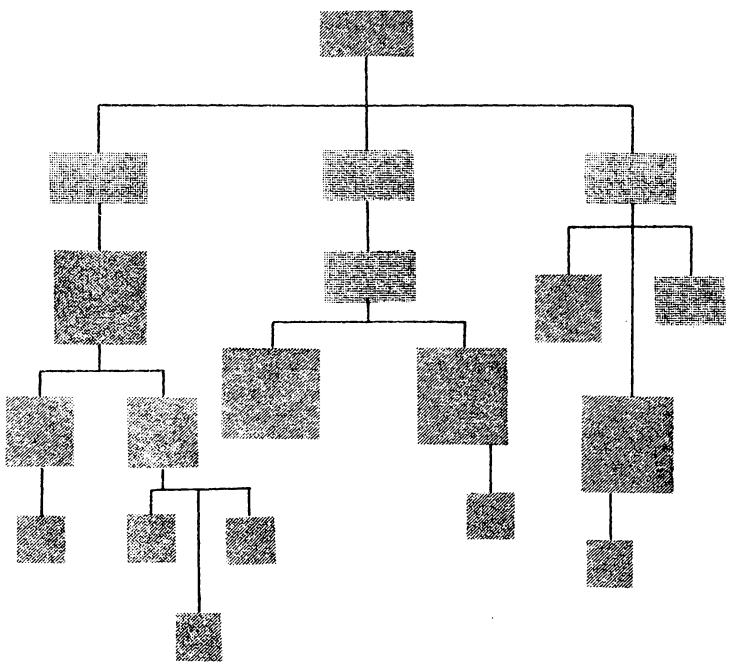
Offices must be able to reorganize in a matter of hours and minutes quickly rearranging to manage the new information flow. To do this, there must be an inherent flexibility throughout the entire field of primary, secondary, and support sub-systems; and there must exist a user group that knows how to use them. This means that furniture, lighting, communications, and electrical; all the systems that make up the modern office must harmoniously integrate for graceful smooth change. Change cannot be thought of as a start and stop, go and no-go idea, instead it must be a continuous on going learning process. (See Figure 2) There always exist a number of alternatives to solving a problem. If one doesn't work then another should be tried. Too often offices are organized with the intention of remaining permanent. Continued over time, this results in inefficiency and strained communication networks, both human and mechanical.



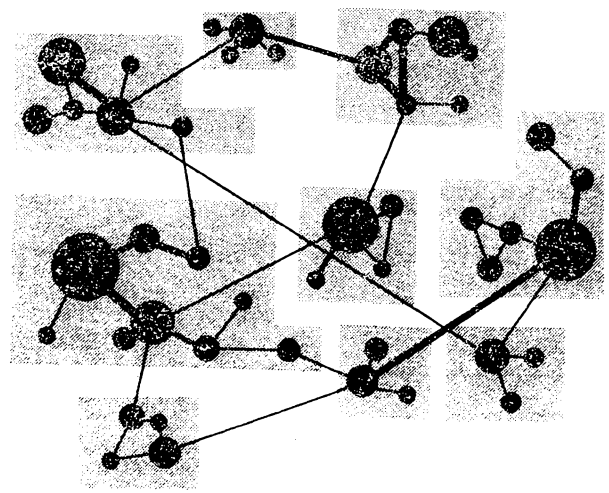
2 Continuous change process in the office

Figure 'a' on page 9 shows how the communication lines of an office may look in theory; but the reality probably resembles the communication lines of figure 'b'. This organization needs to change frequently. Present day equipment systems maintain the status quo in an office. The lack of flexibility-adaptability in these systems defies the pressure and need for change; it locks the office into a state of permanence. Chapter three details these non-adaptive equipment traits that hinder the reorganization of the office.

New systems need to be designed and existing ones re-designed to allow and encourage adaptability in the office. The author of this thesis has attempted to do just that, to search for technological solutions to these technological problems. The conceptualization and description of systems and hardware that are understandable and useable by the office workers themselves, is the goal of this thesis. A worker needs to easily change his or her space in just a few minutes with a minimum of tools and effort. Many manufacturers call their systems flexible and adaptable, but in reality they are too cumbersome, complicated or heavy for



3
a. Typical organizational chart



b. Actual communication interaction

the average worker to operate. This writter contends that no one knows as much about the work related problems in an office as the workers themselves. The people that labor in the office eight hours a day are more involved with the operations of the office than anyone from outside could ever be. With a minimum of instruction and training, workers can organize their own environment to suit their own needs and corporate goals.

All the problems in the office do not have physical origins. Many are psychologically rooted in worker attitudes and perceptions. An in depth study of these psychological factors is not within the scope of this thesis. Only the physical factors are dealt with here in a 'solution' context. Of course the two cannot be separated and therefore the author has reviewed three psychological aspects in a secondary supportive context as to how they have or may effect the adaptability-flexibility concept.

1. Fred Steele of the Department of Administrative Science at Yale University has synthesized 14 points concerning why workers don't affect change in the office. Many of the categories are psychologically oriented while the rest concern

physical enviromental systems. Steele gives some suggestions as to how these problems may be overcome. The main goal being to increase worker sensitivity and awareness towards his or her environment. (See Appendix I)

2. The concept of territoriality was looked at in reference to how territorial man (assumming such a being exist) may function in a frequently changing environment. There are indications that aggression goes up with an increased rate of change. If feelings of territoriality can be increased then perhaps aggressive tendencies will be reduced. A worker may feel more secure in a work space of his own design. (See Appendix II)

3. The final psychological aspect looked at concerned space programming via observational techniques. The conclusion reached was that these methods had their place as tools for gathering information but had serious drawbacks that kept them from being the dominant factors in a continuously changing environment. (See Appendix III)

chapter 2

growth of the office

"It would be difficult to overstate the magnitude of change that will take place in the lives of all of us, in human history, as a result of the information revolution that has so unobtrusively taken place in our day. Information, its communication and use, is the web of society; the basis for all human understanding, organization and effort..."
John Diebold - "Beyond Automation"

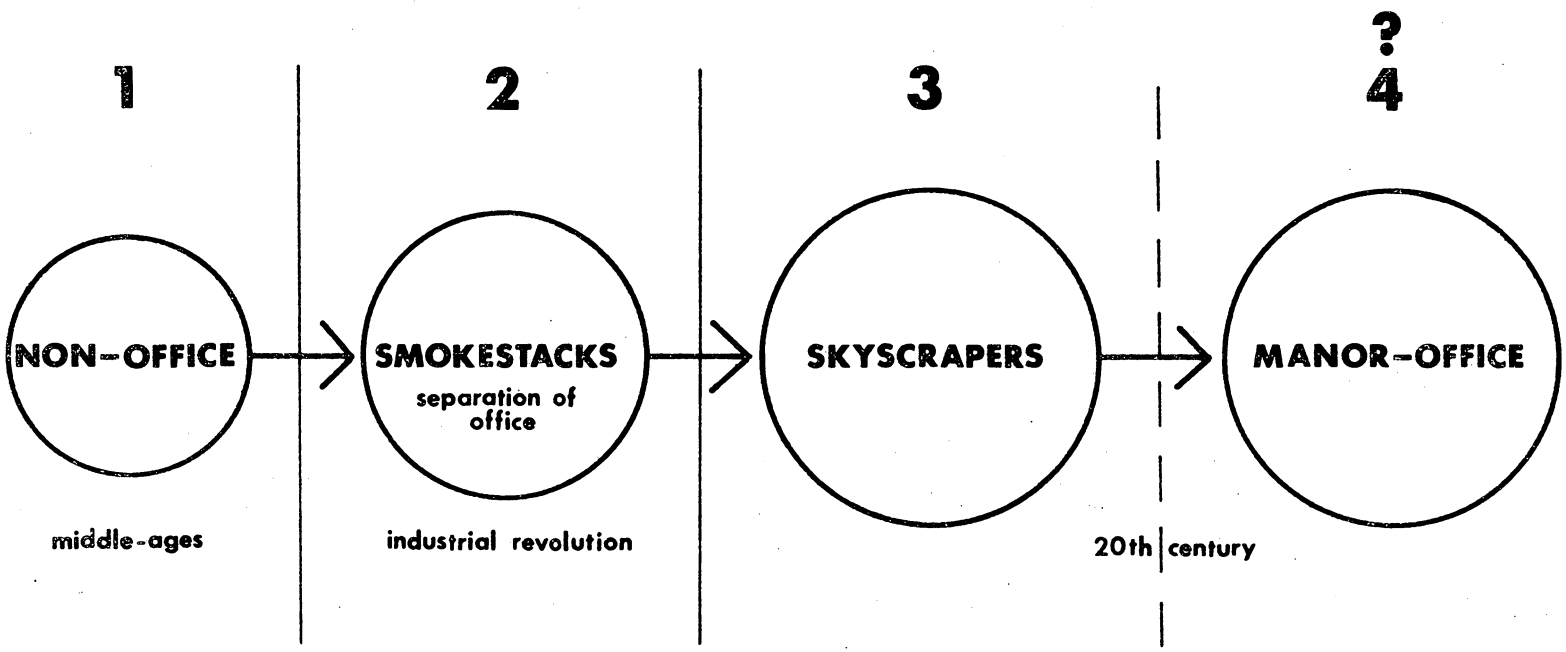
CHAPTER 2

GROWTH OF OFFICES

Beginning with Europe in the middle ages and continuing through to America of the twentieth century there have been four evolutions in the setting of the office. Initially, the setting of the office was an insignificant part of the medieval city, gaining a physical form during the industrial revolution and becoming the dominant form of the city in the twentieth century. Finally, in the nineteen-fifties the office began to acquire a fourth setting in the country. (See Figure 4)

Office type functions as we think of them today were virtually nonexistant in the medieval society. There were no separate facilities for information handling. The vast growth of manufacturing during the industrial revolution increased the need for information collection and recording. For this purpose large offices had to be constructed near these factories.

Out of the industrial revolution grew the inventions of the nineteenth century causing the skyscraper setting of the office to emerge. Factories were moved to the periphery of the



4 The four settings of the office

city while the office tower became the dominant image of the city. During this same time period the growth in the percentage of female workers increased significantly - finally outnumbering men in performing the more routine functions of the office.

Throughout the twentieth century the actual philosophy, procedures, and equipment of running the office changed very little. With the end of World War II a new philosophy for operating the office was developed. Until this time the office had been formed by a helter-skelter of external pressures acting upon it. Now, new concepts based on the functions of the office emerged called Burolandschaft or office landscape. This attempt to maximize space use and communication probably aided in bringing about the fourth setting of the office. In the latter fifties some companies began to leave the city and built one or two story buildings on vast picturesque tracts of land in the suburbs and rural areas. All personnel working on one or two floors fit well with the office landscape precept of large floor areas.

What does the future hold? With the continued deterioration of the central cities, many companies will decide to make the move to the

country; but, most experts feel that the majority of offices will remain in the central cities. The economic conditions of the cities will have a lot to do with whether this bears out. Overall percentages of office employment is expected to increase, at least until the turn of the century.

Developing Office Functions

The role of the city in the middle ages was for trade, protection, or for political or religious administration. There were no large scale businesses; instead small work shops and cottage industry comprised the production processes. Offices as separate facilities did not exist either, most business type transactions were carried on at a personal level and extensive information recording was not necessary. In an age when most people were illiterate, records were kept in the head, not on paper.

Industrial Development

The colonization of the seventeenth century increased the demand for goods and their

transportation causing business to become international in scope. The result of this pressure for 'more and faster' has been called the industrial revolution. In the cities large factories were built to manufacture goods cheaply and quickly. New tools and machines replaced workers in the field, freeing them to migrate to the city to work in the factories.

Against this background of streaming smoke, the office now began to acquire its own definitive setting. Along with the increase in size and volume of industry, came an increase in complexity. More people were needed to control and guide these manufacturing empires and more information had to be committed to paper. Haire (1959) has shown how rapid the growth of office functions usually occur.[2] The growth of the number of clerical workers; those involved with information recording, duplicating, storage and retrieval, that support manufacturing functions, increases proportionally faster than the growth of the business itself. In London, a good illustration of this upsurge is shown in the category of commercial clerks. In 1851 there were 16,420 of these clerks, whereas by 1891 their numbers had increased to 78,180, an increase of 476%, while the

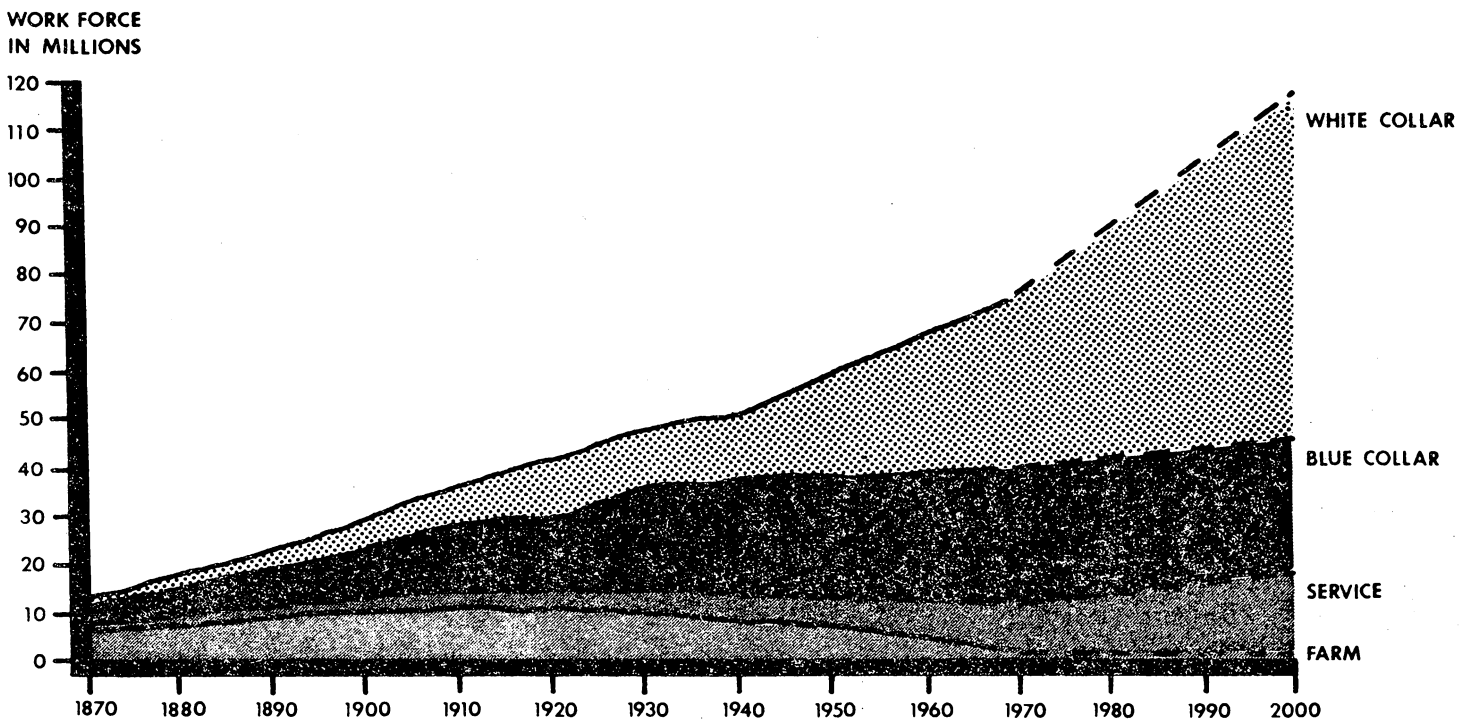
general population increased only 78%. Part of these numbers can be attributed to London's role as the administrative core of the British Empire. However, in America too this growth in office workers is evident. In 1870 only seven percent of all employment was office-type occupations. In 1930 this fugure has risen to 23% and to nearly 40% in 1970. (See Figure 5)[3]

The industrial revolution was responsible for bringing about the administrative function of an industry as a separate entity.

> Plainly, no great corporate enterprise with a world-wide network of agents, correspondents, market outlets, factories, and investors could exist without relying upon the services of an army of patient routineers in the metropolis: stenographers, filing clerks and book-keepers, office managers, sales managers and their varied assistants right up to the fifth vice-president whose name or O.K. sets the final seal of responsibility on an action.[4]

In America this separation was aided by falling cost of transportation and communication.

> Indeed, the same developments that were essential to the rapid growth of the industrial complex in the American Mid-west in the late years of the nineteenth century - rise in speed and the fall in cost of transportation and communication - were fundamental to the establishment of the detached office.
>
> Before a manufacturer could hire specialist in administration, planning, sales



5 Growth of the white collar workforce[3]

> promotion and finance, those being the key personnel in central offices, he needed a large volume of business. And this volume was generated by the rise in scale of plant production that accompanied the falling cost of transportation and communication.[5]

Prior to the mid-nineteenth century, few women worked in offices because they were not seen as being capable of making the necessary decisions or shouldering the responsibility of running a large corporation. The creation of more routine jobs generated a need for workers and opened the way for women to work in offices. Designers now had to start taking women into account when they designed offices. A benefit of this envasion was that it freed more men to work in the more strenuous factory jobs.

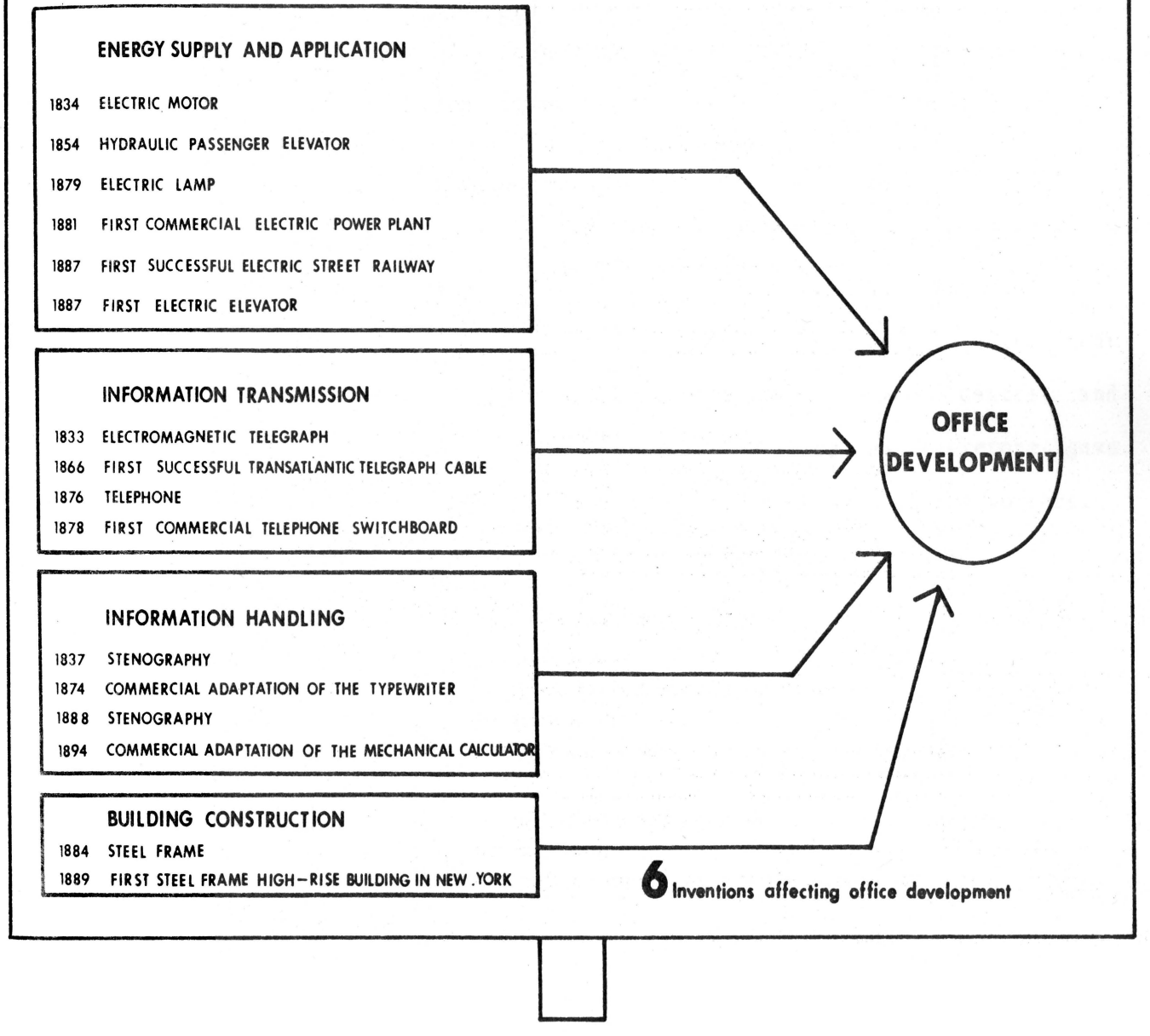
In 1881 there were 7,000 women employed as clerks in England and Wales, in 1911 this figure had risen to 146,000. One fifth of office employment belonged to women in 1890; in 1910, this figure had risen to one-third.[6] Before long women outnumbered men in the more routine functions of running the office. Working in an office afforded women greater social opportunities than the factory and was cleaner, healthier, and more respectable.

Inventions of the 19th Century

In the latter half of the nineteenth century, a myriad of inventions had lasting effects upon the office. Six of these inventions have played a very important role in shaping the form and function of the office. Three concern communication - telegraph, typewriter, telephone; three directly affected building form - light bulb, steel frame, elevator. (See Figure 6)

The telegraph, used extensively in England in the first half of the century, gained widespread use in America in the latter half of the century. In 1851, the first successful cable from Dover to Calais was strung and five years after that, 1856, an international telegraph system was inaugurated between England and the United States. In 1861 America's two coasts were linked by a transcontinental system. By 1862 there were nearly 300,000 miles of telegraph wires lacing Europe and the United States.

The telephone, invented by Bell in 1876, made person to person communication even quicker. Personal visits or sending a message via a runner were no longer necessary; dialing a telephone or asking the



6 Inventions affecting office development

operator to connect you made the handling of routine matters much more efficient. Confirmation of instructions, appointments, and purchase orders, etc., soon became standard operating procedure via the telephone.

The telephone like the telegraph also had its affect on separation of office and factory.

> The separation of the office from the plant also rested in part on the development of the long distant telephone in the 1880's. With the telephone, it became possible to choose one location for production and another for part of the office work.[8]

One effect of this virtually instantaneous information - communication network was to give a central headquarters more control over its far distant operations. Corporate heads could be kept together for group decision making. The practical effect was to increase messages being sent back and forth between central and regional offices and therefore gave impetus to even more office workers.

Typewriters, invented in 1874, were not seen as necessary tools of the office. When first developed, many decried their use as too mechanical and cold, lacking any personal touch. The telephone, oddly enough, can be credited for the

successful introduction of the typewriter; workers, transmitting the phrase "send me a memo on that":, increased the demand for office typist. Most of these typist were women.

> The secretary has been the model of aspiration for most office girls. The typewriter too, of course, has been the woman's machine, and in itself has not led to factory like effects. In and out of the office world, it has been a highly respectable machine. Its operator, equipped with stenographer's pad, has managed to borrow prestige from her close and private contact with the executive.[9]

In the field of building developments, a reliable light bulb, invented in 1879 by Edison, allowed architects to design buildings with greater depth than was possible when natural light had to be relied upon for illumination. Gas lamps were in use but these required much maintainance and could not be moved about. They were always a potential fire hazard and as few as possible were used, resulting in low and often inadequate light levels. With electric light as the chief source of illumination, windows could be made smaller and buildings safer.

In the 1850's the development and refining of the evevator by E. G. Otis increased the heights of buildings beyond what were previously thought

practical. The steel frame, 1884, made it possible to take advantage of even greater height possibilities by ending the limitations imposed by massive bearing wall construction. The first steel frame high-rise building in Chicago was the Home Insurance Company Building, it towered all of ten stories; in New York, the Tower Building, 1889, at eleven stories was that cities first skyscraper.

These two sets of inventions, communication devices which encouraged centralization and construction developments which allowed a higher density of people were the necessary prerequisites for the skyscraper headquarters that were to come just a few years later.

Skyscrapers

The impact of these inventions took shape in the final quarter of the nineteenth century with office clusters appearing in the 1880's and 1890's in New York and Chicago. Lewis Mumford characterized these buildings and the ones to follow as "a sort of human filing case, whose occupants spent their day in the circumspect care of paper..."[10] New York's Wall

Street District was first to be darkened by the man made canyons. The trend for taller office buildings continued until the depression: Park Row Building, 30 Stories (1899); Metropolitian Life Insurance Company Building, 50 stories (1909); The Woolworth Building, 58 stories (1913); the New York Telephone Building, Pan Hellenic House, The Chrysler Building (1928), each taller than the one before. The zenith of this building boom was reached in the early thirties with the completion of the world's tallest building, the Empire State Building, and the single largest assemblage of office space - Rockefeller Center. The new image of the city and the setting of the office are now identical - the skyscraper.

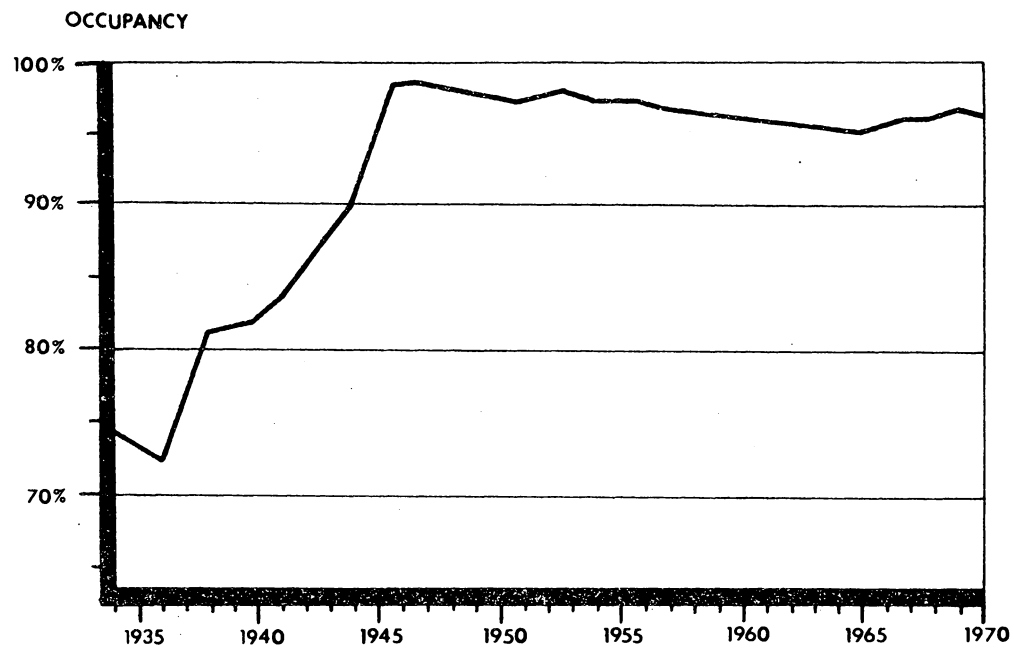
Growth Cycles: Boom-Bust-Boom-Bust

From about 1880 until 1929 was the first boom period in office buildings: however, with the depression and the completion of buildings already contracted for, office construction in the country stopped. The overbuilding of the 1920's coupled with the economic plunge of 1929 caused office occupancy in the United States to drop to a

disasterous 75%.[11] five years after its completion date, the Empire State Building was only 25% occupied.[12] Fortunantly, the rest of the country was not hurt as badly as New York.

The war which caused economic activity to pick up had a positive effect on the office situation and by 1952 there was a shortage of office space in the country. With tight guidelines for occupancy, so as not to overbuild again developers overcame their doubts and the second boom period was on: Lever House, Chase Manhattan Bank Building, CBS Building, Segrams building, The Midland Marine Bank Building were constructed in the late fifties and early sixties. In other cities like Houston, Dallas, and Atlanta many new offices were built. From 1950 through 1970, Dallas experienced a 300% increase in private office buildings.[13]

About the mid-sixties the banks loaning the construction money allowed their occupancy guidelines to slip. The World Trade Center was built along with many smaller skyscrapers, and the net effect was another era of overbuilding; and again occupancy has dropped. Floor space occupancy in New York hovers around 82%, too low for many owners to make a profit from rents.[14] (See Figure 7)



7 Occupancy of existing floor space in the United States[14]

Electronic Revolution

Mechanization of the office continued in the twentieth century. Between 1910 and 1920 over one-hundred new office machines were placed on the market each year. By 1930, 30% of women in the office operated a machine other than a typewriter. Post World War II sales climbed over the one billion dollar figure.[15]

A new office machine, developed during the war, that was to have far reaching affects was the computer. Through the years they have decreased in price and size and increased in efficiency and ability. these machines are able to compute in parts of seconds what formerly required a staff weeks and months to do. The computer caused many routine jobs to disappear and were soon indispensable to nearly every facet of office functioning. In 1955, there were 214 computers in use in the United States, by 1971 there were 107,000, an increase of 500 fold![17]

Because computers have replaced so many people, office managers have tended to allocate some of the space saved to the remaining personnel. An office worker could expect 109 square feet of work space in 1946, the office worker of 1965 had approximately 20%

more area at 129 square feet.[18] However, increases in floor area per person does not necessarily create happier or more productive workers; on the contrary it may increase isolation and hinder communication.

The Manor Office

In the fifties the decision was made by some companies to leave their city headquarters and move to the country. In the country the land was cheap, taxes lower, air cleaner and life easier. Formerly offices had to remain in the city, near to the vast labor market and communication centers; but with fewer people necessary to run a company and good communications available in the country, a few companies made the move.

The buildings constructed had a low profile with only one or two levels. These structures fitted well with the new office landscape dictum of locating as many personnel on as few floors as possible. The idea being that this will increase communication as well as create a more cohesive work force. The Connecticutt General Life Insurance Company was the first to move to the

country, to be followed by the Emhart Manufacturing Company, the H. J. Heinz Company, the John Deere Tractor Company and others. Although it is too soon to tell, a fourth setting of the office could be emerging, one of the central business headquarters, located in the countryside, surrounded by its employees.

The New Landscape

Up until World War II, the form of the office seems to have been the result of external forces rather than the study of the role of the office as a communications center.

At the end of the war, many of the buildings of Europe had been reduced to rubble. An acute shortage of office space forced companies to efficiently use every square foot of existing offices.

The Quickborner design team in Germany developed what has come to be known as Burolandschaft or office landscaping. It is an attempt to maximize floor space and communication in the office. Old ideas about private offices and military like rows of desk were replaced by wall-less open spaces with clusters of desks representing various functions. The

new open landscape was aimed at increasing communication, work flow, and hopefully produce a happier more involved cohesive staff. Reorganization of work units was easier since the furniture was light. Since no walls were used to block noise, carpeting is prescribed to absorb noise. Low sound absorbing panels were used to define specific work areas and limit views.

Not until the 1960's did the concepts of office landscape cross the Atlantic to America. Its initial reception was mixed; it was criticized as being accoustically inefficient and not affording enough privacy or storage. However, the benefits of the system became apparent as a few companies tried the new radical concepts. American designers had previously worked with the landscaping concepts but nothing really caught on until the European systems arrived. Eventually American manufacturing companies, beginning with Herman Miller and its Action Office Program, began producing their own versions of office landscaping systems for the American market. The main difference between the American and European versions concern storage space; American systems placed more emphasis on vertical space than the European

designs. By 1975, there were at least 40 companies involved in the manufacturing of complete office landscape systems.

What About Tomorrow ?

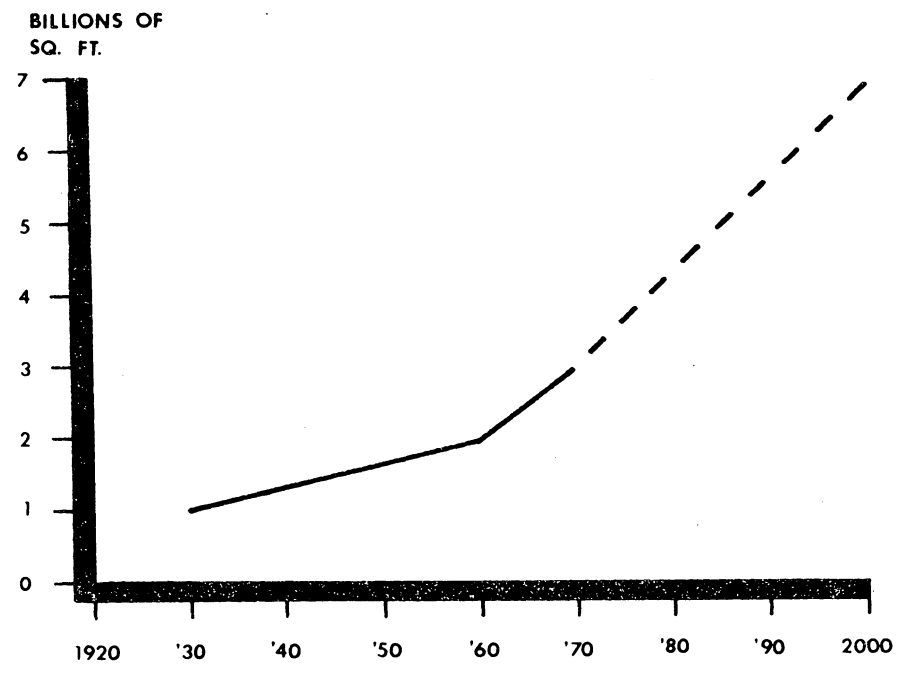
What is the future of the office? Many pronostigators believe the office will continue to grow in the city, that buildings in the suburbs and country are more a fad than a trend. Cities like Atlanta, Dallas and Houston seem to bear this idea out; but New York, the headquarters location of most of the country's largest companies is losing some of its corporate giants. There are some good reasons for remaining in the city. first, the greatest concentration of brains is here; second, more experts in any given field are to be found in the city; and a third factor relates to the type of people that are attracted to the city:

> The young women's preference for a job in the central business district today, therefore, is not based so solidly as before upon the compulsion of the transport net; it is based instead on the increased opportunities for after-hours recreation, lunch-hour shopping, and the greater opportunities for husband hunting.[19]

With crime on the rise in the central cities, they are becoming less

attractive to everyone. Although there has been talk about the 'return to the cities', it appears to be more like a trickle than a flood.

Most indications are that offices will grow in number, whether they are in the city or the country. Right now 40% of us work in the office, this figure is expected to rise to 66% by the turn of the century, if present trends continue.[20] One long term prediction for Manhattan sees a demand for office space equivalent to seventeen World Trade Centers. In the surrounding area 30 World Trade Centers would be necessary to meet future needs. (See Figure 8)[21]



8 Present and projected growth of office space in the United States[20]

chapter 3

page 36

present day environmental systems and hardware

"It is the thesis of this book that society can only be understood through a study of the messages and communication facilities which belong to it; and that in the future development of these messages and communication facilities, messages between man and machines, between machines and man, and between machine and machine, are destined to play an ever-increasing part...It is the purpose of Cybernetics to develop a language and techniques that will enable us indeed to attack the problem of control and communication in general, but also to find the proper repertory of ideas and techniques to classify their particular manifestations under certain concepts."
Norbert Wiener - "The Human Use of Human Beings"

CHAPTER 3

PRESENT DAY ENVIRONMENTAL SYSTEMS AND HARDWARE

This chapter will show that contemporary office equipment, electrical sub-systems as well as furnishings, are of a permanent nature and contribute toward the maintainance of the status quo in an office. When flexibility is built into a system it it usually too complicated or cumbersome for the average office worker to manage. The advantage of the flexibility is then lost and the present state of affairs continues.

Office operations involve four main equipment systems: power distribution, communication distribution, lighting, and furniture. Each of these systems will be reviewed in this chapter. Specifically, the most common sub-systems will be detailed and their major advantages and disadvantages will be noted.

Power and Communication

The demand for electrical energy in the United States is growing faster than the population. By 1980 the electrical energy consumption in

America is expected to be equivalent to 23.58 million barrels of oil daily.[22] Offices are contributing to this rapid rise, partly through the development of new machines to make offices more efficient.

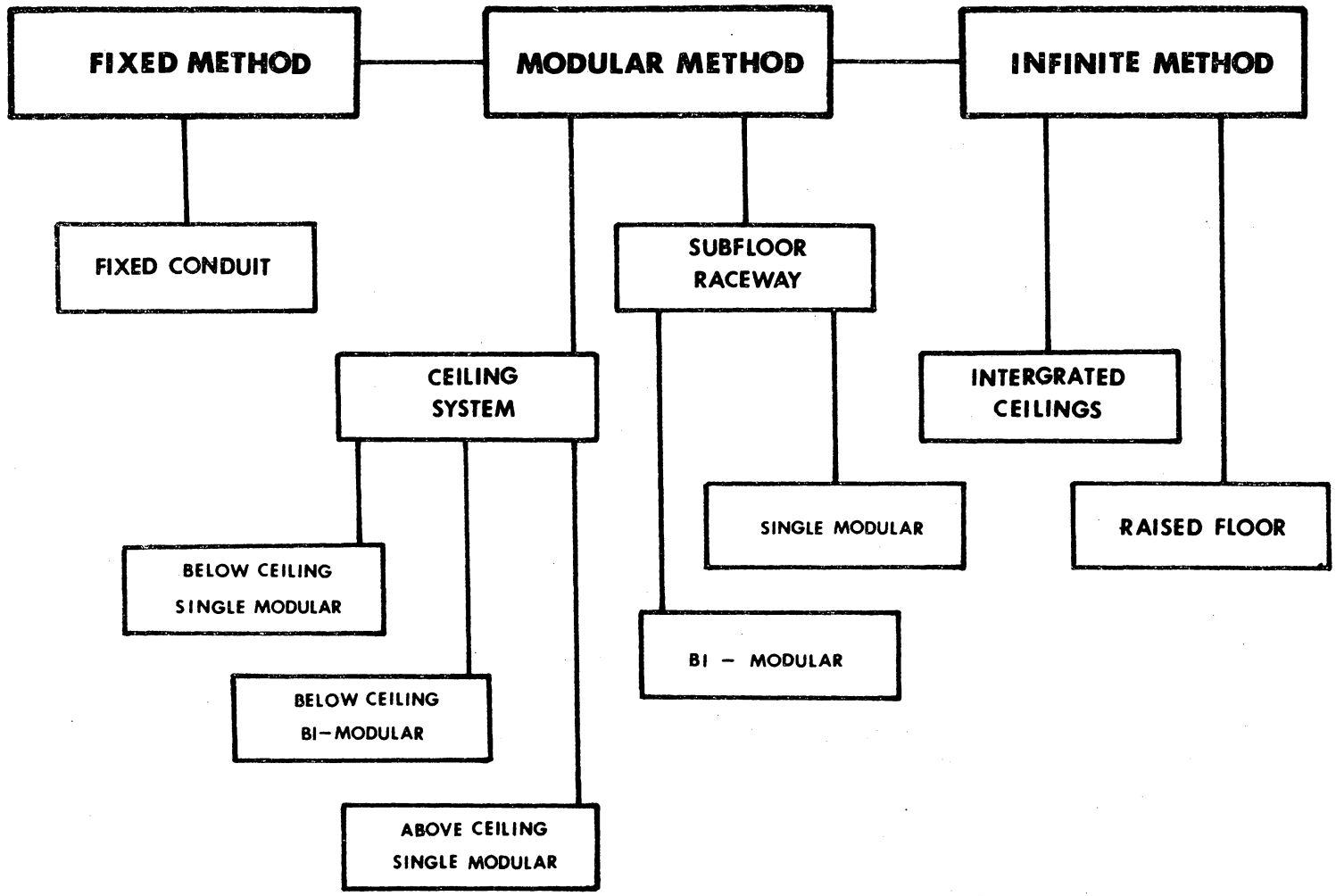
From the time the main power line enters a building, every effort is made to conceal it from view. Once in a building, wires are smuggled and snaked, around, under and through, walls, floors and ceilings; not showing themselves except to expose a receptacle.

Once the initial installation of receptacles is complete the job is usually considered finished; that no other alterations will be necessary. However, the distance from the receptacle to the power using equipment is an unconsidered zone that can become a major problem, filled with extension cords and the concomittant hazards that they present. The office layout options are then dictated by the availability of receptacles and plugs. This could be tolerated if an office remained fixed, receptacles and plugs could be located exactly where needed; however, every office needs to reorganize from time to time. Availability of support systems should not become criteria for this reorganization. The primary

function of the office should be the major determinant for reorganizing an office. Thus far most technological solutions for flexibility have generated their own set of secondary problems which tend to nullify their primary purpose of adaptability.

There are two sets of electrical communication devices in an office, primary devices that contribute toward the functioning purpose of the office: telephone, intercom, public address, etc.; and secondary devices that deal with maintainance: thermostats, burglar alarms, smoke detectors, etc. The maintainance devices are seldom given much thought as to distribution of wiring. They are worked in with little thought as to how they look or how they integrate with other facits of the building. Leave it to say that it is a mess. On the other hand primary devices have been given tnougnt, but as will be shown, leave a lot to be desired.

There are three basic distribution methods for power and communication: fixed, modular, and infinite. (See Figure 9) These designations are an indication of the distributional diversity of the systems. They also take into account the ease of adding or relocating fixtures.



9 Breakdown of power and communication distribution methods

A - Fixed Method

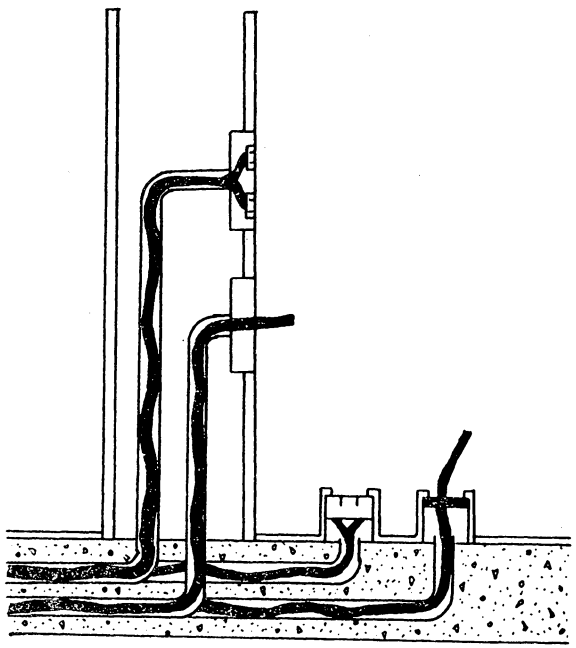
Fixed conduit system - This distribution method is permanent, once services are installed in the original construction phase, that's it. The service carrying conduits are usually run through concret slabs and stationary walls. (See Figure 10)

This system saves money in first cost of construction. However, installation or expansion of the system later requires major modification and is quite costly, time consuming, and disruptive to the office routine. The system lacks any kind of flexibility; the addition of a single 220 volt wall outlet would be a major undertaking. (See Figure 11)

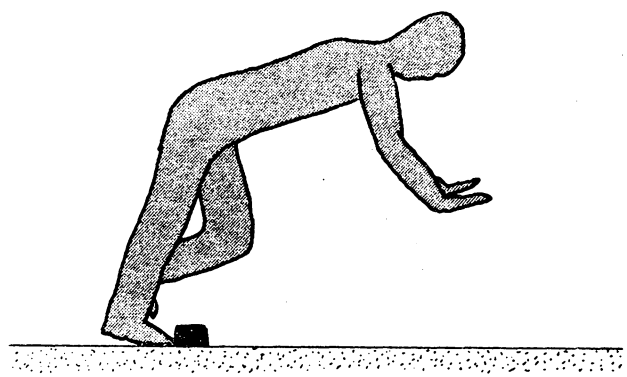
Another problem, though not unique to this system, is raised floor outlets. (See Figure 10) Stubbed toes and tripping will ultimately result, and boxes will be literally kicked loose by people with quick tempers.

B - Modular Method

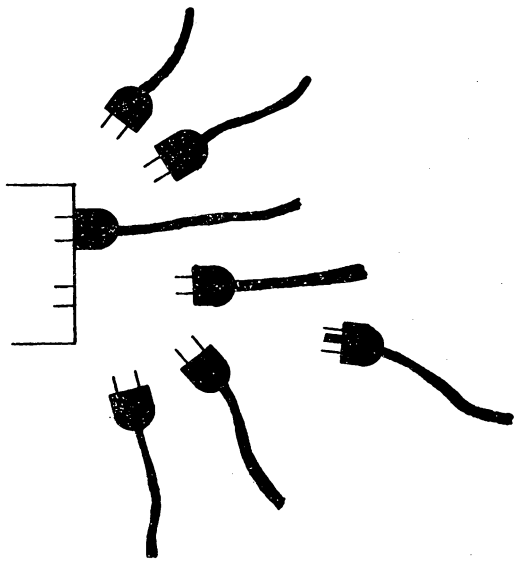
This distribution method is characterised by controlled access points for both power and communication. Systems are distributed through floors and



10
a. Fixed conduit system

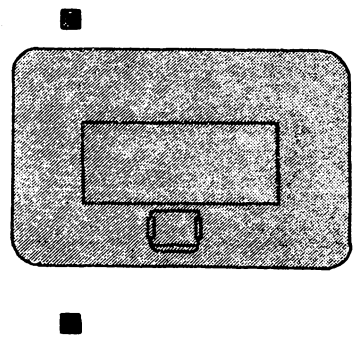


b. The hazard of the raised floor outlet



11

a. More demand than supply



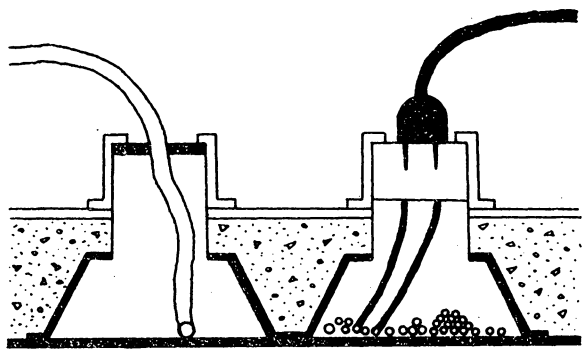
b. Work area, service access noncompatible

ceilings and can be tapped on grid points.

Sub-floor Cell or Raceway - This system consists of 2" - 5" deep parallel raceways which are embedded in the floor on four to six foot centers. Cost of a floor with the cell system is about one dollar more per square foot than without the cells. The system was originally developed to feed services into movable partitions.

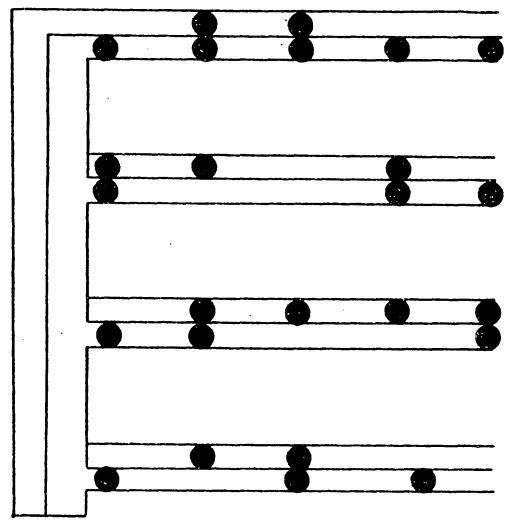
Two variations of the sub-floor raceway system exit: single modular and bi-modular. The single modular system uses two separate raceways to carry power and communication wires. (See Figure 12) The bi-modular system uses one raceway with a dividing wall between the two services. (See Figure 13)

To access the raceways two techniques are used. Service taps are built into the floor on a grid usually ranging from 4' - 6', access is gained by removing a plate in the floor. The main problem with this technique is that the taps begin to control the placement of work spaces. Telephones and electric cords have to be located near the taps so as not to become a nuisance and hazard. Also, if the single modular system is used, twice the number of taps must be provided.



12

a. Single modular sub-floor raceway



b. Distribution and access of services

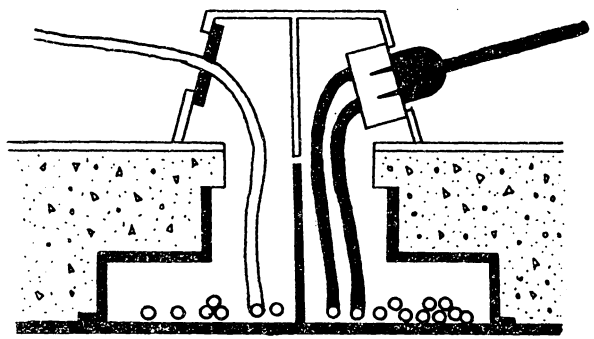
These taps, unless handled well could be unsightly.

The other technique for accessing the raceways is to drill a hole through the floor into the raceway. This method allows the service fixtures to be located where they are needed. However, the drilling operation is noisy, dirty, and disrupts the office routine. Futhermore, it may cost anywhere from $12 to $64 to install each service fixture depending on cutting method, wages and fixture used. Each time the office is reorganized new fixtures may have to be installed and unused fixtures may have to be removed. This presents the problem of covering up the remaining hole.

Raised floor fixtures are a hazard in this system. Since this is a floor system, it is susceptable to possible water damage should a water pipe break and fill the raceway.

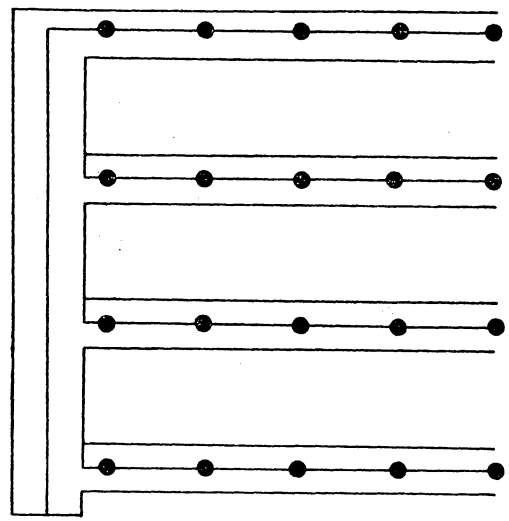
Addition of a power or communication system would require pulling wires through the raceways, again this would be disruptive to the office routine.

Ceiling system - Ceiling delivery methods are used where a high rate of change is expected. The services are carried in parallel trays 4' - 6' apart, that either suspend from the



13

a. Bi-modular sub-floor raceway



b. Distribution and access of services

ceiling or are above the ceiling. The services are delivered to outlets and panels through flexible plastic tubing or floor to ceiling service columns.

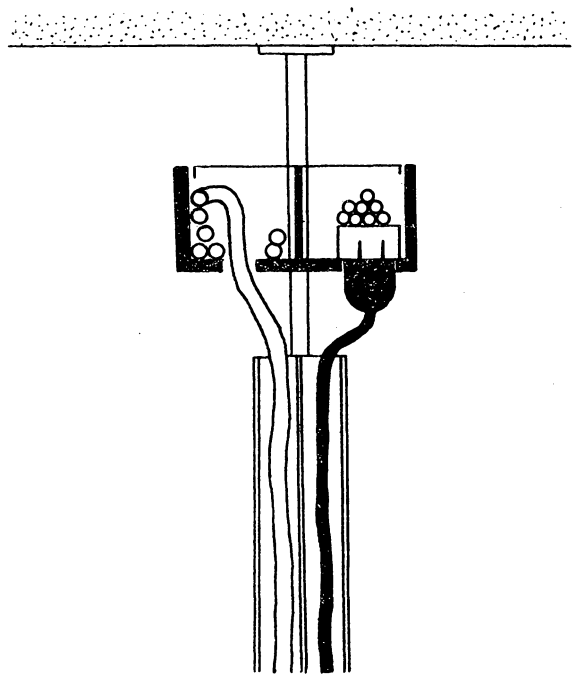
The modular ceiling system is less expensive to install than the modular floor system. Addition of wires is accomplished by simply laying the wires in the trays.

There are two below ceiling and one above ceiling distribution system. The below ceiling single modular trays are accessible anywhere along their length by splicing into the wires. (See Figure 14)

The bi-modular trays are accessible only at specific points, usually 4' - 6' on center. (See Figure 14) A major problem with the suspended trays is that they exclude the use of full height partitions.

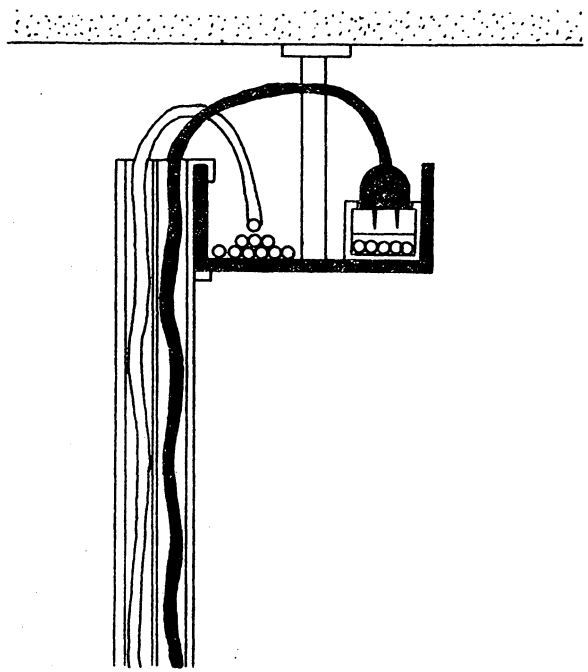
The above ceiling single modular system is accessed through predetermined penetrations in the ceiling. In this system the wire carrying tray is out of sight since they are above the suspended ceiling. (See Figure 15)

In all three of these delivery methods a technician would have to be called in to connect the services. Ladders would be necessary to access the ceiling trays. None of these methods lend themselves to being

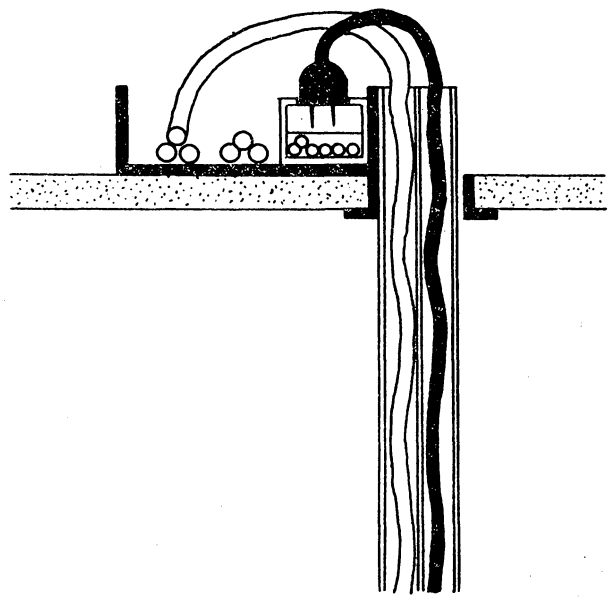


14

a. Single modular ceiling distribution



b. Bi-modular ceiling distribution



15
Above ceiling single modular system

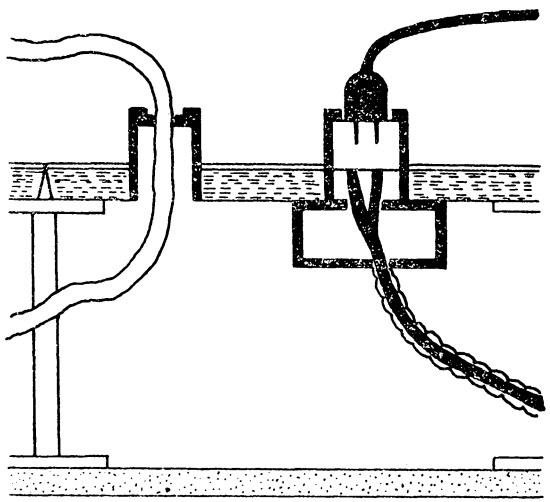
installed by the office workers.

C - Infinite Method

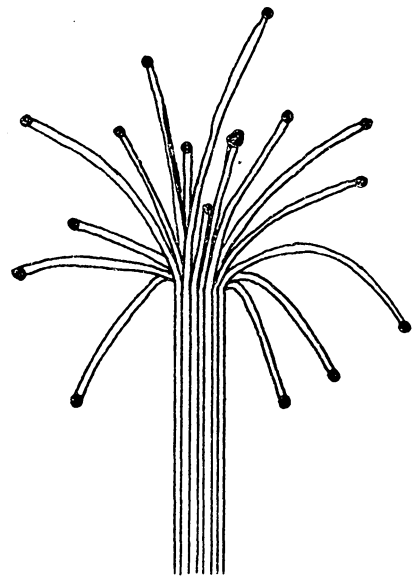
Two types of distribution systems are characterised by unlimited installation points for power and communication. One distribution method is in the floor and is known as raised floor or computer flooring; the other method is through the ceiling plenum and is known as an integrated ceiling.

Raised Floor - The raised floor distribution system was originally developed to be used in computer rooms. (See Figure 16) Raised floor systems consist of removable panels installed on pedestals. These panels can be covered in tile or carpet. Wires penetrate the panel through removable cover plates or specially drilled holes. Ample space exist in the floor plenum to run any number of wires, air ducts can be placed in this space also.

It suffers the same short comings as other floor systems, namely, susceptability to water damage, and the hazard of raised floor fixtures. Running wires beneath a floor requires removal of floor panels and possible moving of funniture, or someone may



16
a. Raised floor – infinite distribution

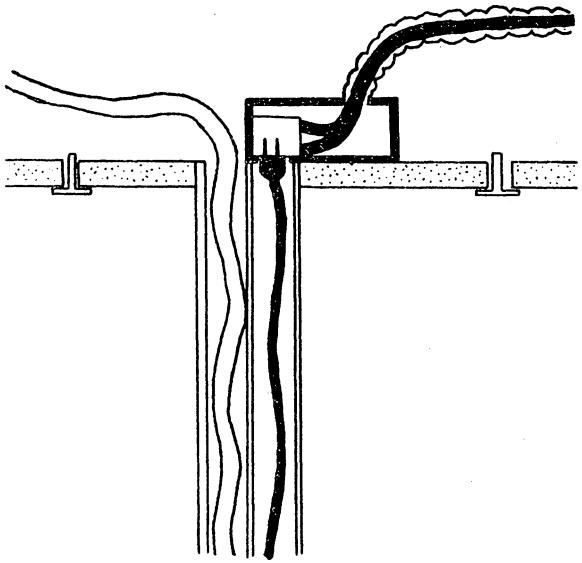


b. Plan view – distribution of services

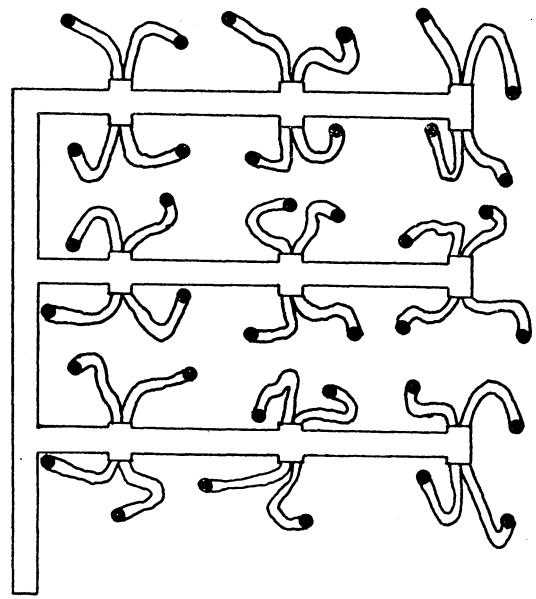
have to crawl through the plenum and pull the wire. Obviously, a technician is required to install this system. If a panel has been drilled to allow for the penetration of wires, then the removal of that fixture will require replacing the panel or patching the hole.

Integrated Ceiling - the integrated ceiling is similar to the raised floor except that the panels are laid into a suspended ceiling. (See Figure 17) Services are delivered across the ceiling plenum and down through tubes connected to the ceiling panels, these panels are movable anywhere on the grid. The service columns can be located at any desired point. This type of ceiling, if well designed, can handle without conflict air supply and return, lighting, acoustic speakers, power and communication systems.

This system conforms to work space needs not vice versa. Adding wiring into the plenum is a simple procedure but requires a technician, since ladder access to ceiling is required. If a service column is removed, the ceiling panel must be replaced since it has a hole in it, and the color of the new panel may not match the old ones.



17
a. Above ceiling – infinite distribution



b. Plan view – distribution of services

Lighting

Twenty-five percent of all electrical energy consumption in this country goes toward lighting. By 1980, this figure is expected to be equivalent to 5.895 million barrels of oil daily.[23] Twenty-five to sixty percent of the cooling load of an office building is directly attributable to the heat produced by the lighting system.[24]

Light is the media by which we attain most of our information. As important as good lighting is, its uses are often given too little consideration in design of buildings. This is especially true of offices. It would be safe to say that the majority of offices are lighted by a single system of flourescent tubes located at the ceiling. Is this adequate? The answer is 'no'. A typist may need high intensity lighting on a letter she is typing; a draftsman may need high intensity light on a particular detail that he is trying to draw. An operator at a computer console may require a low light level on a video screen and a higher light level on the console keys; only general lighting may be necessary on the adjacent writing surface and finally, the plant beside

her desk needs a very high illumination level. There is no shortage to high intensity, spot and flood lighting, fluorescent and incandescent lighting are available in an array of shades and colors.

Following are descriptions of the two most common lighting techniques - fluorescent ceiling and task lighting units.

A - Fluorescent Ceiling System

Most offices are lighted by fluorescent ceiling fixtures; they are less expensive to run and maintain than incandescent and they generate more foot candles per watt than incandescent. They last longer therefore requiring fewer replacements. They burn cooler and create a lighter cooling load on the air conditioning system. However, a fluorescent ceiling is not flexible enough to meet all lighting situations, and if used exclusively, this savings in money must be weighted against the reduced efficiency of office workers, each earning anywhere from twenty-five to over one-hundred dollars per day.

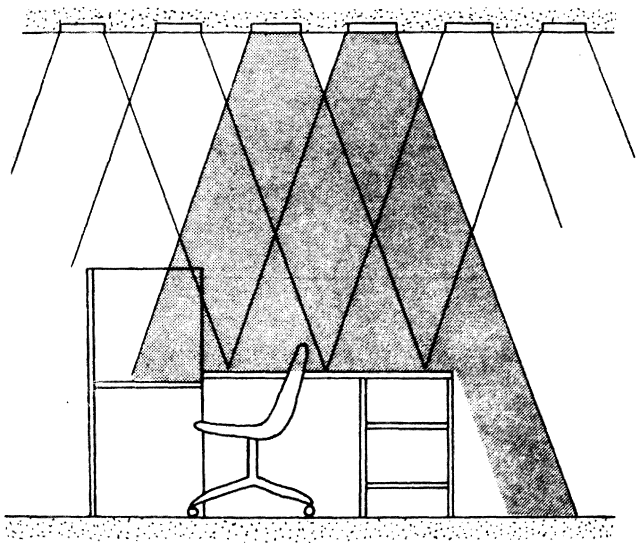
There are three techniques for installing fluorescent lighting:

recessed, flush and suspended. (See Figure 18, A, B, C) Recessed lighting is often used in integrated ceilings, flush lighting is most often found in suspended ceilings. Suspended lighting fixtures are usually installed where suspended ceilings are not used, (i.e. - concreate cofter ceilings, plaster ceilings, concrete slab or concrete T's, etc.). Fixtures normally consist of one, two or four tubes, and larger units may contain as many as eight or sixteen. Most fixtures use four foot tubes; eight foot tubes are the second most popular.

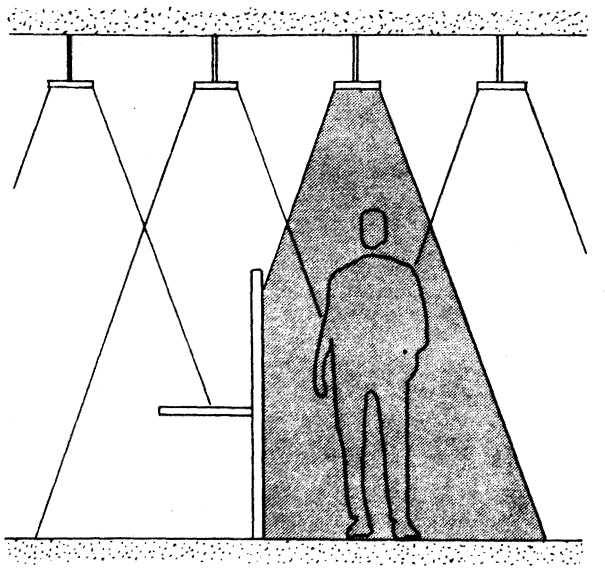
Fixtures are usually wired together in banks; if only one person is working, energy is wasted, since an entire bank must be cut on. Hauserman Incorporated has a switching hook-up that allows only a few luminaries to be switched on; however, maintainance personnel would have to be called in to do any rewiring. Offices with this type of lighting are usually characterised by a dulling visual sameness, there exist no variety nor differentiation.

B - Unit Task Lighting

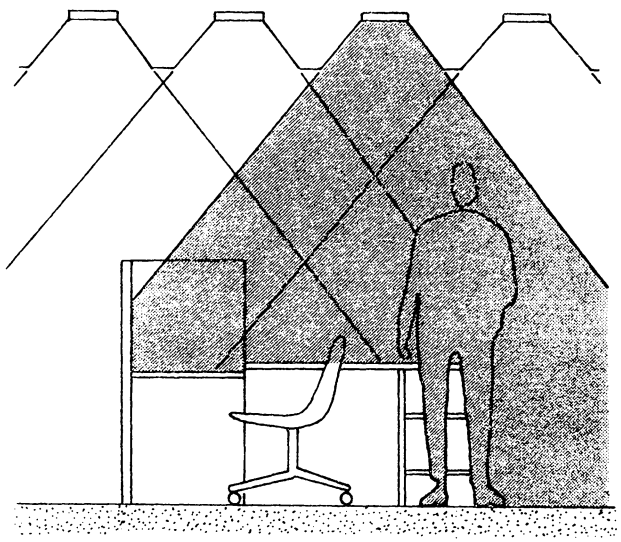
These units are usually small 18"



18
a. flush fluorescent lighting



b. suspended fluorescent lighting

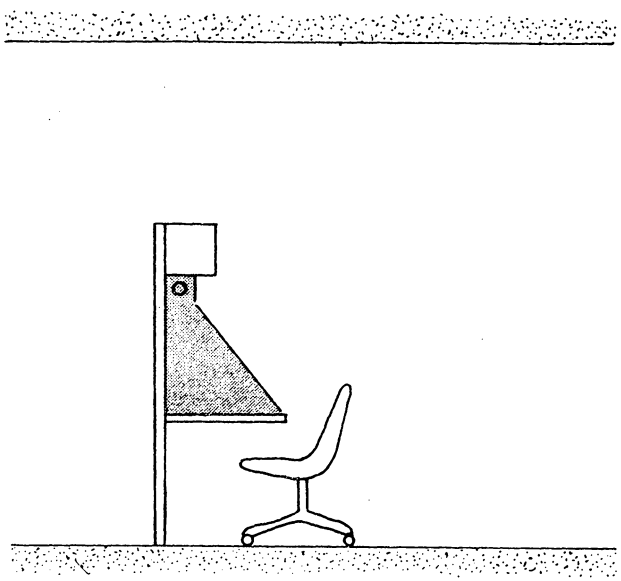


c. recessed lighting

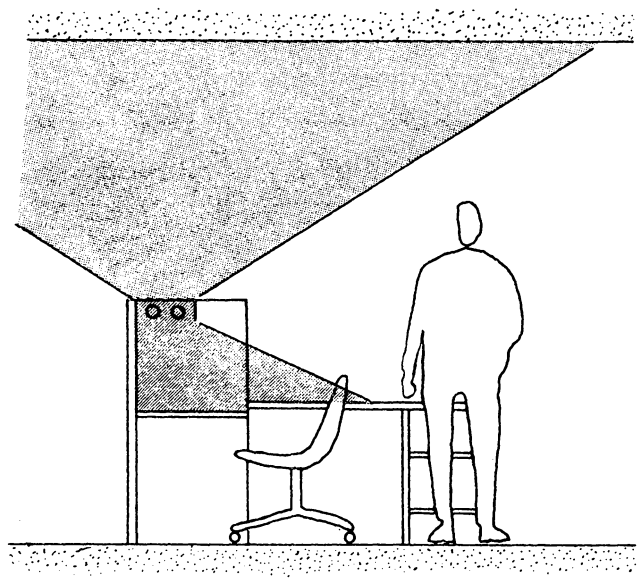
or 24" fluorescent tubes that attach to a work unit and are divided into two categories, movable and non-movable. (See Figure 18 D & E) Being within reach of the user, the tubes can be easily changed. Individual units can be cut on and off by the workers. Shadows cast by cabinets and shelves are eliminated.

The non-movable type were developed for attachment to landscape office panels. They usually are located below overhead storage cabinets and may not always meet specific need. Sometimes it would be necessary to have the light closer to the work area than these fixtures could allow. These units attach to the panel system and are restricted in their placement. A typing return without a backing panel would have nothing to attach the fixture to. The latest development in nonmovable task lighting is by J. G. Furniture Company. They sell a workspace with a built-in 72" or 96" fixture that provides both task lighting and ambient light reflected from the ceiling. No ceiling fixtures are necessary.

Movable task units are the every day desk lamps that either set on the work surface or are clamped to the edge. They are either incandescent,



d. task lighting



e. task and ambient lighting

Lighting techniques

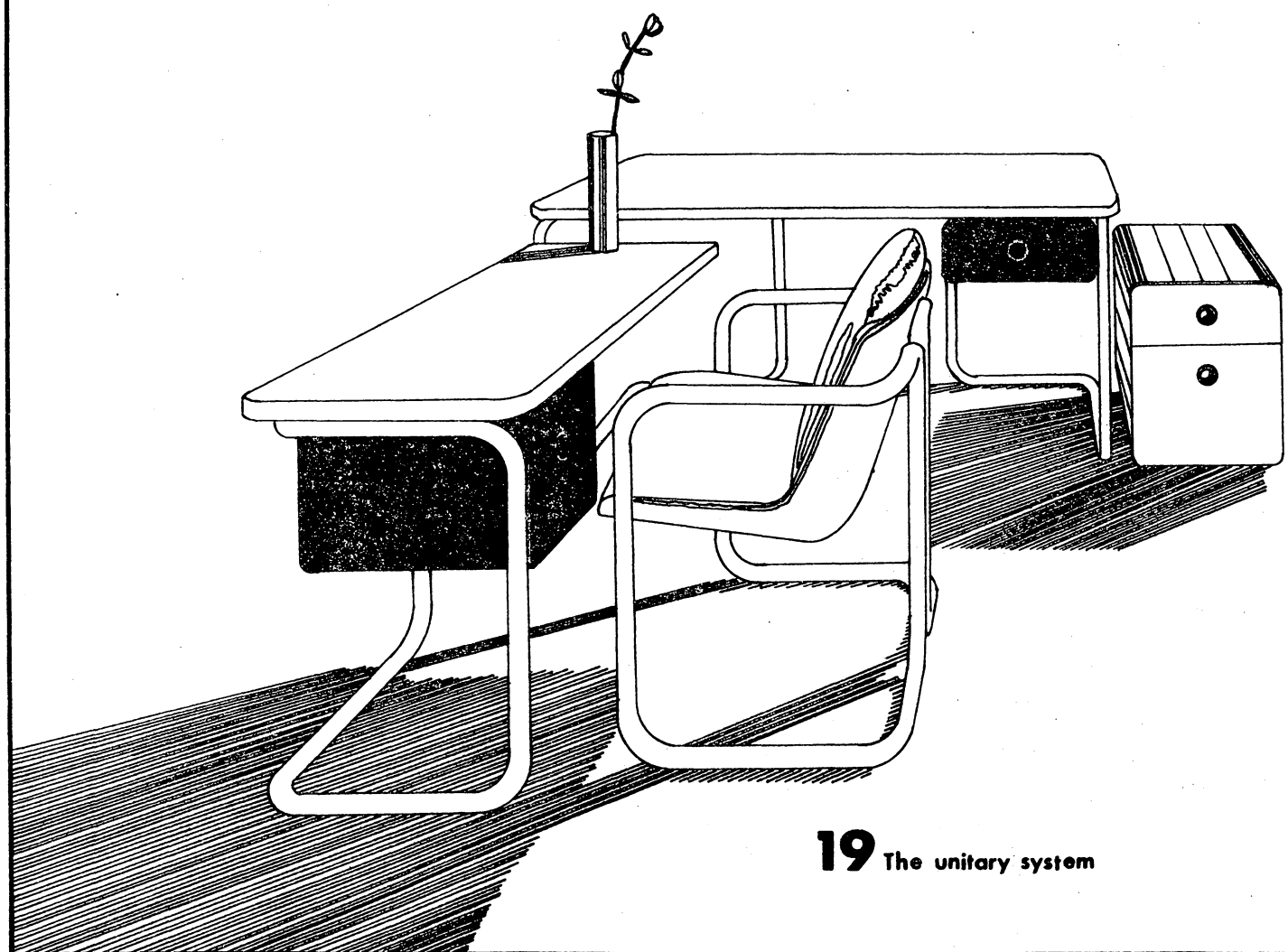
fluorescent or both. They have the ability to be positioned where needed at correct height and angle. Their only drawback is that they may take up needed space on the desk top.

Furniture Systems

Three types of furniture systems are used in open plan offices: unitary (separate individual components), panel, and storage wall. Within each type there are many variations because there are many manufacturers. Some furniture system don't fit well in to any category as they employ elements of all three.

A - Unitary

Independant equipment operations is the most notable characteristic of the unitary system. (See Figure 19) Work surfaces, storage files and visual screens are loosely integrated for increased flexibility. Work surfaces are kept light by mounting them on tubular steel frames so that they can be easily moved about by the workers. Storage drawers and file units are often mounted on c asters for easy mobility. Acoustical visual



19 The unitary system

screens may double as display areas (tack boards, charts, chalk boards) but are not intended as panel mounted storage areas. The purpose of the screens is controlling sight lines, creating privacy and absorbing sound. The OES (Open Equipment System) by Designcraft is one of the better unitary systems available.

Three weaknesses characterize the unitary systems. Lack of variety in components; organizational needs may arise that the system may not be able to respond to. Consideration for integration of electrical, communication, or lighting sub-systems is limited. The system relies on existing in place services. Unitary systems do not take advantage of vertical space.

B - Panel Systems

Attachment of storage elements, lighting, wire runs, work surfaces and display areas to vertical panels is the theme of the system. (See Figure 20) The vertical panels are the skeleton onto which the other elements are secured. Most manufacturers offer two or three heights of panels in numerous widths. Many manufacturers also make full height, floor to

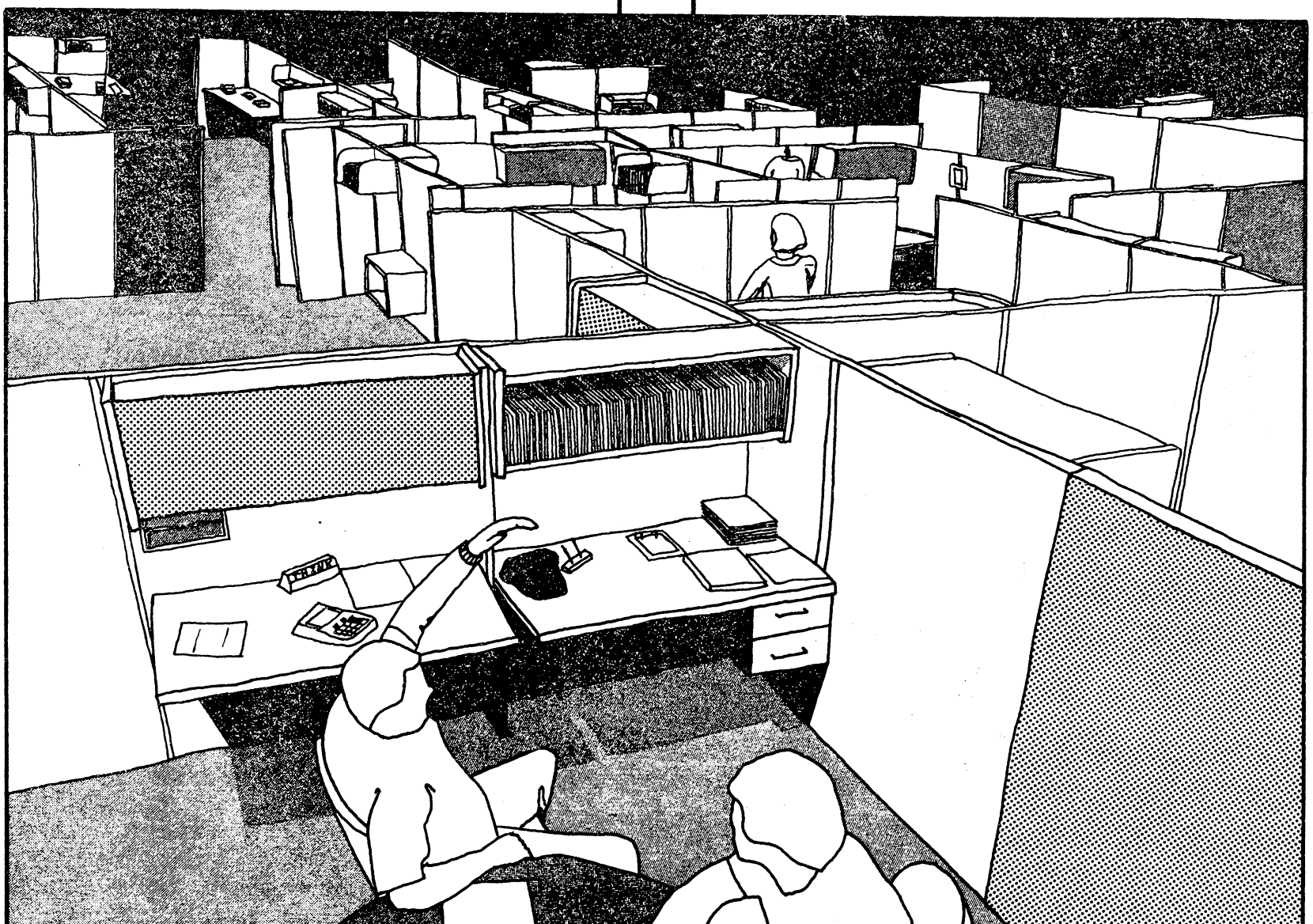
ceiling panels to create complete privacy. There is little compatibility between the components of different manufacturers; either due to patent protection or an attempt by the manufacturers to lock a client into a system. Service columns supply power, communication, and light switches are standard equipment in many systems. Power and communication can be fed into the panels through floor distribution systems or through flexible tubing from the ceiling. All these electrical systems require a technician for installation.

Storage elements are supplied in the form of storage cabinets, drawers, tub files, and shelving; all of which attach to the panels.

One of the best employment opportunities for the wheelchair handicapped is in the office. The panel mounted work surfaces can be installed at the correct height for the arms of the wheelchair to clear underneath. However, the free standing work surfaces are all too low. This is an even greater problem in the unitary and storage wall type of furniture systems because a panel mounted work surface doesn't exist.

Taking advantage of vertical space is what the panel hung component systems do best. The panel is also

20 The Rat's Maze



one of its conceptual flaws in that it reduces person to person communciation in the office. The original European office landscape concept behind the panel was to define groups and create privacy where necessary. In the American versions, by tying panel and storage components together, the placement of panels is no longer governed by visual criteria but by storage and access to the storage. Visual preferences and storage may conflict. The tendency then is to turn offices into rat like mazes. (See Figure 20) It's quite ironic really, the original landscaping concept was supposed to open up the office. It was criticized for its lack of storage provisions. The American versions solve the storage by recognizing the value of vertical space, but destroyed the original concept of openness and communication.

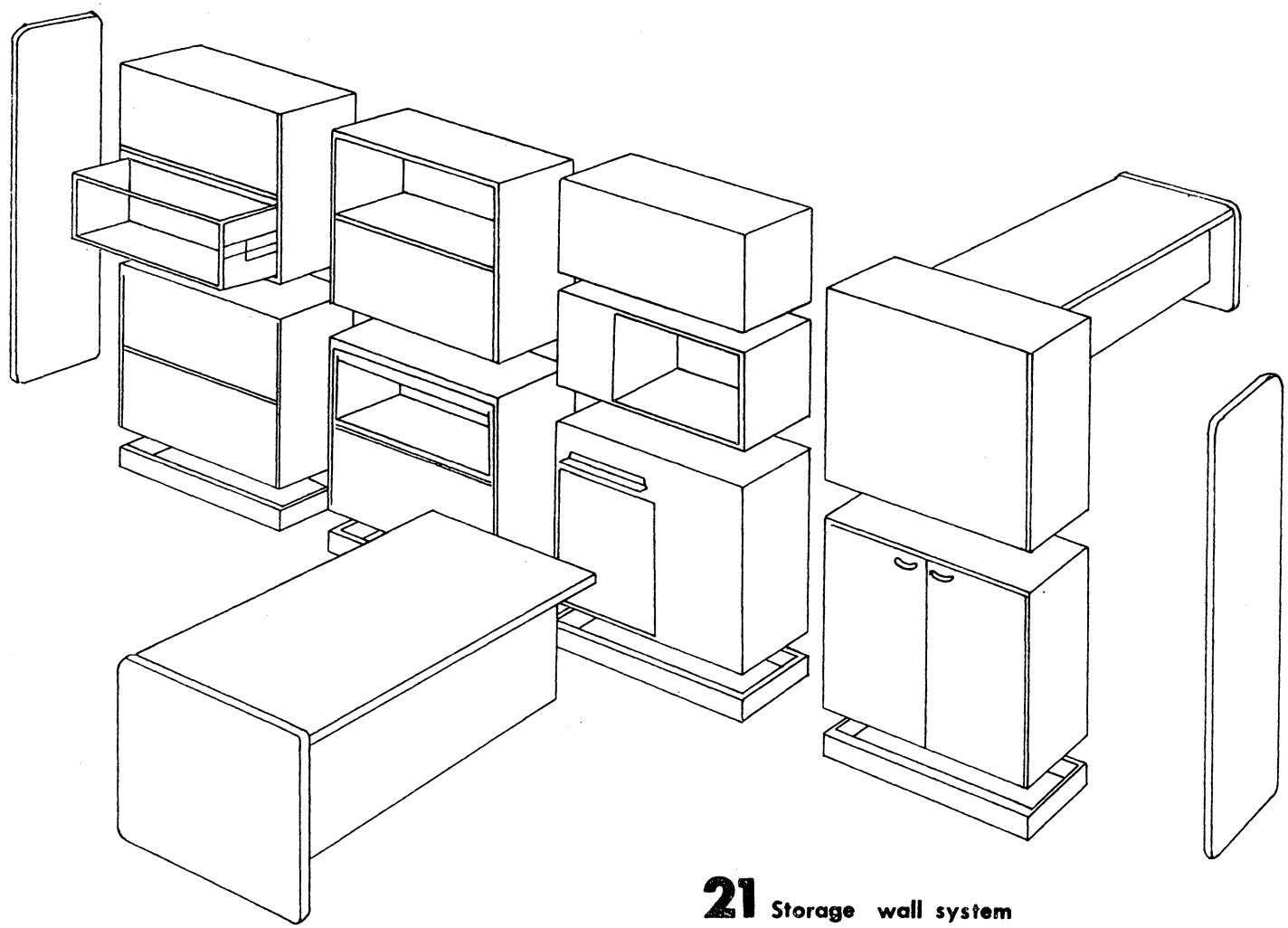
The OIS (Office Interior System) by Hauserman, the Uni-group by Haworth, the ASD system by Westinghouse, and the Action office by Herman Miller are examples of the better panel systems available.

C - Storage Wall Systems

Stacking of individual storage

elements creating walls is the core of this system. (See Figure 21) Numerous modular storage components containing various files, drawers, cabinets, and communication equipment may be stacked as high as seven and a half feet in some systems. One end of a work surface may attach to the storage wall or it may be free standing. The storage boxes are mounted on a base which can hide electrical outlets beneath it. The total unit would be more flexible if casters were attached to the bases. That way the entire unit could be rolled around in a reorganization avoiding unstacking and restacking. The building block concept suffers a major drawback in its application. The individual storage units can only service one side of the wall at a time, the problems begin when two people on opposite sides of the wall need a cabinet in the same place.

The Conweb Concept and the Reff Environment 4000 and 5000 are two storage wall systems.



21 Storage wall system

chapter 4

page 70

an adaptable office system

"We have today a consensus on the need to get the most of any investment in a new office building and all operating expenses connected with it. Designing beautiful facades, impressive entrance halls, and luxurious executive suites is not enough... The Quickborner Team's professed aim is to plan office buildings which not only meet fully the requirements of office procedures, but also environmental and "work-needs" of the office personnel - not only for today, but for the entire life span of the building."
The Quickborner Team

CHAPTER 4

AN ADAPTABLE OFFICE SYSTEM

This chapter presents a user oriented hardware system for a changing office environment. Flexibility-adaptability are the key words of the system. All component elements can be quickly and easily moved. The system was designed to be operationally simple, require a minimum of tools to assemble it (one allen wrench) and be within the capabilities of an average office worker to operate. Keeping in mind both dimensional and weight factors, all components have been scaled to be handled by a single individual.

Power and Communication

This section gives a description of the power and communication distribution devices. How the equipment works and how to install it is covered. Although power and communication services are provided through the same devices they will be explained separately.

Electrical power, both 120 volts and 220 volts, is distributed

throughout the office via parallel ceiling tracks. (See Figure 22) The track is 1 3/8" wide and 2 1/8" in depth. It is made from extruded anodized aluminum. The copper electrical conducting strips are protected from the housing by PVC (polyvinyl chloride) insulation. (See Figure 23) The tracks can be three to four feet on center and may be part of a suspended ceiling. (See Figure 22) The power is brought down from the ceiling through a floor to ceiling service column that plugs into the track. The service column is 2 1/8" in diameter and made from extruded anodized aluminum tubing. Thirty inches from the base of the service column is located the outlets for 120 volts (2), 220 volts (1), and a co-axial communications socket.

The head end of the service column contains the electrical contacts that engage the electrical strips in the track. The upper two contacts carry 220 volts and the lower contacts carry the 120 volts line. When not in use the contacts are recessed into the head of the service column. They are made to protrude when the lower portion or the service column is rotated one turn. (See Figure 25) The service column can be plugged into the track anywhere along

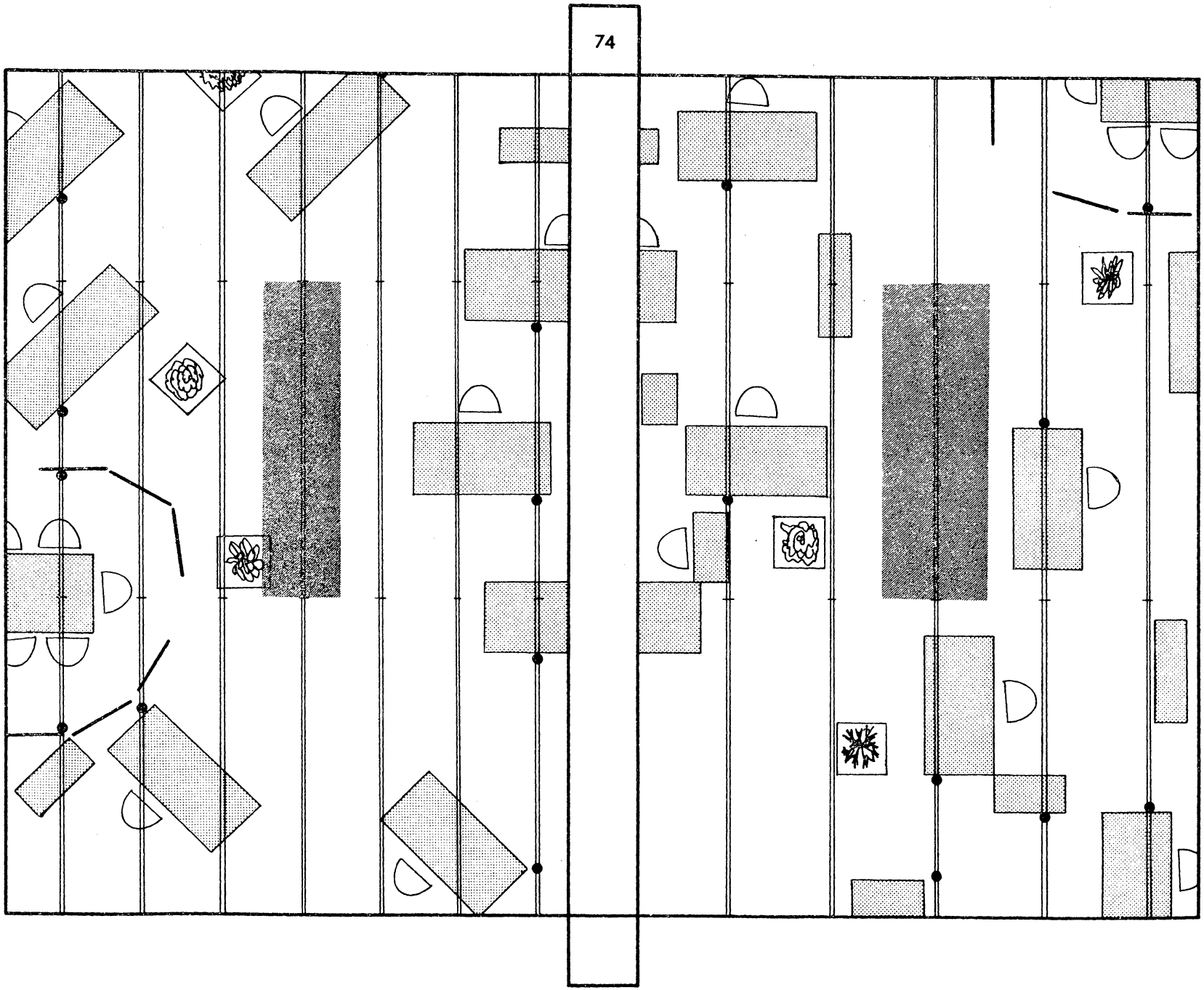
Zone serviced———

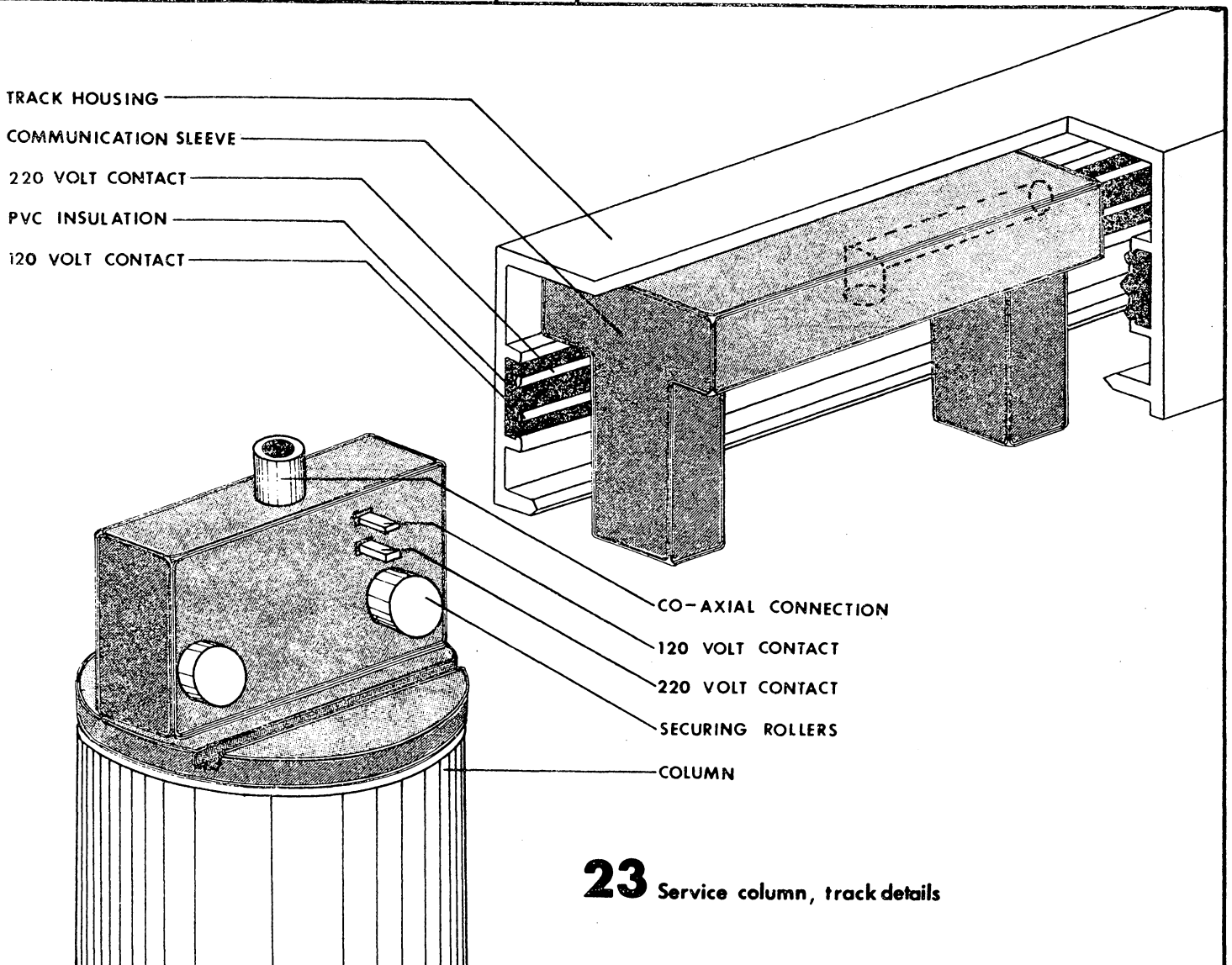
Zone serviced———

22
Service track distribution

a. 3 foot parallel

b. 4 foot parallel





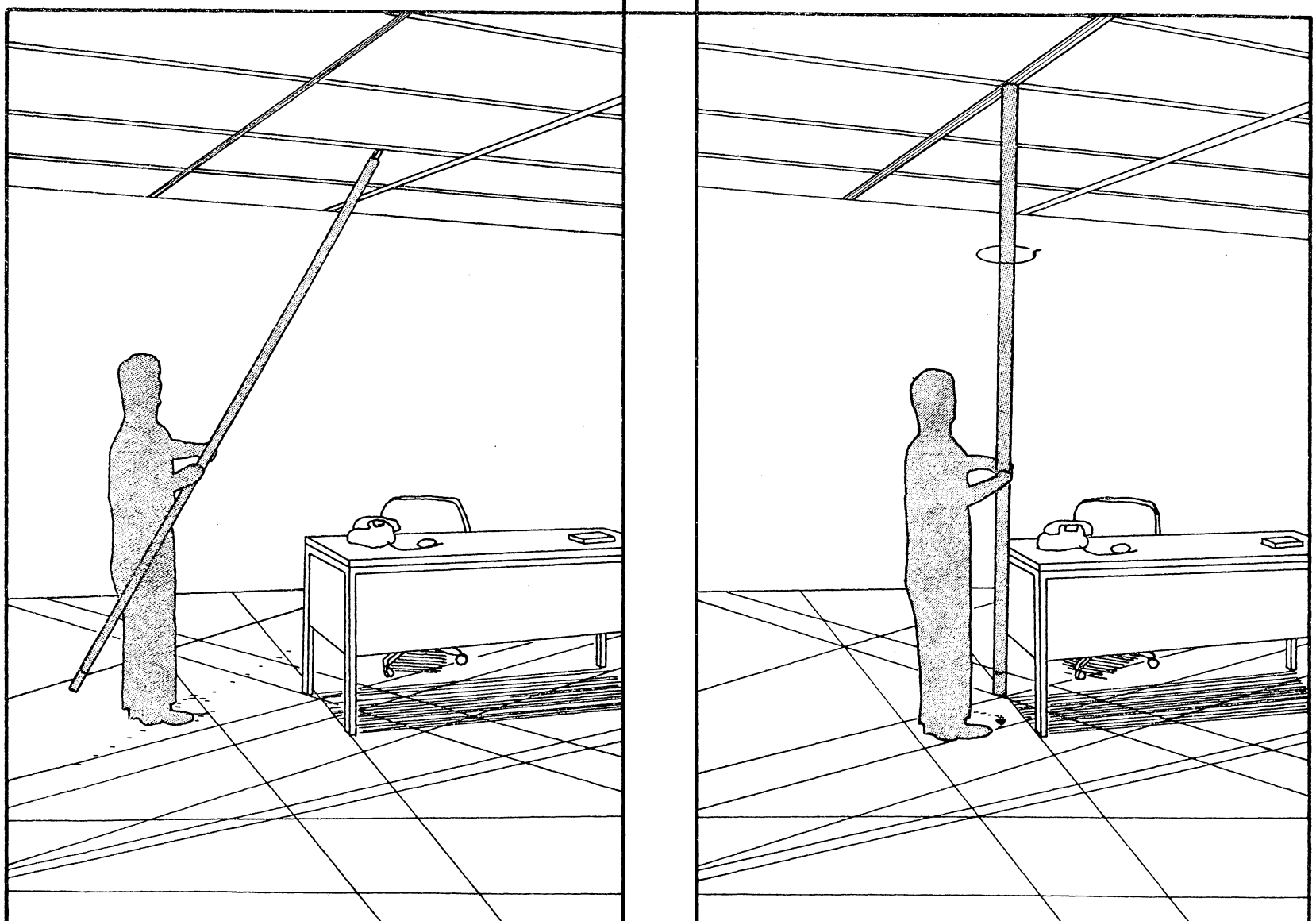
23 Service column, track details

24

Installation of service column

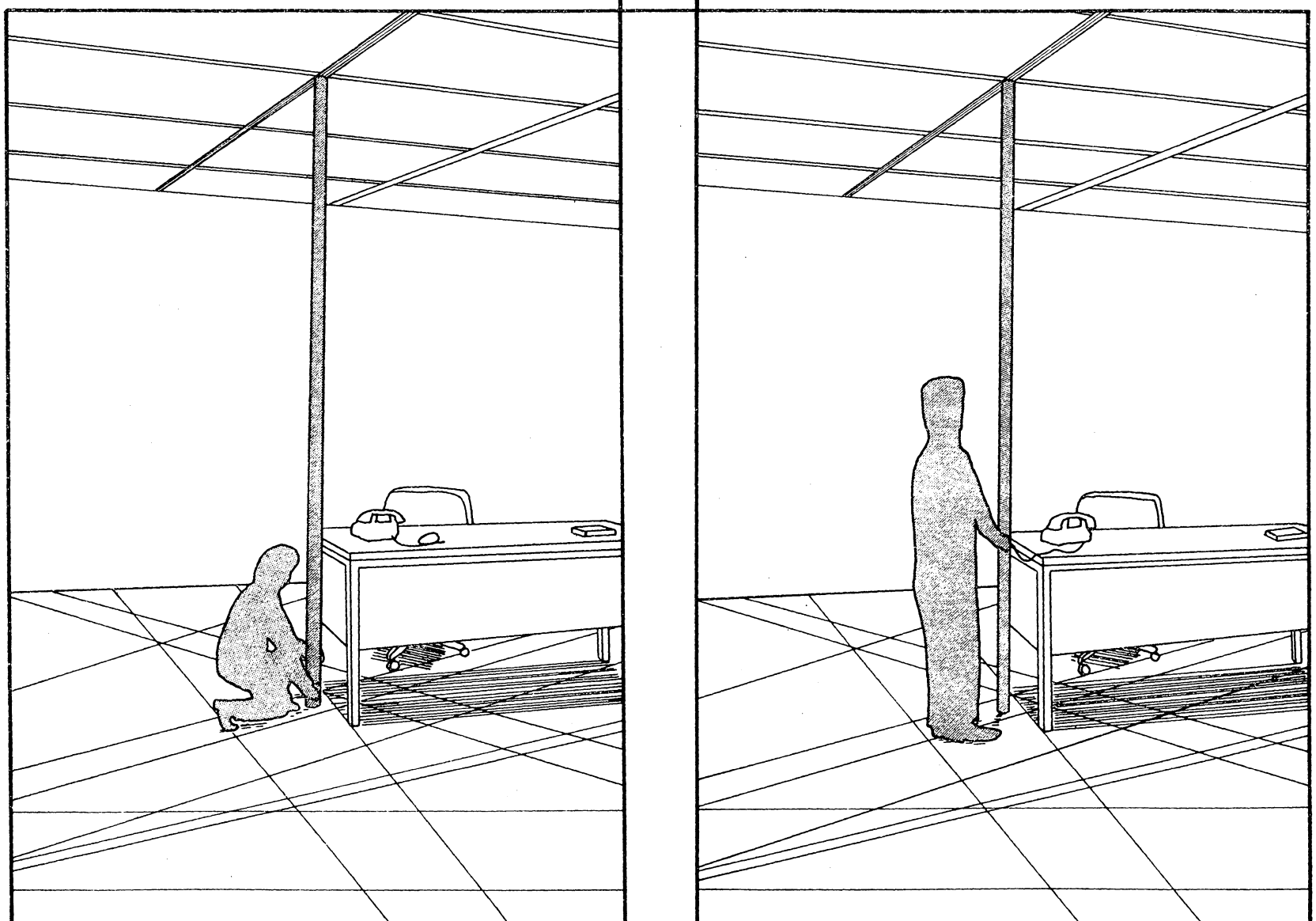
a. Insert column into track

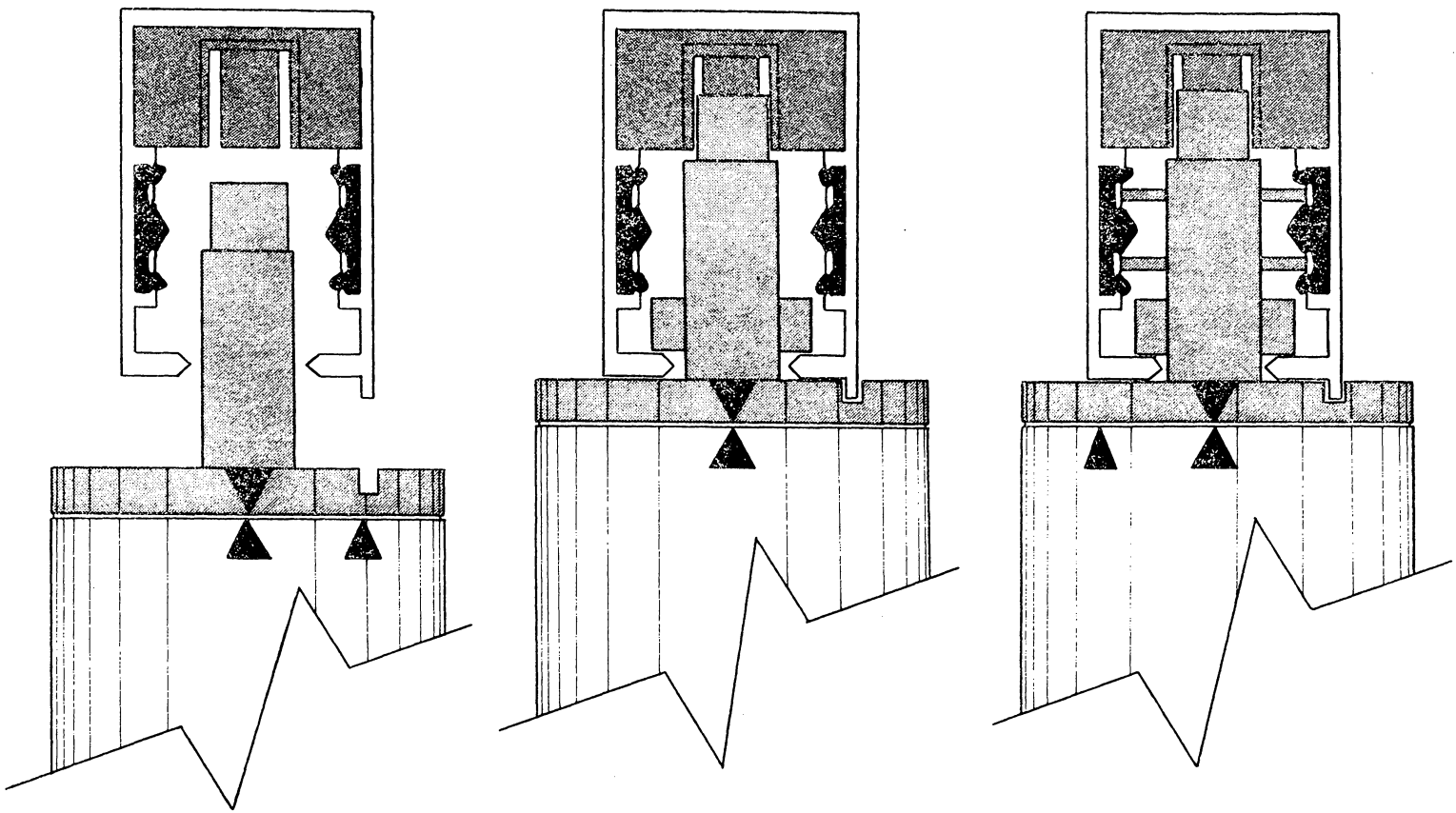
b. Rotate column to secure pole and complete circuit



c. Extend spring loaded base

d. Plug in equipment





a. insert

b. 180° rotation

c. 340° rotation

25 Installation of service column

its length. Installation of the column for electrical power only is accomplished in four steps. (See Figure 24)

1. Place connection end of the service column into the track.

2. Turn the column one revolution. The first half of the turn will secure the service column. The second half of the turn will cause the electrical contacts of the service column to engage the electrical leads in the track.

3. Make sure the service column is vertically aligned and then engage the spring loaded base.

4. Plug in the power consuming equipment.

To remove the service column just follow the steps in reverse order.

This section specifically concerns communications and is divided into three parts The first part explains how the broadband cable works and list its capabilities. The second part describes the distribution hardware and the third explains how to install it.

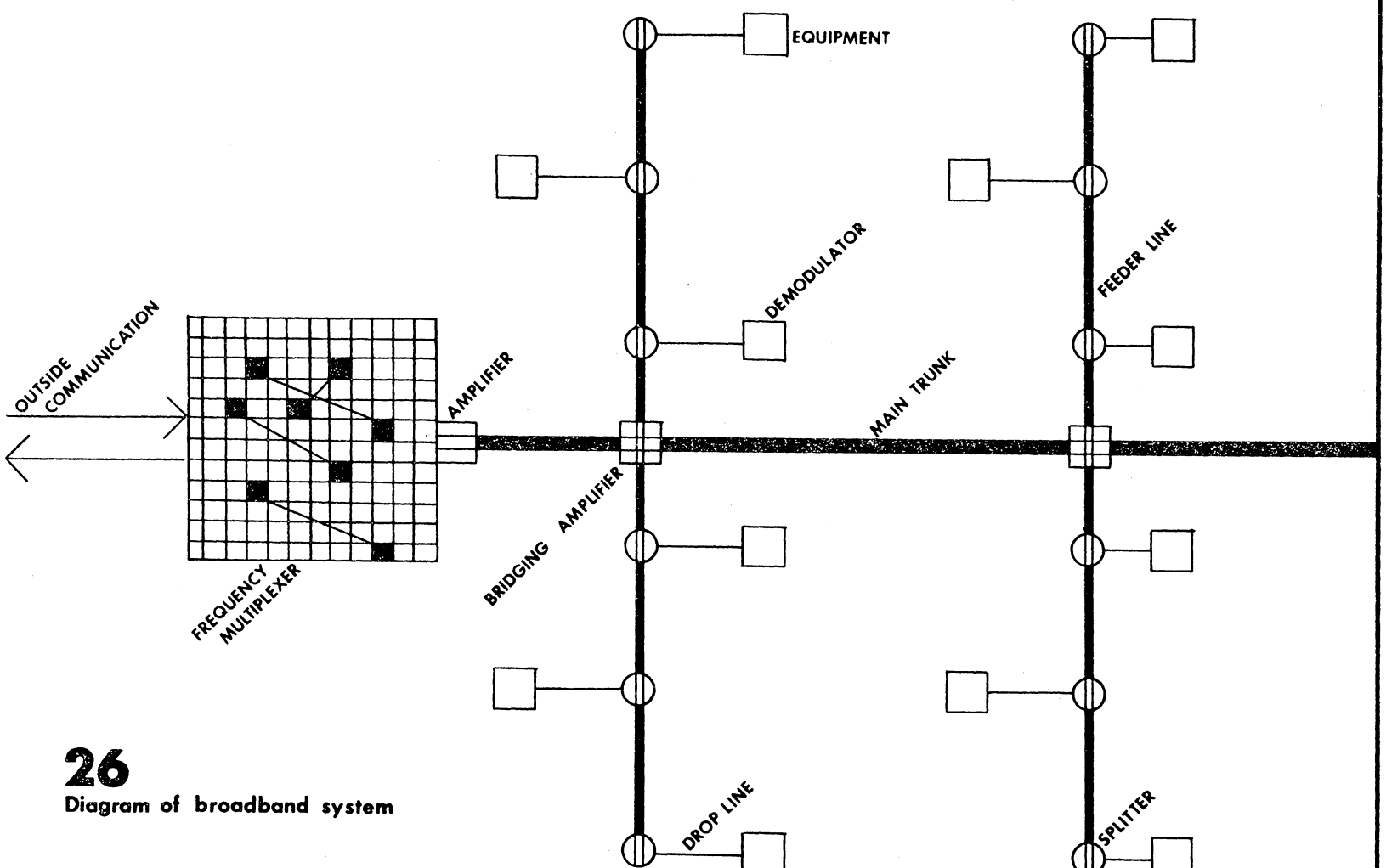
The broadband communication system is a mass distribution network employing only one cable for carrying all signals. The system also uses a series of amplifiers, a frequency multiplexer, and signal splitters.

(See Figure 26) It is very similar to the cable television systems now in use throughout the country.

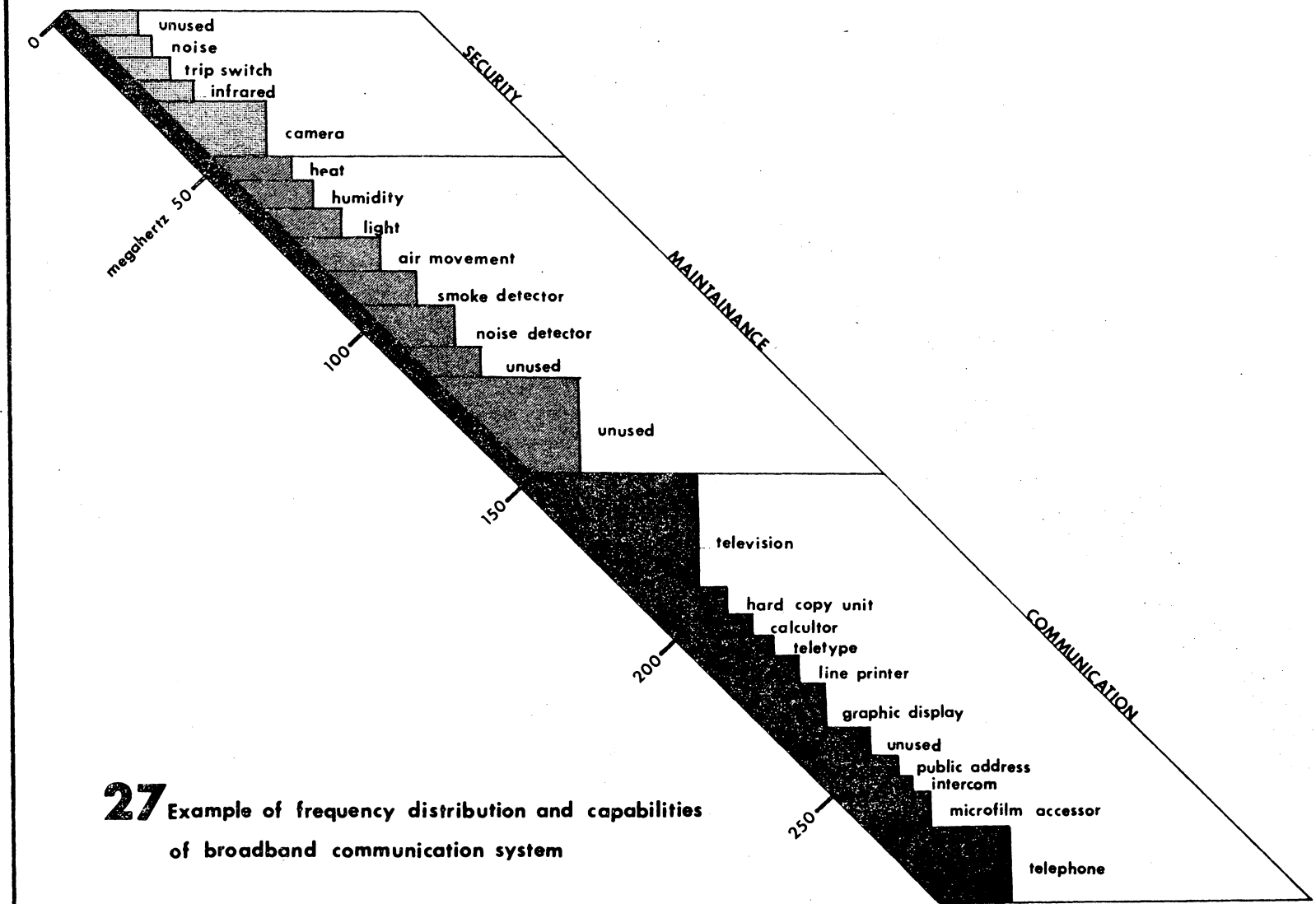
Co-axial cable has a very wide frequency capacity, 1 - 300,000,000 hertz. Each communication device plugged in to the cable uses only a small specific portion of the total bandwidth and no two communication devices use the same bandwidth. (See Figure 27) A telephone uses only about 3,000 hertz; a 1 - 300,000,000 hertz system could handle upwards of 100,000 telephones. Signals are sent throughout the cable network to the communication devices after being processed by a frequency multiplexer which modulates the signal to the bandwidth that the device is set up to receive. Example: A telephone call from bandwidth 'a' is modulated by the multiplexer to bandwidth 'b' which can only be picked-up by telephone 'b'. Signals traveling from telephone 'b' are processed through the multiplexer and modulated onto bandwidth 'a'.

The broad band communication system has three major benefits.

1. It uses only one cable to carry all signals. If a new information system needs to be added to the building, there's no problem. The computer would simply assign each new device with a bandwidth. A



26
Diagram of broadband system



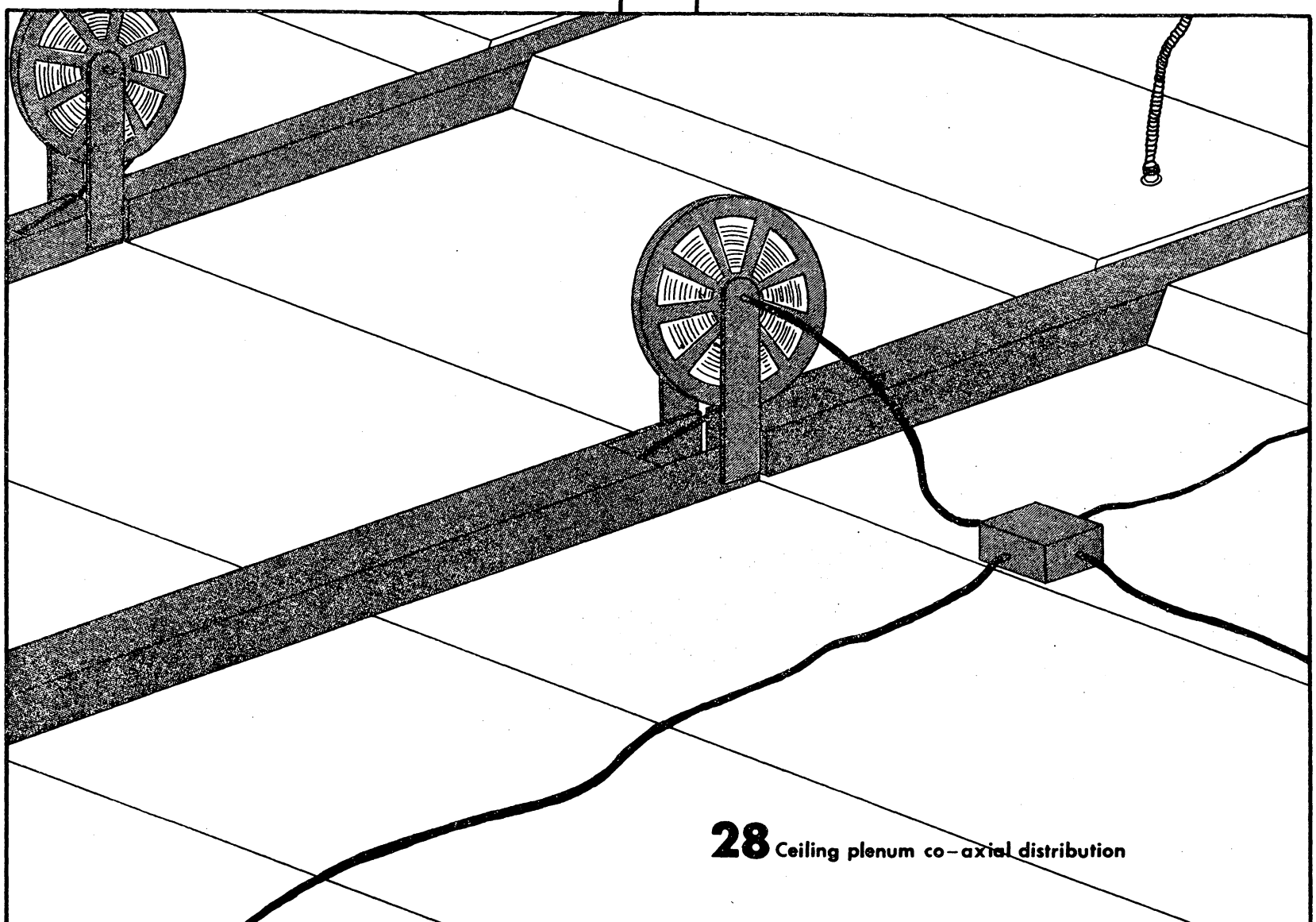
27 Example of frequency distribution and capabilities of broadband communication system

receiving-demodulation mechanism would be attached to the device and the device would be immediately operable. No new wires would have to be run.

2. The system can carry the signals from dozens of different information systems: telephones, intercoms, closed circuit television, thermostats, burglar alarms, etc. (See Figure 27) Information systems can be added or taken away at anytime.

3. any communication device can be moved at anytime. Just unplug the device from the service column, carry it to another location, plug it in to the nearest service column and it is immediately operable. There is no longer any need to call a technician.

The co-axial cables are distributed in the plenum above the ceiling. (See Figure 28) The cable uses two conductors, a copper wire conductor at the center covered by insulation and a foil conductor that covers that. A layer of insulation covers the foil. The cable is connected to a take up reel located at the end of a ceiling track, it dispences cable to a communication sleeve which slides along the inside of the track. The reel maintains a constant tension on the cable to take up any slack. The communication sleeve is made from PVC and contains



28 Ceiling plenum co-axial distribution

the male plug that receives the head end of the service column. Also within the sleeve is a 70 ohm resistor that automatically engages when a service column is not plugged into it. This is done to maintain the strength of the signal. At the top of the service column is the threaded female socket piece. The male plug and the female socket are secured by one revolution of the service column.

Connecting the communication system is similar to connecting the power.

1. Place the end of the service column into the communication socket that is located in the track.

2. Turn the column one-half revolution. This will secure the column.

3. Slide the service column to its desired location.

4. Turn the service column the final one-half revolution. This will complete the connection of the co-ax cables.

5. Engage the spring loaded base.

6. Plug in communication device.

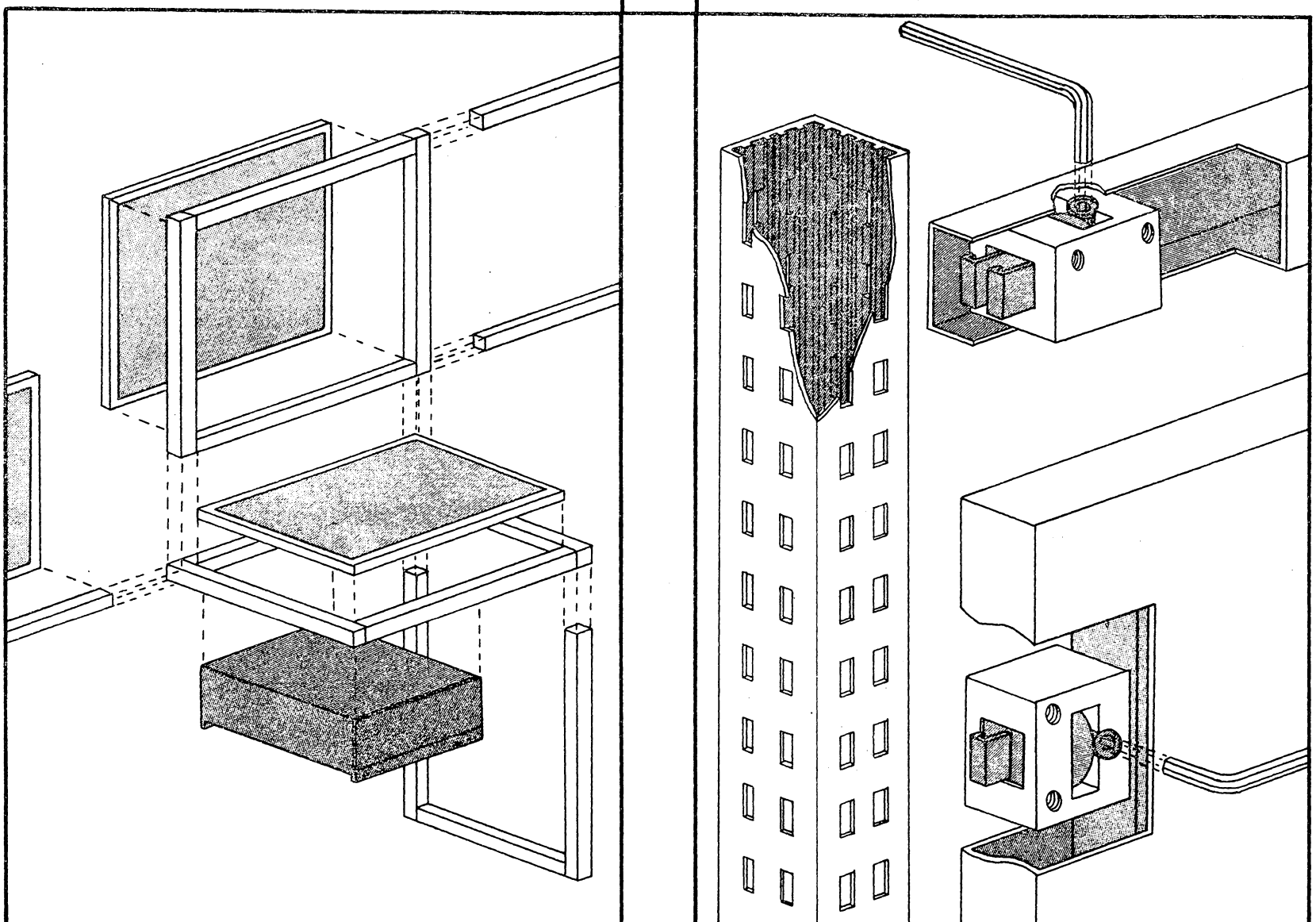
Furnishings

The furniture system is composed

of tubes and panels. The tubes are used to erect a framework, into which the panels can be inset. (See Figure 29) This method allows the individual to form his or her work environment the way they want it. The degree of closure can be controlled, having the option of complete visual openness or visual privacy.

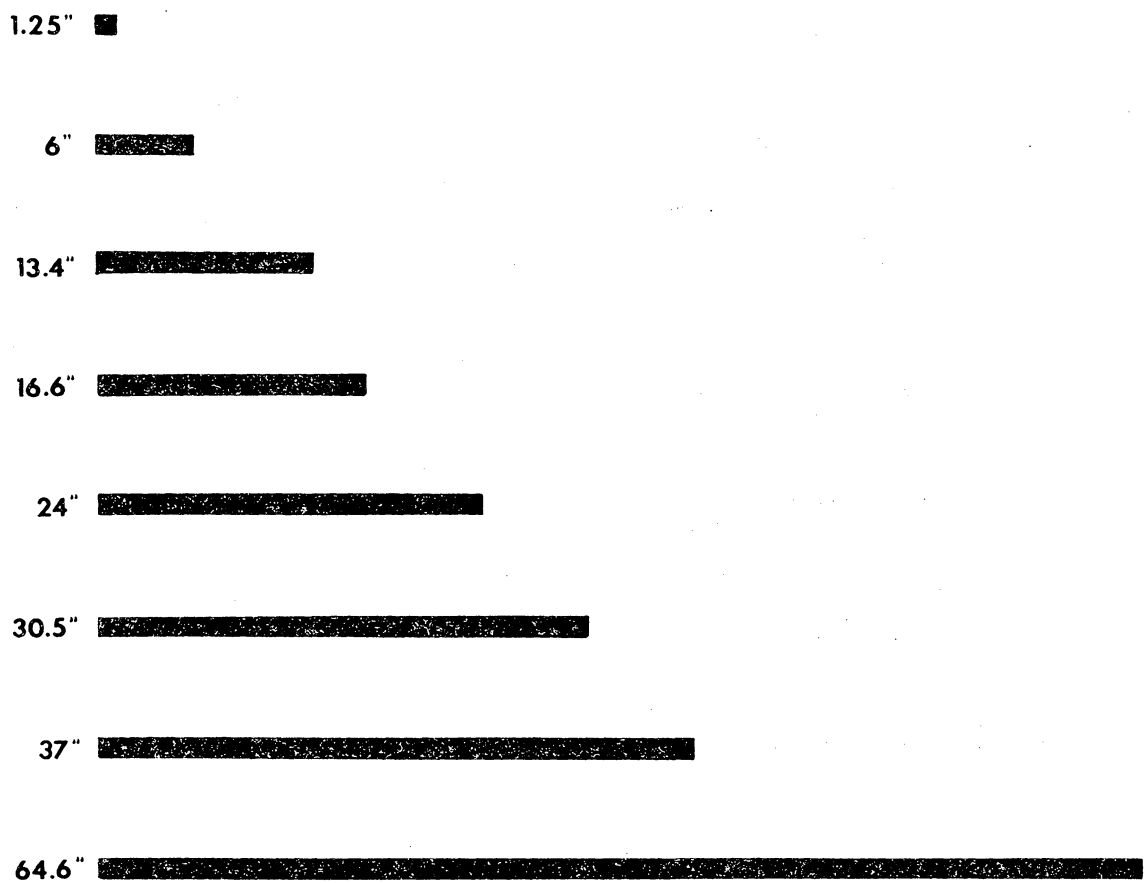
Work spaces can be tailored to the individual person. Tall people can have high work surfaces and high storage elements; short people can keep these elements low. An individual in a wheelchair can keep file drawers raised above the floor and work surface can be placed high enough so that the arms of the wheelchair will clear underneath; while overhead storage elements can be kept low within easy reach.

The tubes are made from extruded anodized aluminum which are cut to length. For this study seven lengths of tubes plus one socket piece have been used. (See Figure 30) At the end of each tube is a worm gear locking mechanism for securing tube to tube. (See Figure 31) Retractable clasping hooks penetrate the sides of the tube and tightly secure the two tubes together. (See Figure 32) The only tool needed to attach the tubes together is an allen wrench.

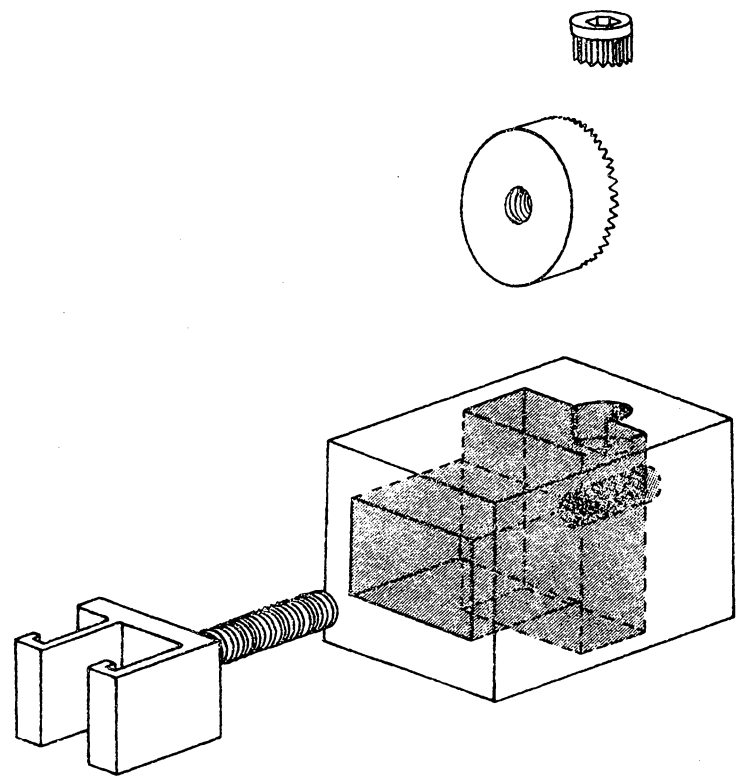


29
Organization of elements

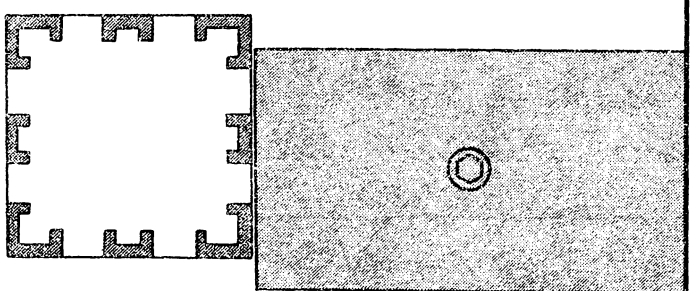
a. tube detail
b. tube connector
c. panel connector detail



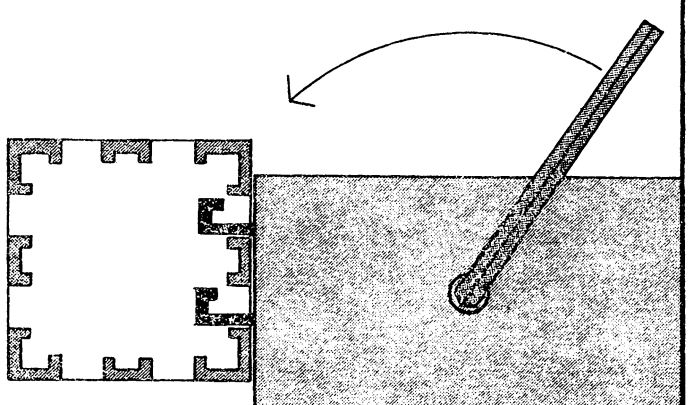
30 Tube sizes



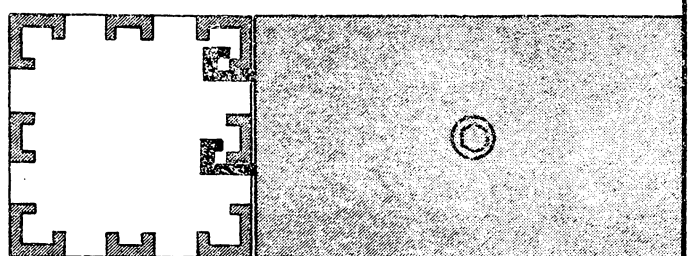
31
Detail of tube – end connector



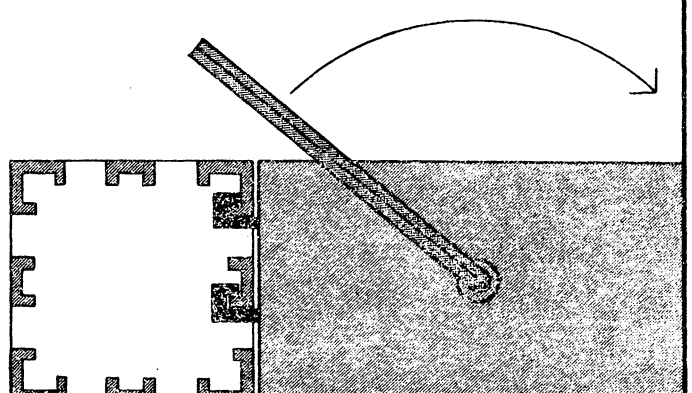
a. position tubes



b. extend clamps



c. move tubes into place



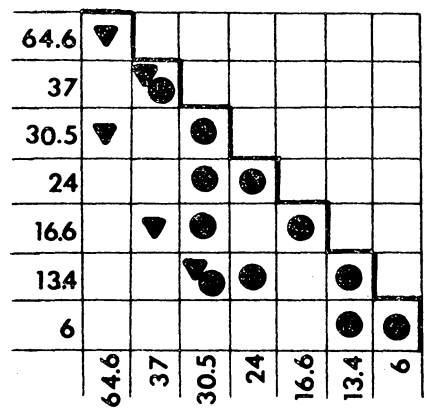
d. retract clamps

32 Tube connection procedure

Eleven panel sizes were used for this study, corresponding to particular paper sizes and anthropometric data. (See Figures 33 and 34) The largest panel is 37 inches square: sizes larger would be too cumbersome for one person to easily manage. Surfaces larger than this can be made by combining multiple panels and tubes. The panels are attached to the tubes with the same type connection device as used in the tubes. (See Figure 29) One side of the panel can be used as a work surface while the other absorbs sound.

The panels are of sandwich type construction at 3/4" thick. The core is a 5/8" thick aluminum grid frame with cells 4" square. The cells are filled in with 5/8" thick rigid acoustical fiberglass. One side of the frame is covered with 24 gauge cold rolled steel, the otherside is covered with 20 gauge cold rolled steel that is perforated with holes. the perforated side is then fabric covered. An NRC (noise reduction coefficient) of .40 could be expected. (See Figure 35)

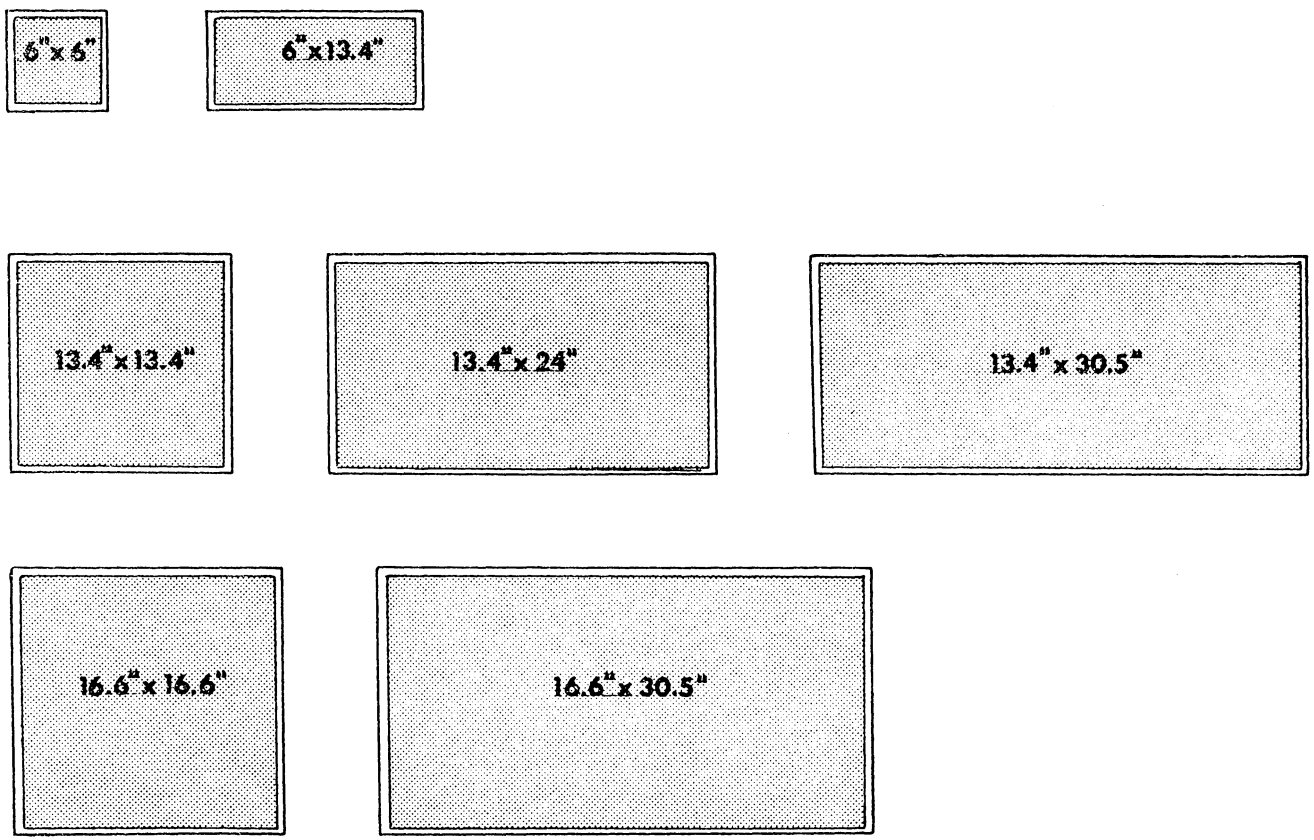
Accessory equipment is provided in the form of plastic tube ends, coasters, door swing limiters, tube end levelers and hinges. The hinges can be attached to either tubes or



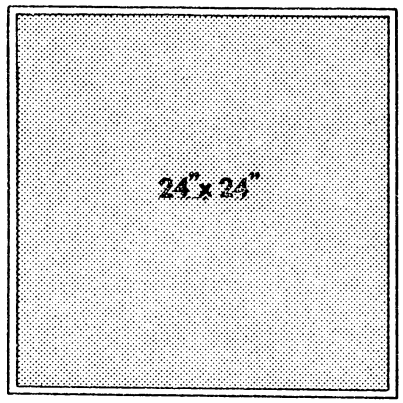
33

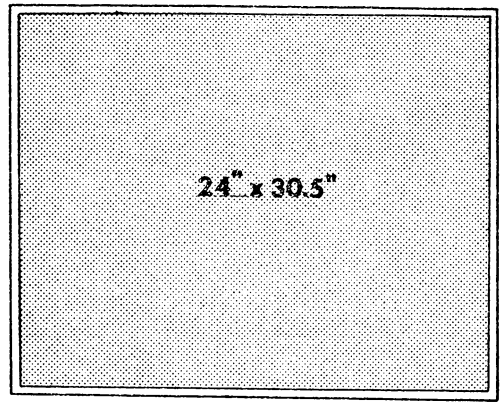
● Available panel sizes

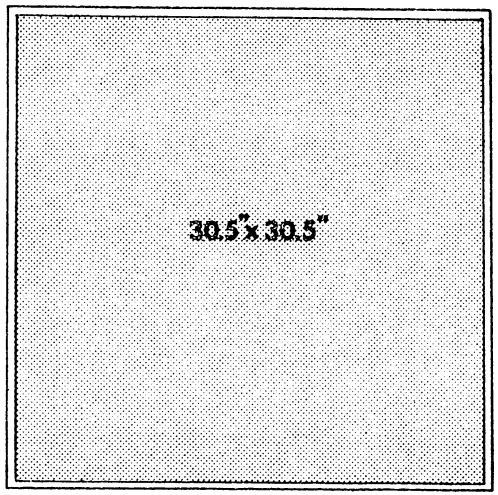
▼ Composite panel sizes

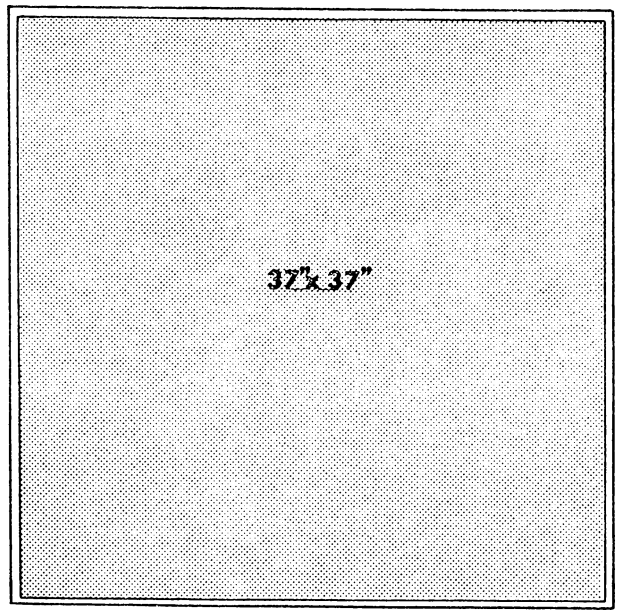


34 a. panel sizes nominal







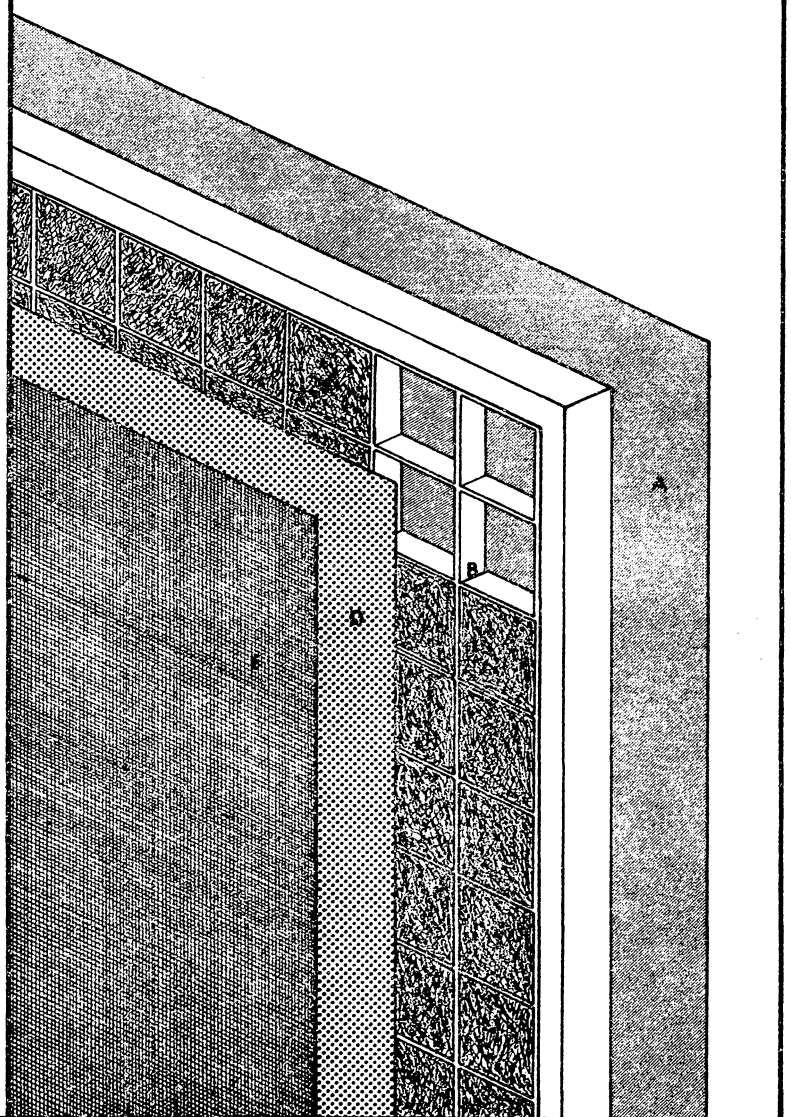


b. panel sizes nominal

A COLD ROLLED STEEL

B ALUMINUM FRAME
C FIBERGLASS INSULATION
D PERFORATED COLD ROLLED

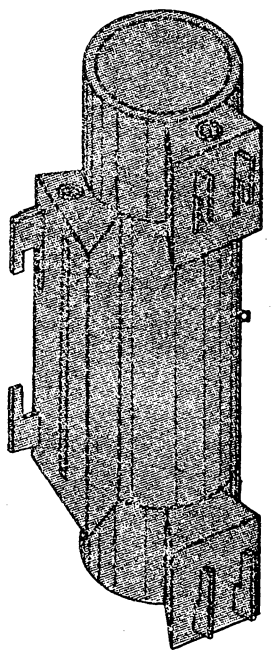
E FABRIC



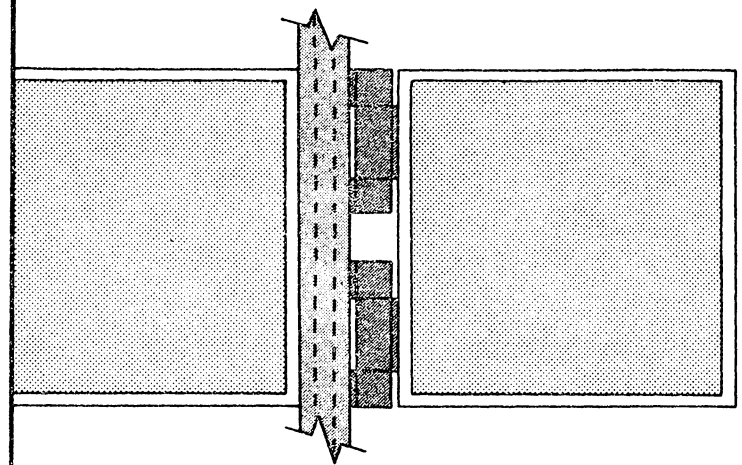
35
Panel construction

panels. (See Figure 36, 37 and 38)

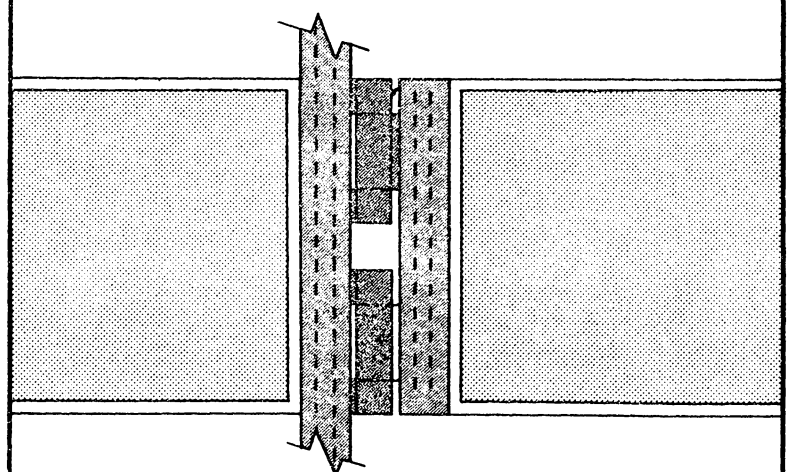
The drawers are composed of three main elements: a variable attaching mechanism, a box and the drawer insert. (See Figure 40) The box element can be secured on top of a tube or fliped over and suspended from below. (See Figures 41 and 42) The drawer glides will function in either orientation. Three sizes of drawer inserts are provided, two box drawers at three and five inches deep, plus a file drawer. When a box is secured in the suspended position, additional boxes can be suspended from it.



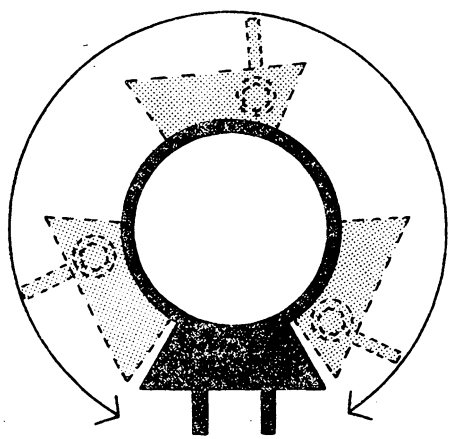
36
a. Hinge



b. Panel – hinge – tube connection

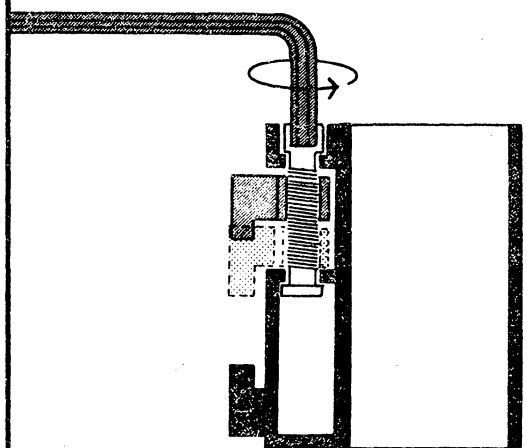


c. Panel – hinge – panel connection

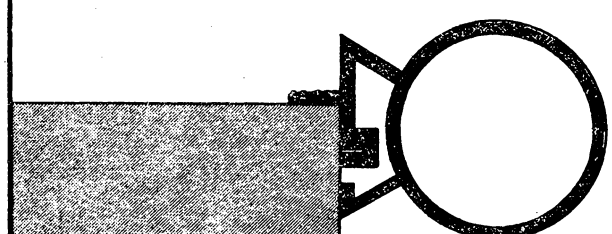


37

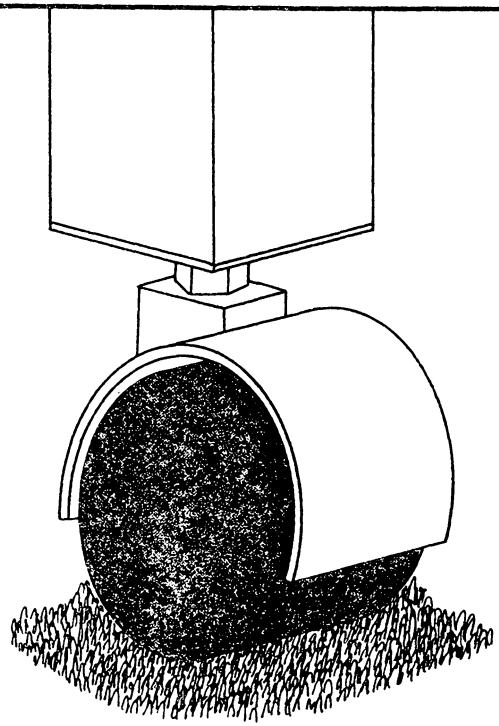
a. hinge rotation

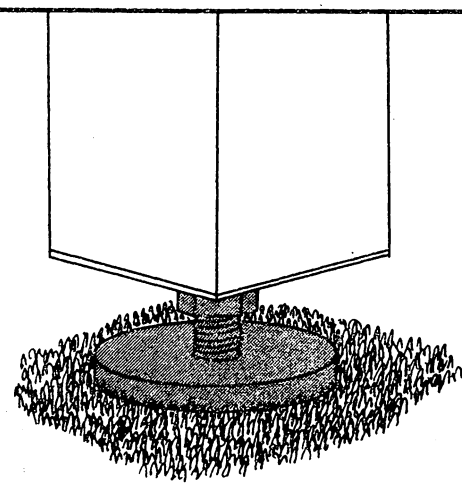


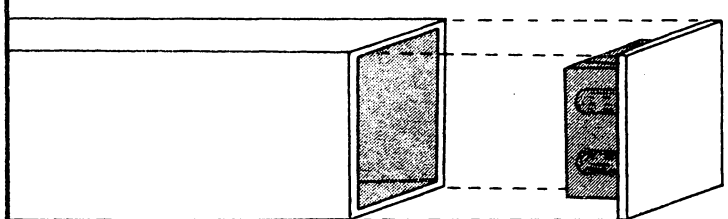
b. section of hinge showing clamping mechanism



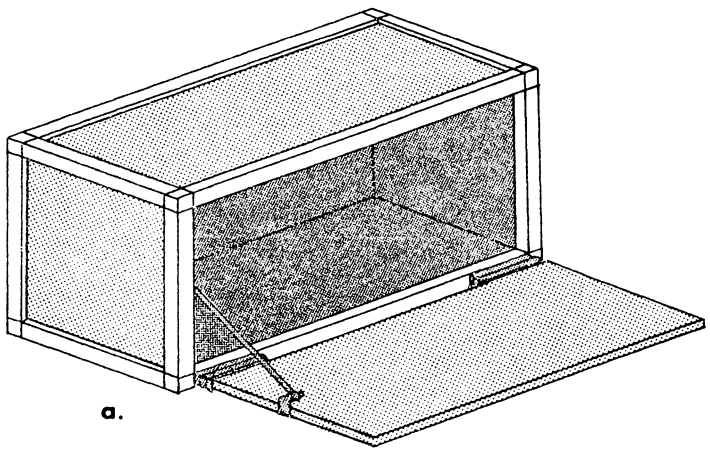
c. panel–hinge connection



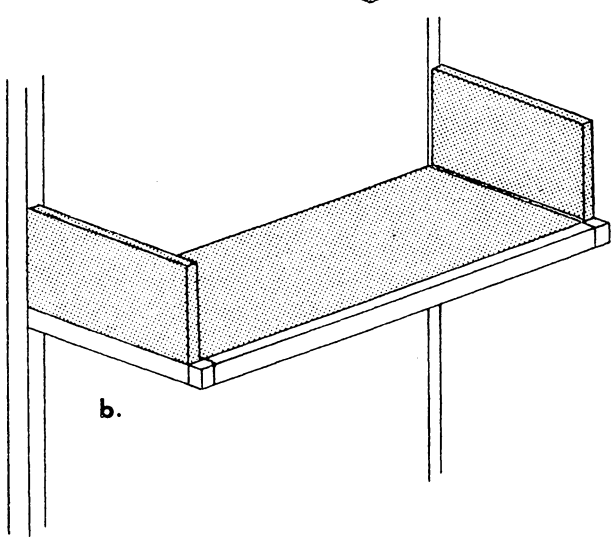




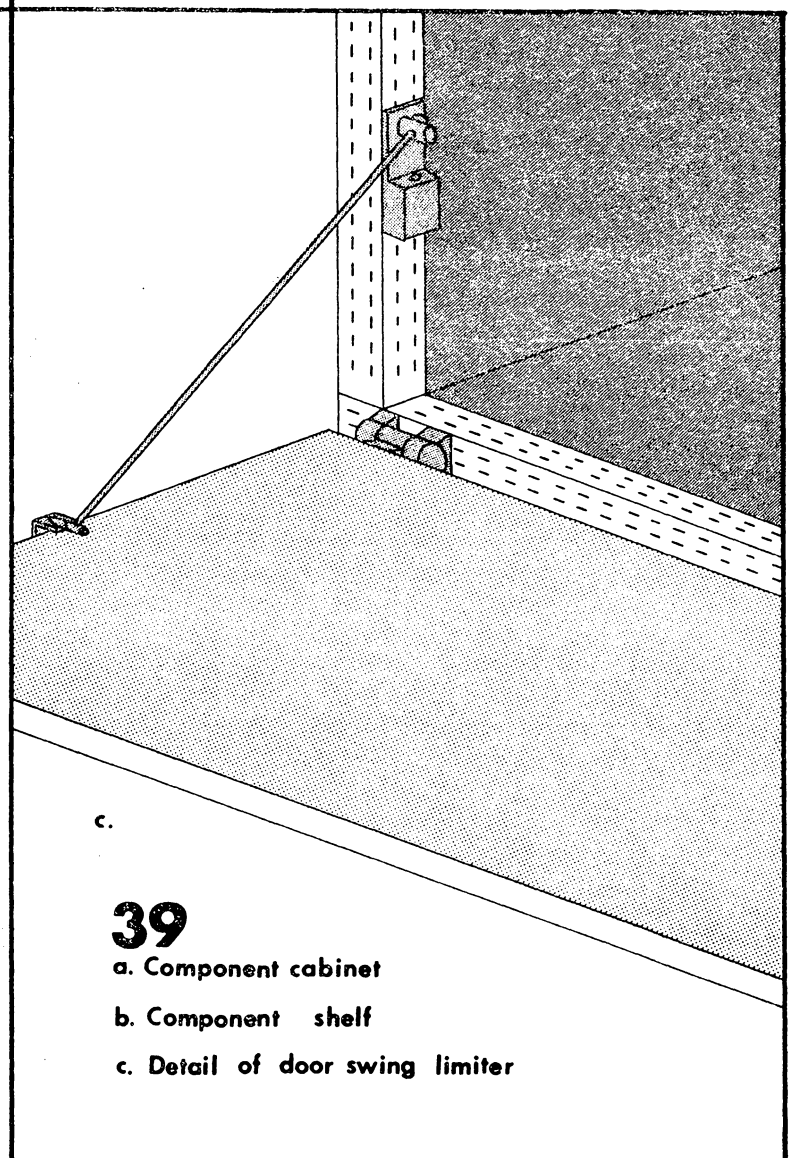
38
Accessories



a.



b.



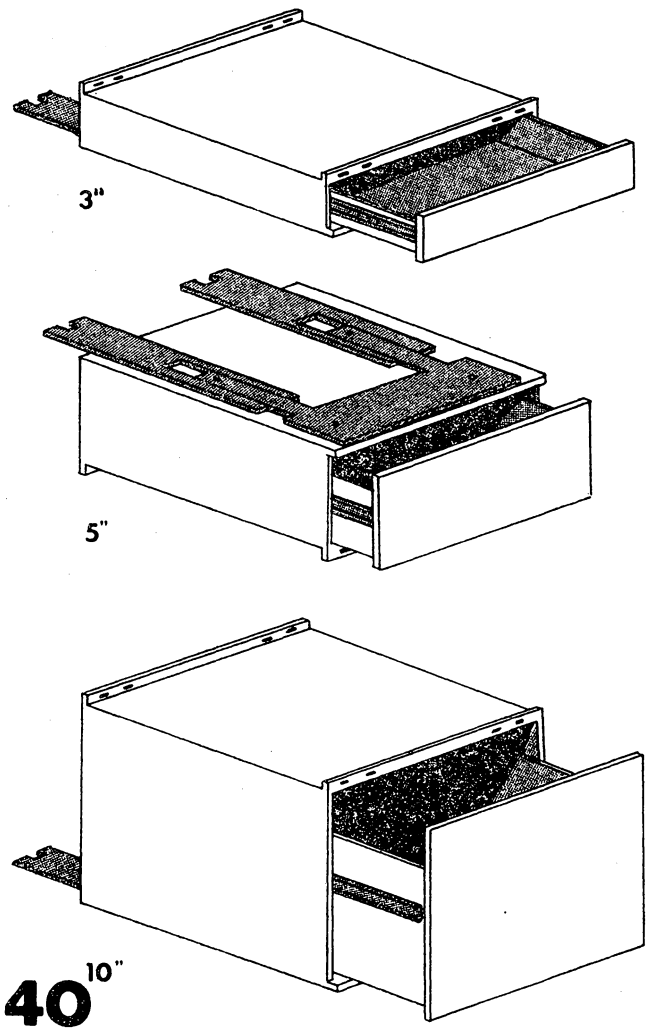
c.

39

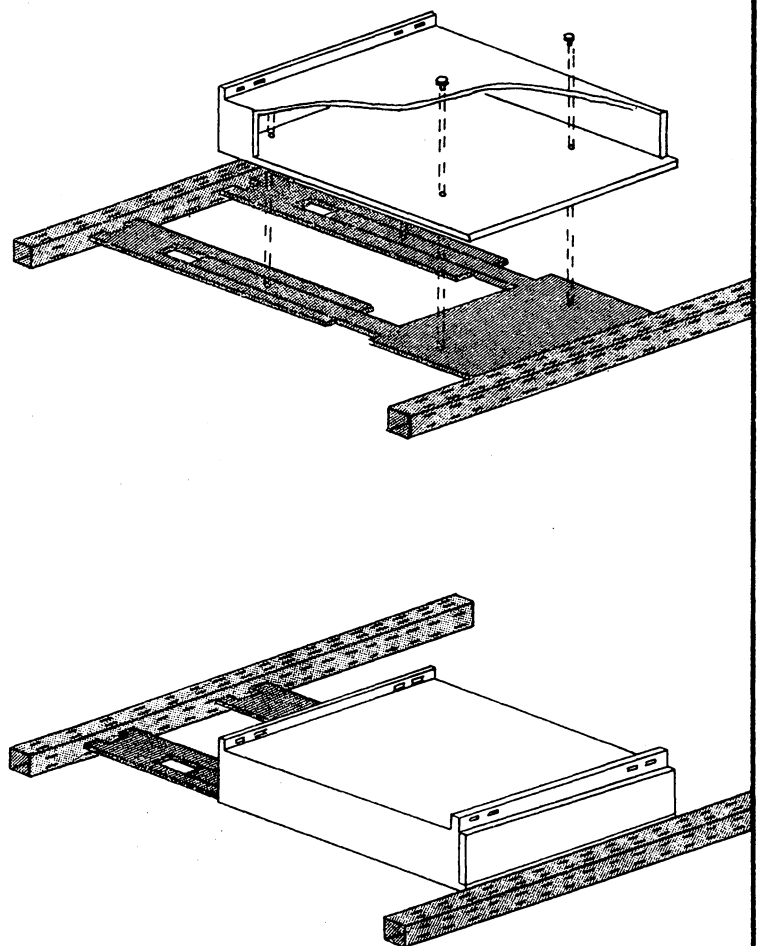
a. Component cabinet

b. Component shelf

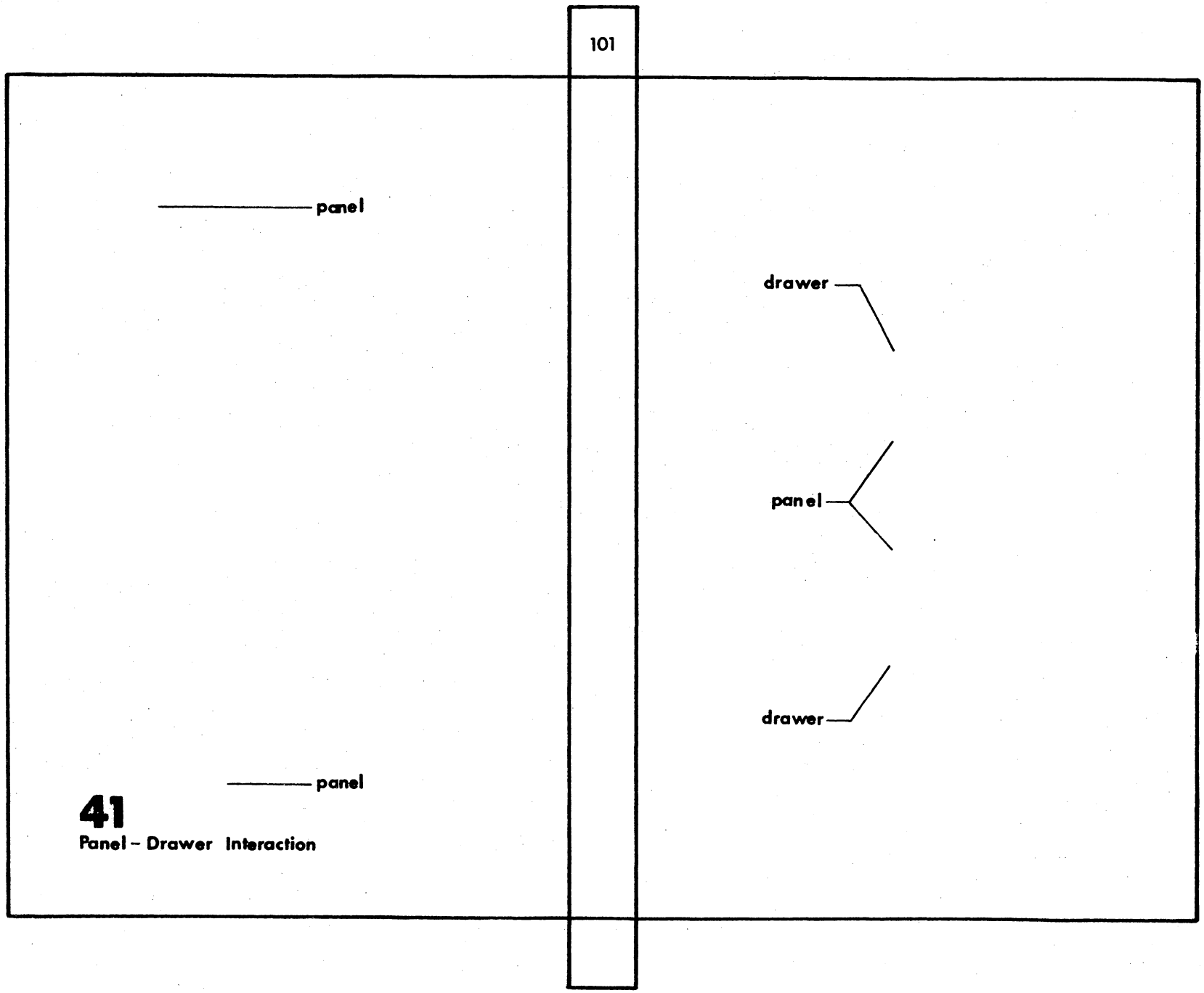
c. Detail of door swing limiter



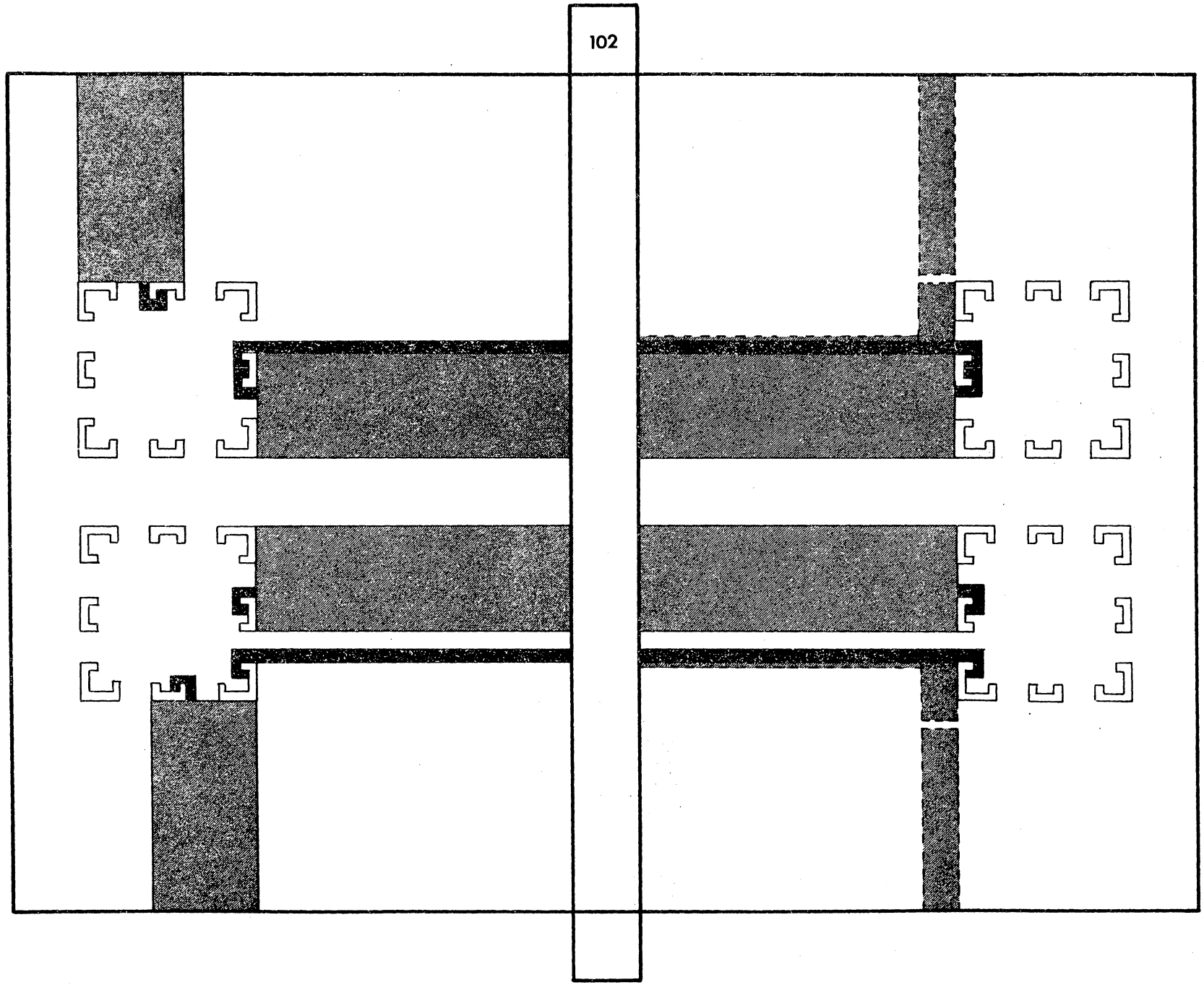
a. Drawer sizes

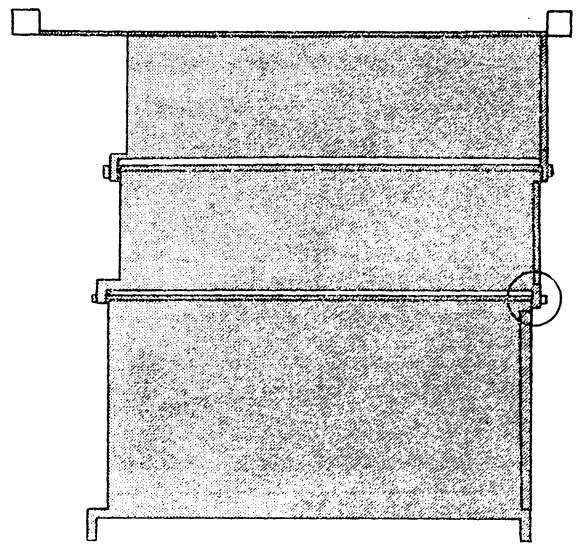


b. Drawer installation

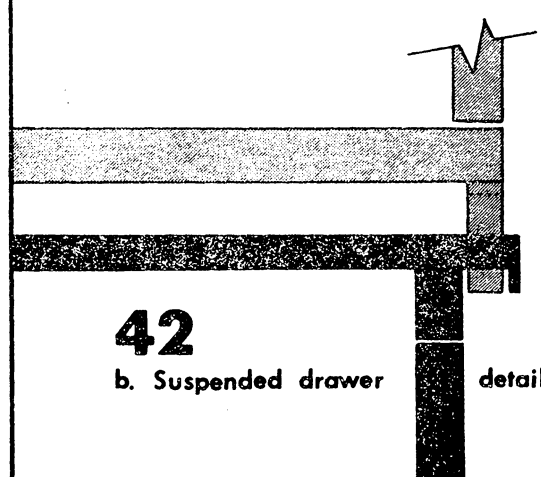


41
Panel – Drawer Interaction





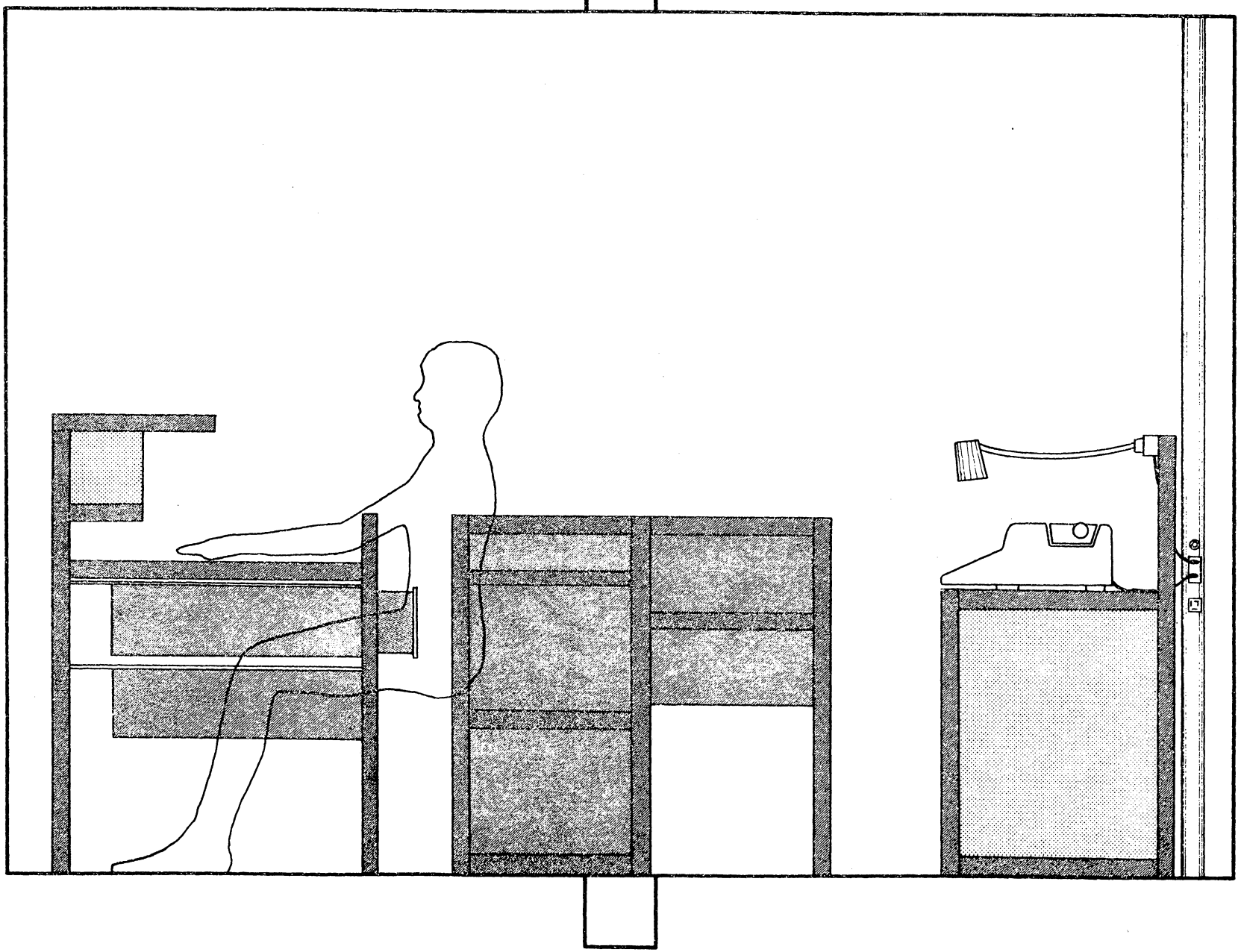
a. Suspended drawer organization



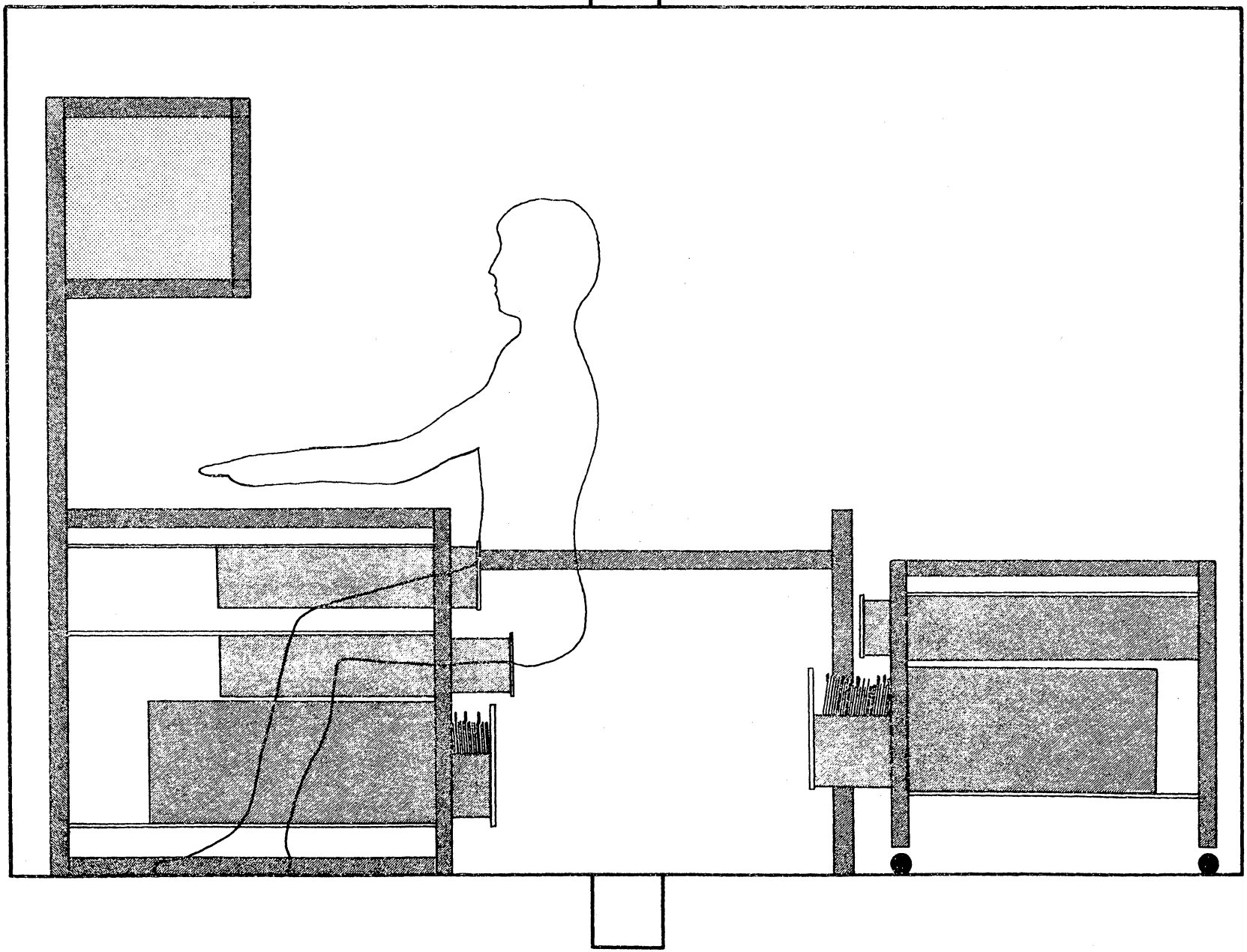
42

b. Suspended drawer detail

43
Furniture organization for a person 5'-0" tall

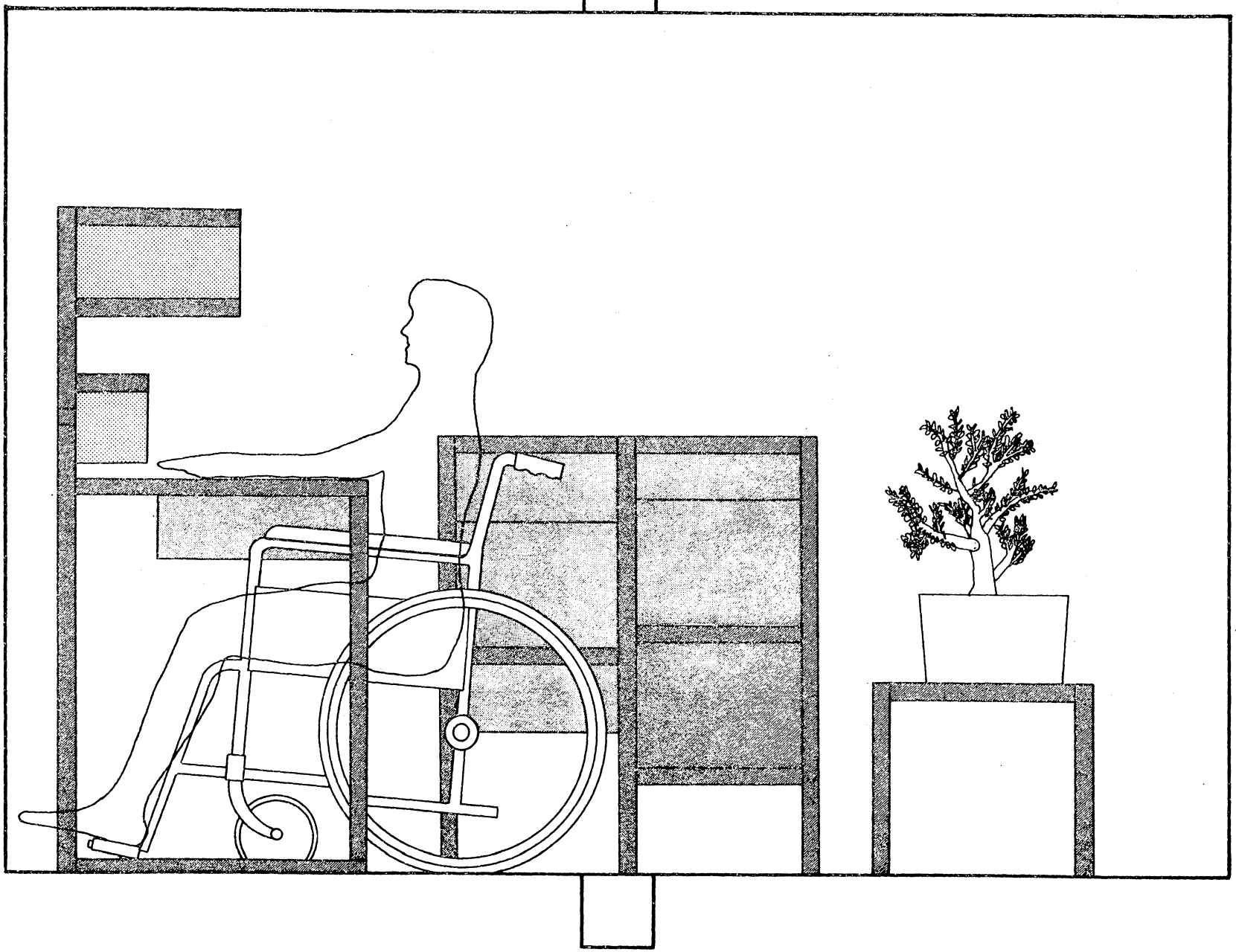


44
Furniture organization for a person 6′-6″ tall

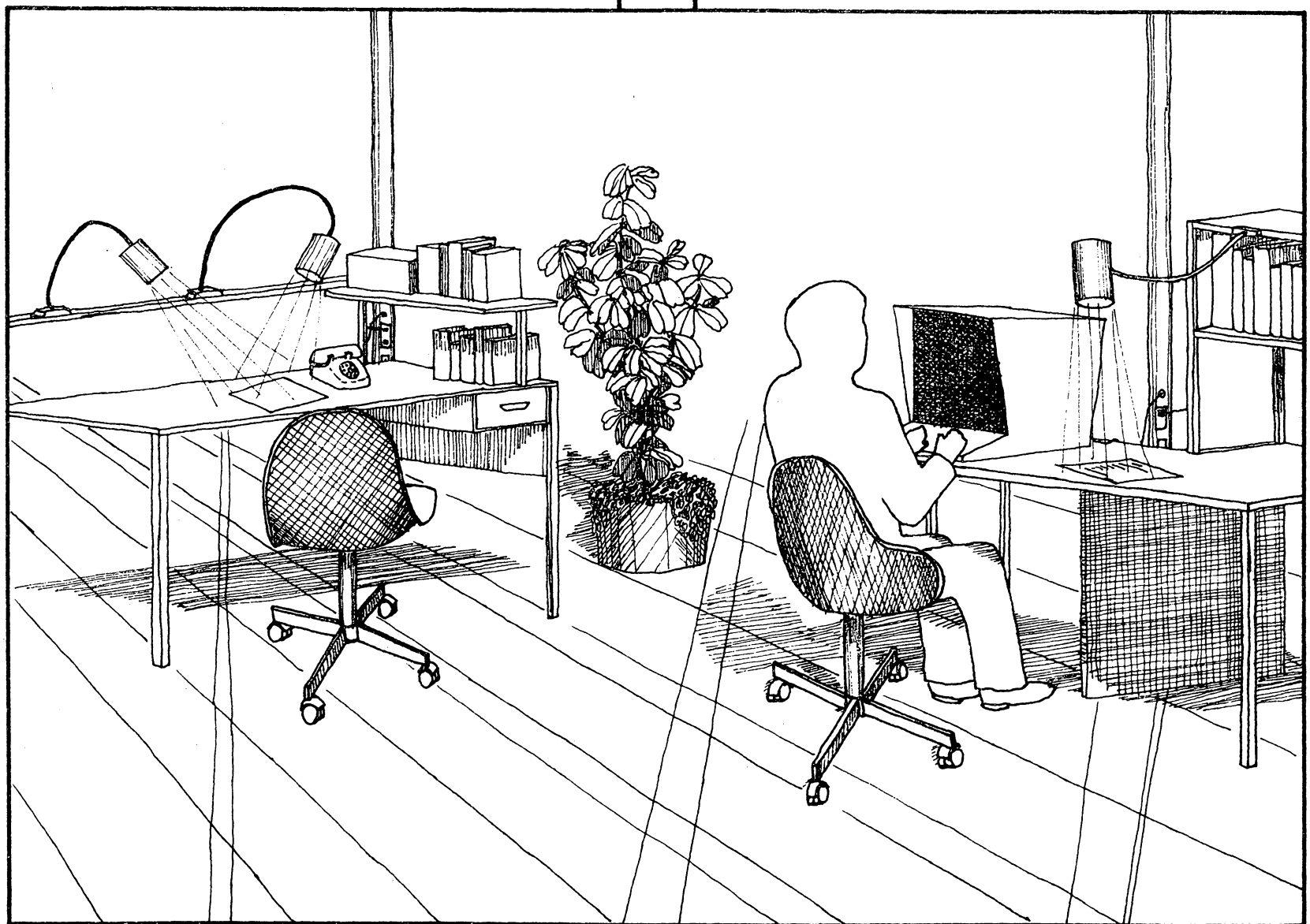


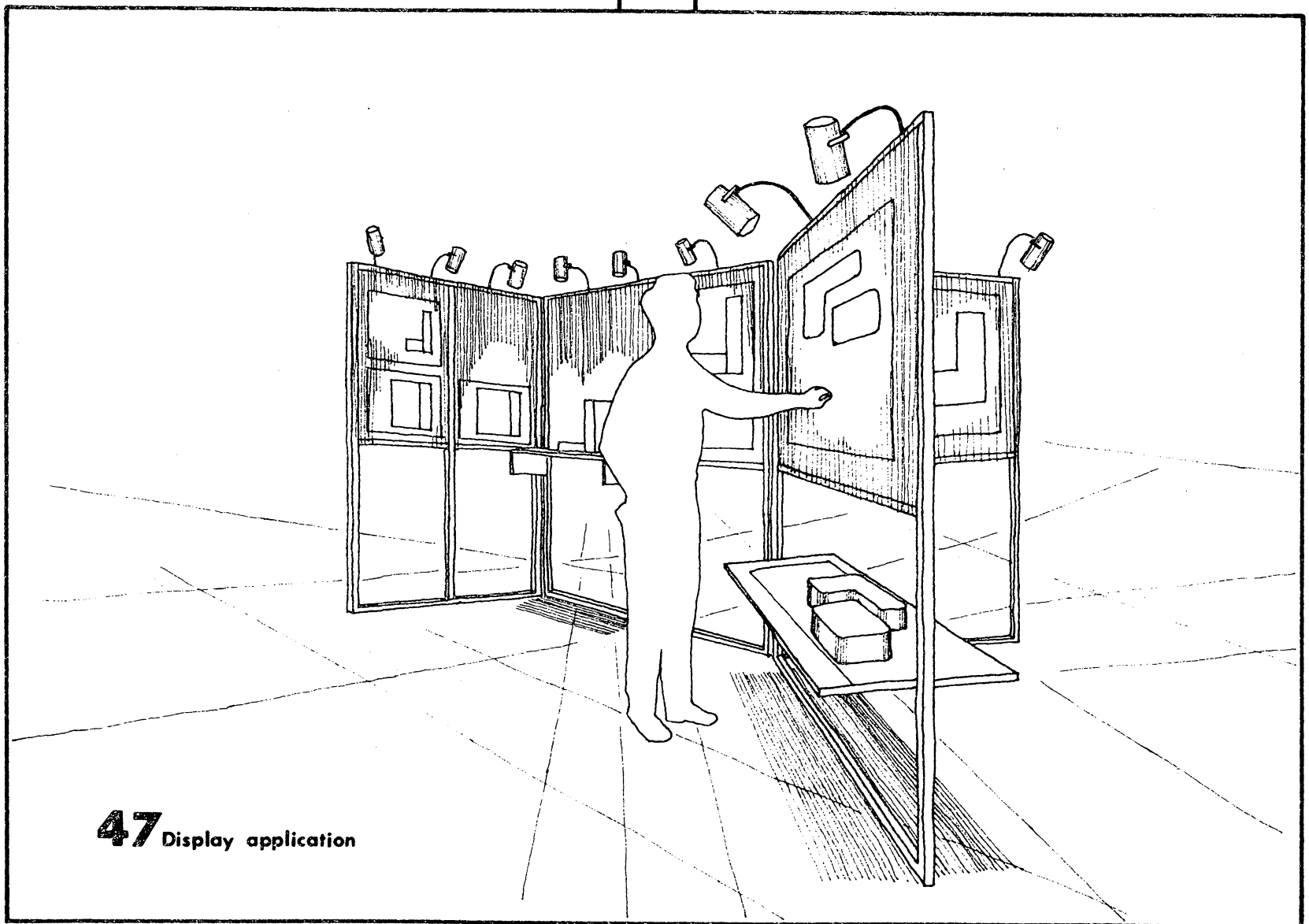
45

Furniture organization for a wheelchair bound person



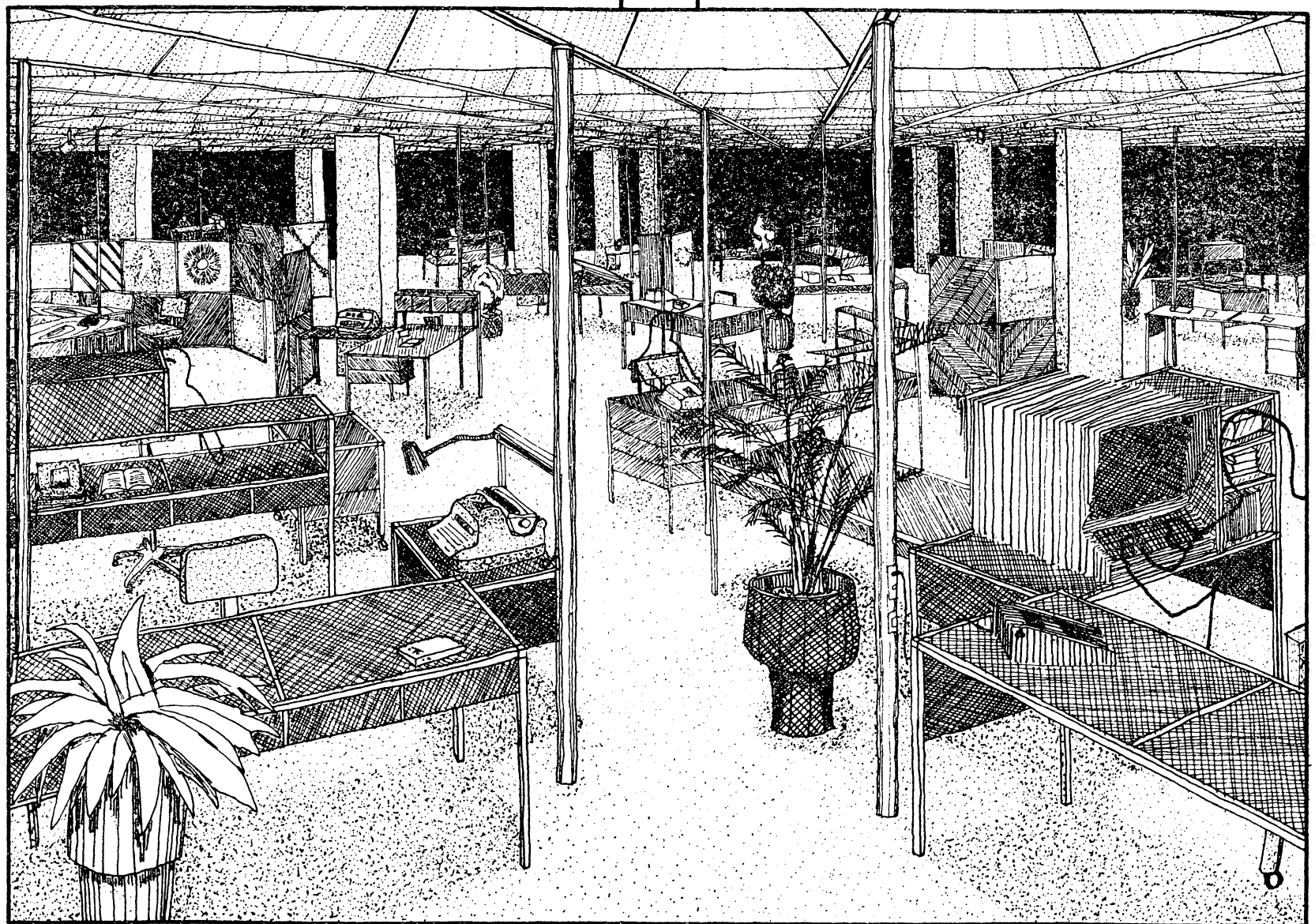
46 Typical application





47 Display application

48 Office application



Lighting

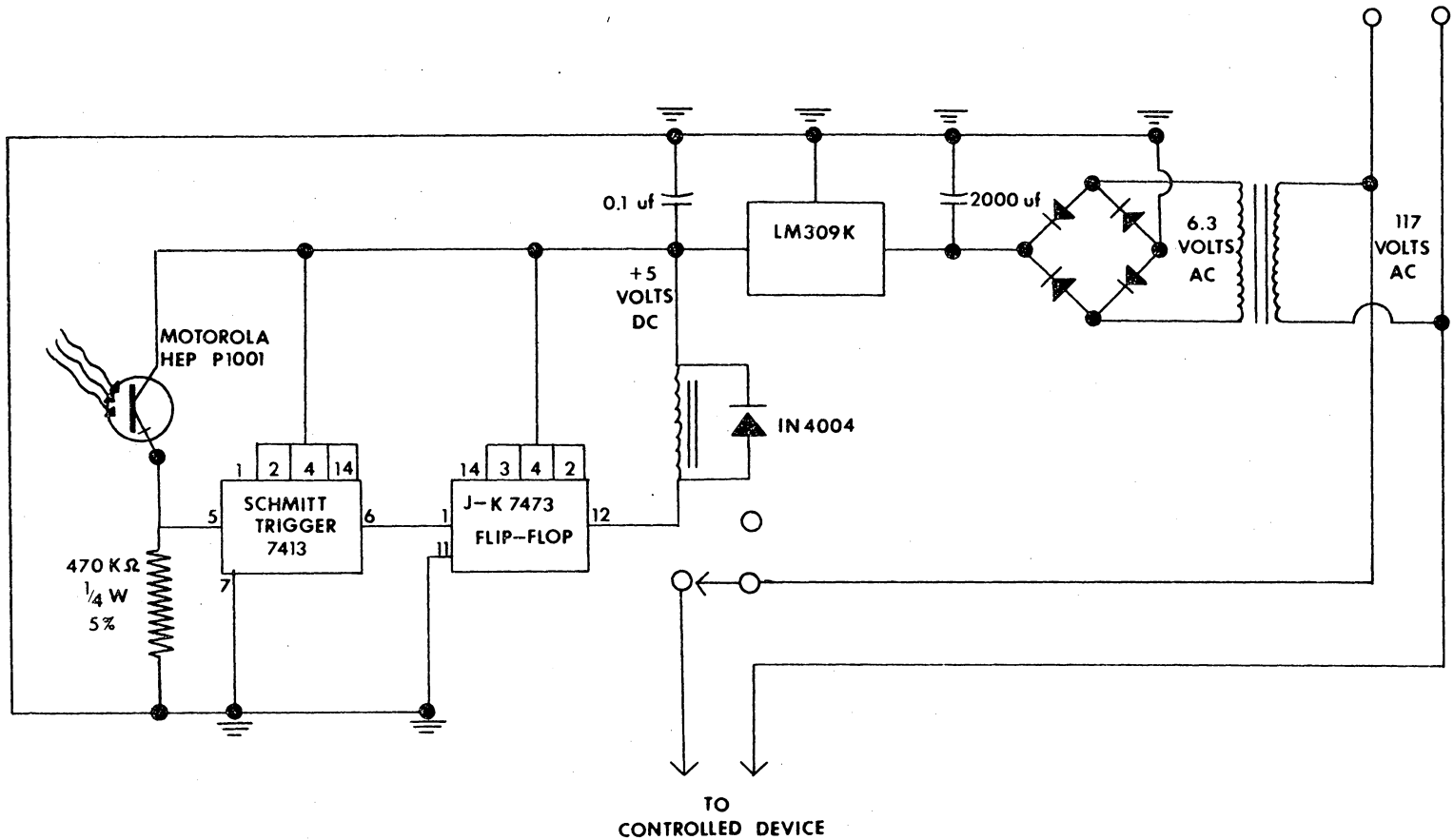
The lighting requirements of an office are varied and therefore require adaptable types of lighting to satisfy the different situations. This new system uses three main types of lighting.

A - Fluorescent Ceiling

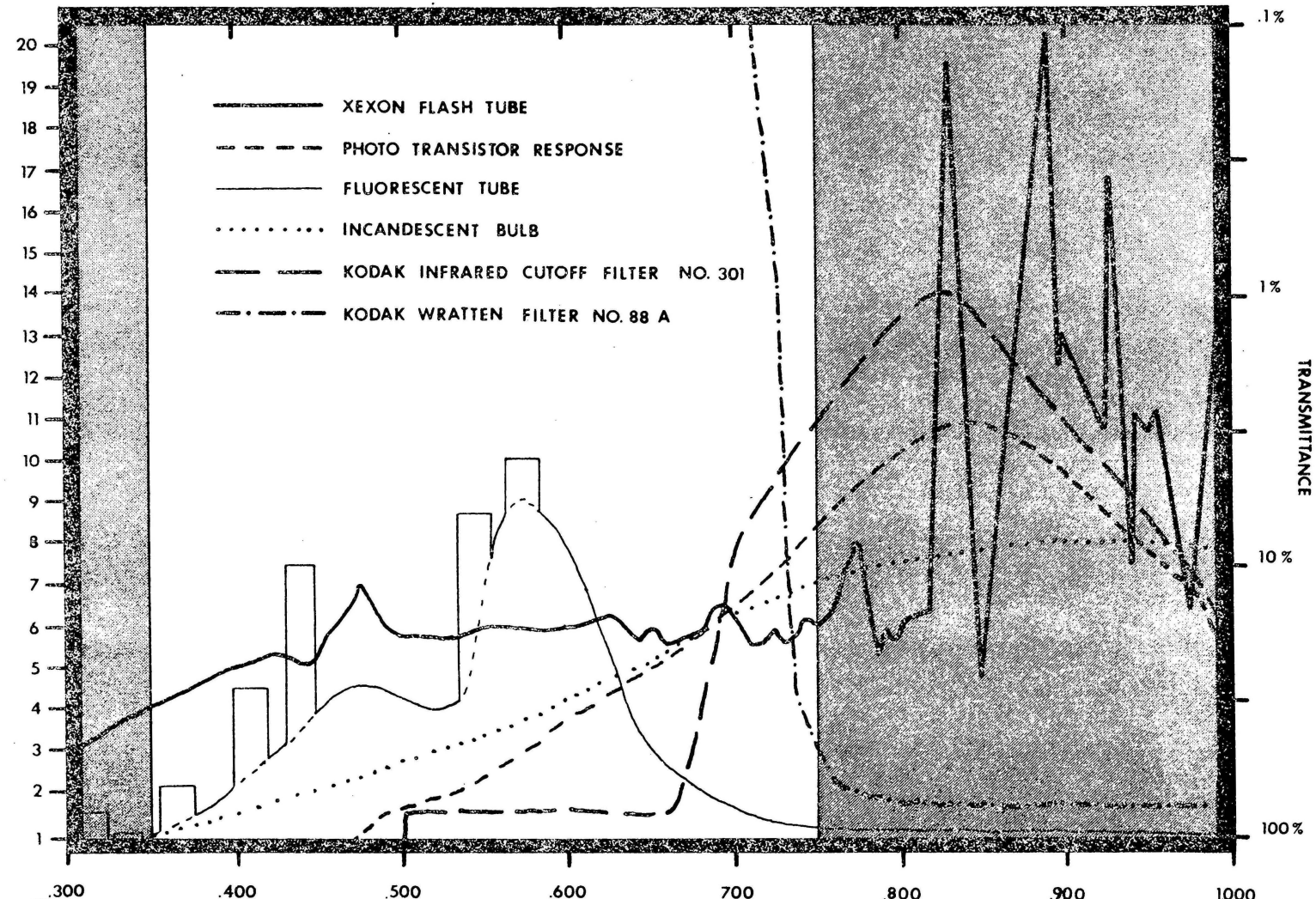
This type of lighting is good at providing ambient light. The system has been changed to give the people that work immediately beneath these

lights greater control over their operation. The fixtures have been incorporated with a switch which allows each luminaire to be individually controlled by the workers. There are two types of switches that can be utilized.

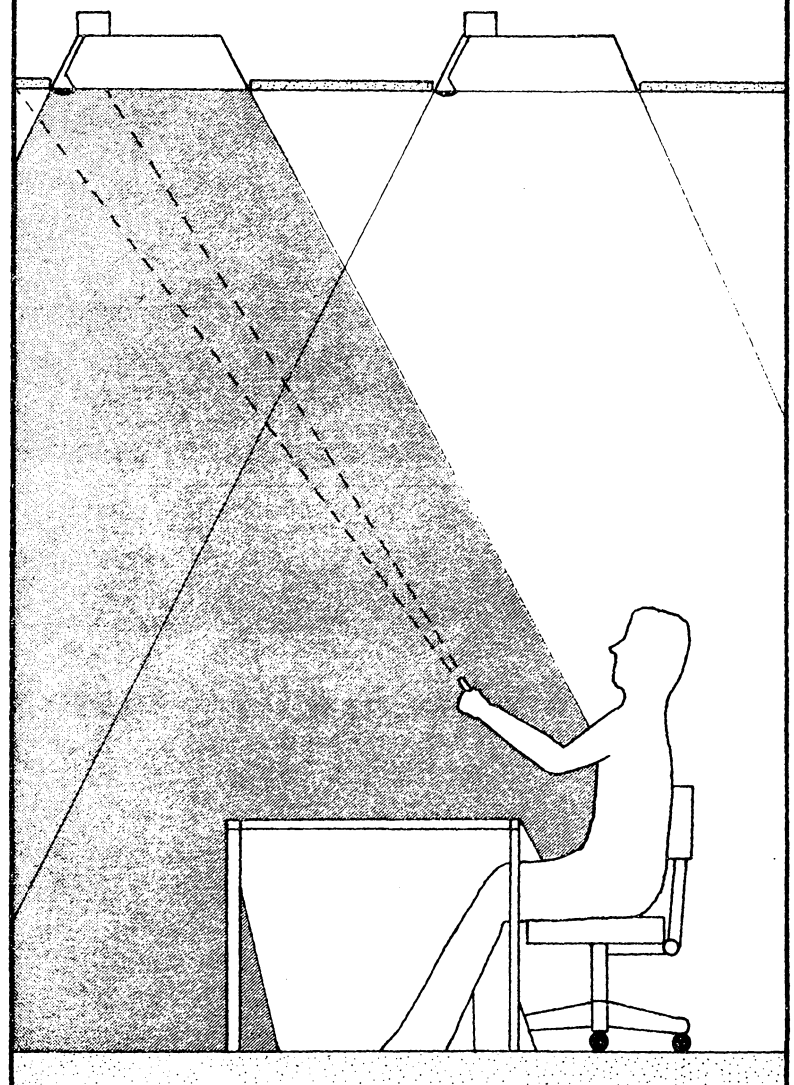
Infrared switch - An electronic switching relay is placed in each fixture. (See Figure 49) This switch is actuated by a photocell that is energized by an infrared light beam. This trips the relay to close the circuit on the luminaire. The infrared light beam, operated by the worker, is generated by a portable instrument much like an electronic flash unit; it uses nicad rechargeable batteries. (See Figure 51) The light beam is produced by a xexon flashtube which has a large portion of its spectrum in the infrared region .7 - 1.0 microns. (See Figure 50) to obtain a high intensity signal, the lamp is pulsed much like a photographic electronic flash. Any visible light is filtered out by a Wratten number 88 A gelatin filter. The beam is narrowly collimated so that only one light fixture is activated at a time. The electronic switch is so designed so as not to be affected by the infrared light that exist in the space. The threshold of



49 Circuit diagram for infrared switch



50 Comparative energy levels (.3 microns to 1.0 microns) and filter bandpass characteristics



51
Operation of infrared switch

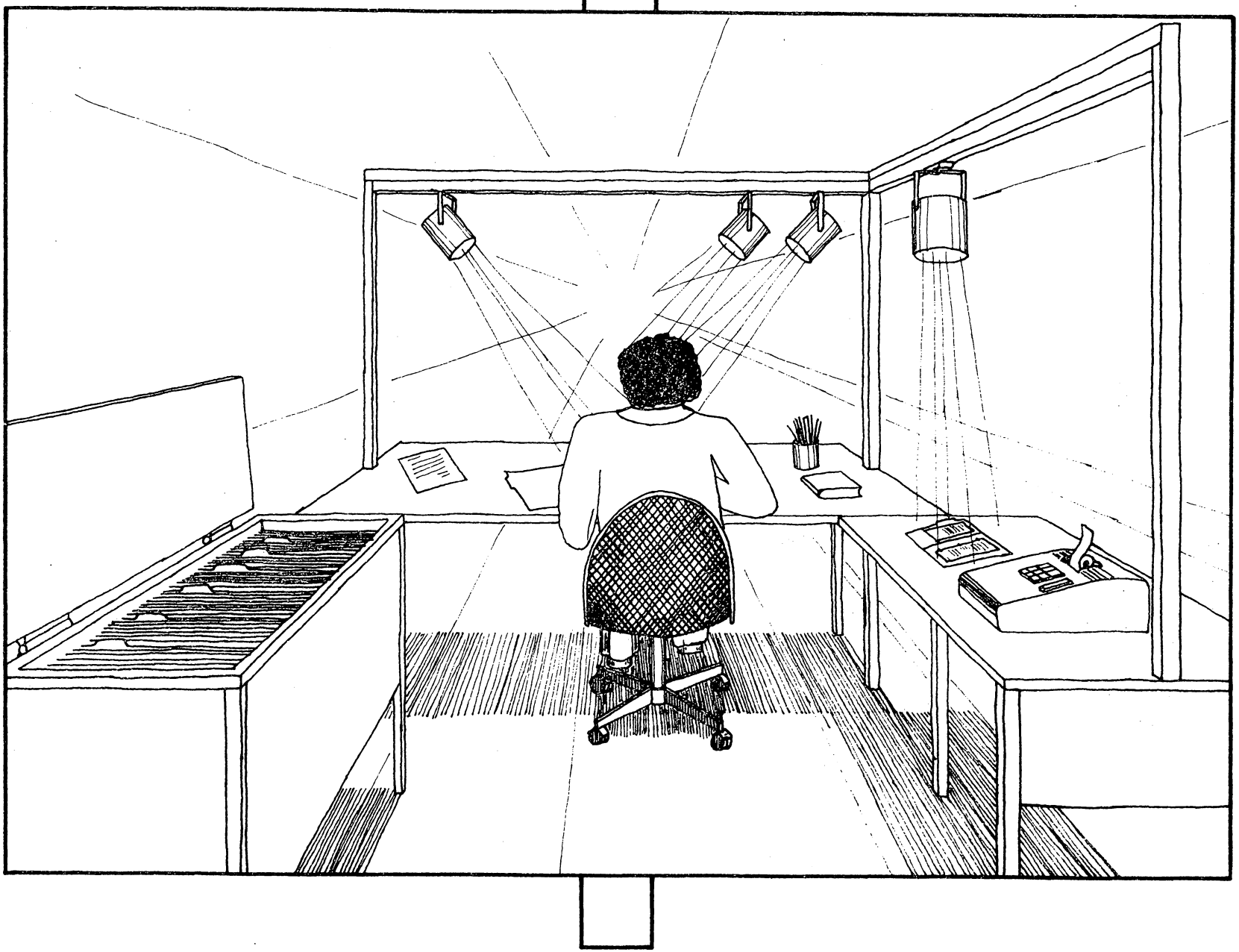
the switch is set high enough so that existing luminaires can not activate the photocell.

Broadband switch - A second way of controlling individual luminaires would be through the broadband communication system. Each luminaire would have an individual code number displayed on it. Using a calculator or telephone or any kind of information sending device that is connected to the computer via the broadband system, a command could be sent to the computer to open or close the switches that control that particular luminaire. The computer could control the luminaires through a central switchbox or at each individual luminaire.

B - Ceiling Track Lighting

Track lighting units can be plugged into the power-communication service tracks in the ceiling. They can be used to provide ambient or spot lighting. The luminaires are a 'goose' neck type with the neck being about three feet in length. The units are reachable from the floor by the office workers. Installation and removal of the luminaires is accomplished in the same fashion as

52 Typical lighting application



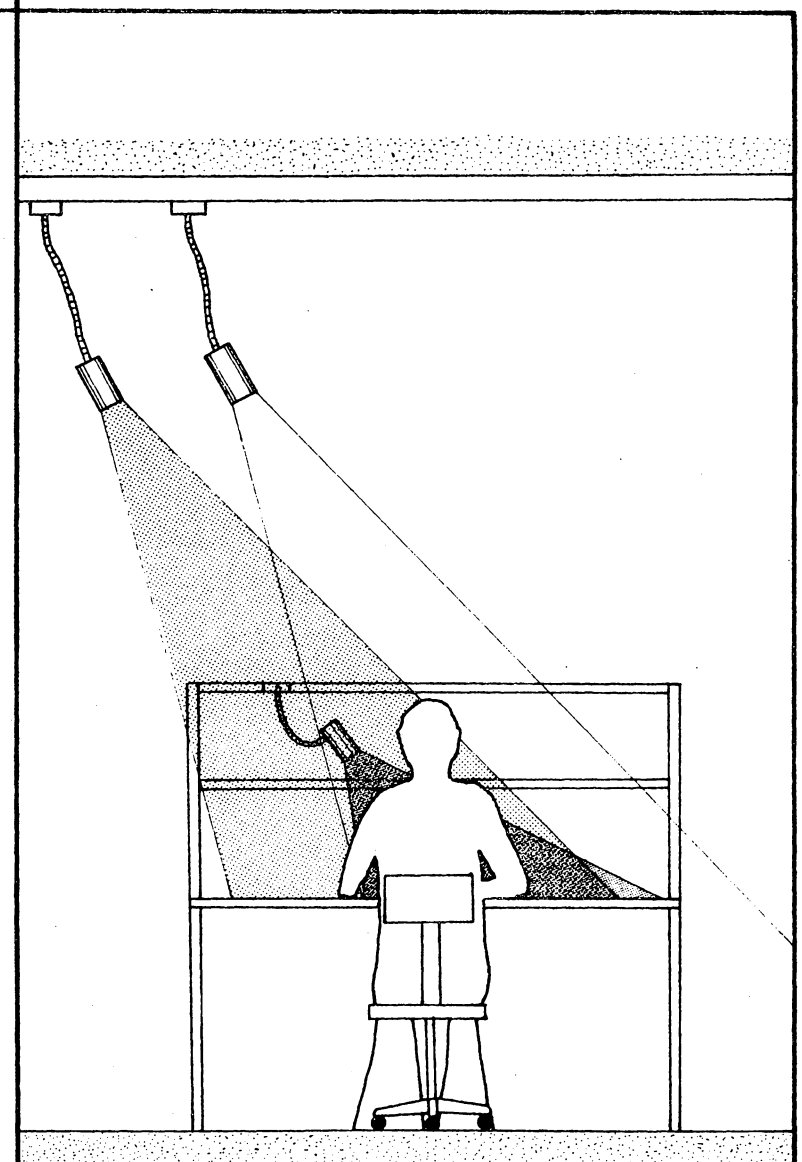
the service columns, by turning the goose neck one rotation. (See Figure 53) These units can also be equiped with the broadband and infrared switching mechanisms for remote control.

C - Unit Task Lighting

Since track lighting is so flexible it has been integrated into the furniture system. (See figure 53) The tracks can attach to the furniture tubes. They use the same attaching mechanism as the hinge. Luminaires, both incandescent and flourescent, can be plugged in and positioned anywhere over a work surface. Additionally, this type of arrangement can also be used in display techniques. (See Figure 47)

Conclusion

The systems developed in this thesis are examples of ways of bringing flexibility to the office. A flexible-adaptable office can better cope with the future changes that will be demanded. These systems represent a user framework that can expand, contract, and reorganize to answer the



53

Track lighting – task and flood application

worker's individual needs.

These systems were designed to encourage the user to become more involved with his or her environment. Hopefully, the experiential involvement gained in using these systems will be utilized beyond the confines of the office. People will become aware on a personal level of the effect that their environment has on them and the influence that they can have on their environment.

As all human environmental systems are being affected by ever increasing change adaptability will become more and more important as we try to respond to these rearrangements in our lives, and the physical environmental systems must be made responsive to these rearrangements. They should not frustrate us and force us into roles we would not otherwise choose but they should help us in living our lives as we want.

appendix 1

page 126

psychology of change

"The most likely to labor in anonymous office spaces have the least stimulating jobs. Anonymous space is not occupied by anonymous people; at least no one that works in it considers himself anonymous. The workers in the core office pools are letting us know something is wrong through a masterful display of disinterest."
Forrest Wilson, Editor - "Progressive Architecture"

APPENDIX I

PSYCHOLOGY OF CHANGE AND THE OFFICE WORKER

Change is occurring faster every day. An office must be able to respond to this quickening pace if it wants to remain healthy and viable. A continuous response must be elicited from the people who are in the best position to observe and initiate this response - the office workers themselves. Outside change agents are too intermittent, too slow, too inaccurate to deal with the problems effectively. Office workers must be trained to initiate response to change; and therefore, need to be shown what psychological checks may be hindering them; and given ways of meeting and solving these hinderances.

The response to change must occur rapidly and continuously; therefore, who originates this response to change must be re-evaluated. It is normal that when a company wants to reorganize, it contacts a planning firm that will make recommendations about what should be done. They come in and examine, and question, they analyze, they compute, they finally write a prescription of what should be

done. Completing their work, they are not seen again until another major reorganization is necessary. This kind of planning is out dated. Before the recommendations can be implemented they are obsolete. There is too much time lag involved when change is prescribed from such a remote source.

Change should originate from within the organization, the office body must become aware of its own internal functioning. Employees at all levels, down to the lowest level office clerk must learn why change should take place and how to do it. The people that work in the office every day, the ones that know most about it, should be the ones that control it; not some consultant that might be called upon every five or ten years.

Why Workers Don't Initiate Change - 14 Reasons

If the workers are to initiate the response to change, then the forces that inhibit this response must be identified, explained and overcome. Fred Steele, of the Department of Administrative Science at Yale University, has compiled a list of reasons as to why problem solving

about space does not occur regularly by workers. He offers some suggestions and insights about how the situation may be altered. Forces that tend to keep offices in a fixed state fall into two categories, characteristics of the individual, and characteristics of the social setting.[26]

A - Nine Individual Characteristics

1. Personality traits - might produce an individual who basically takes a non-problem solving stance toward his environment. They are passively influenced by the world rather than proactive toward changing it. A program that offers these people some experience of psychological success, something that is direct, thus observable, may build their competence for managing their environment.

2. Non-awareness - Lack of awareness of one's experiences can block problem solving. Many people are not aware of how they feel or experience a situation. They think in terms of how they will describe the situation later, but are not on an experiential level in real time. An illustrative example is a visitor in a

foreign land with a camera, he is in more contact with his camera, and what he is planning to show the neighbors when he goes home, than he is with the actual unknown place that he is visiting. An office worker, not in contact with his environment, cannot be expected to change it for the better. Several people such as Perls, Hefferline, Goodman, and Schutz have developed experience based training methods to re-connect people to their environment.

3. Non-realization- Those people that are aware of their experiences, often have difficulty realizing the spatial influences that cause these feelings. It's analogous to a fish in water, the environment is all around but the fish can't see it. Consciousness expanding experiences (light shows, drugs, happenings, sound and the like) that are occuring today may be a start toward the recognition of the sensory effects of the environment on people.

4. Non-understanding - A space can be extremely flexible; however, if a person doesn't understand the technology for changing it, he will often disassociate himself from the problem and leave it to the 'experts'. These experts will probably not grasp the problem as well as the user, any

change initiated by the expert will probably be insufficient. A 'how to do it' booklet should be provided with a space to educate the worker on the operational mechanisms of his environment.

5. Undefined priorities - A fifth individual characteristic is that people sometimes have a low awareness or lack of priority about what they want or what they are trying to do. Deriving an appropriate setting then is difficult. Practice at making choices, specifying goals, and elaborating on the environment may firm up their priorities. Often the problem cause may be a vocabulary deficiency. How does one elaborate about his environment if he doesn't know the language.

6. Motivation - Motivational factors may check spatial improvement. A person who feels of little worth may extend this feeling to his environment. He may not try to improve his setting because he feels that he doesn't deserve any better. A transactional analyst would recognize this behavior as an ongoing process of playing out one's 'life script'. To overcome the script, the person's low sense of selfworth must be overcome first. His self image might improve by having him alter his environment

himself, not have it imposed on him by a source he may interpret as superior.

7. Change seen as unnecessary - Another motivational factor concerns itself with a person's feeling about whether a space 'needs' to be changed. The functions being carried out may be deemed so important, that the impact of the space is perceived as having only minimal effects. A way to check the setting is by simply asking oneself "is the setting right?", often, though the answer be "no", when contemplating changing the setting, the resignation "it's not worth the effort" follows and nothing happens. When a person says this he may be justified in his declaration. The reorganization of a space may be exceedingly time consuming, energy consuming, and just a plain headache to undertake. If the setting were more flexible, quick to plan and initiate action, instead of saying, "it's not worth the effort," may instead be followed by "let's move that table over here, and cut that light out over there,...., there now, that's a lot better."

8. Problem solving ability - An individual (or group) may lack ability at problem solving. This is probably not a reflection of intelligence but the result of a process of being

locked into a particular set of assumptions which may limit the quality of solutions. On going training sessions could be setup to get rid of these assumptions. By moving objects around in the environment, particularly to absurd nonsense places, the worker becomes acutely aware of their effect and quickly tunes in on alternative solutions.

9. Fear of failure - The final individual factor which affects many people, is the fear of failure. People often feel that any changes they may initiate are irreversible, that change must be perfect. In this country success is highly prized; as coach Lombardi said "Winning isn't everything, its the only thing." Many people do not wish to accept responsibility for failures that may occur. The premise that a solution must be perfect must be thrown out. Instead, change must be seen as a learning process that never ends.

B - Five Social Factors

10. Group norms - The social climate of an organization is usually quite clear. Groups norms may operate to limit any kind of suggested action

by a group. Suggestions for change may be viewed as a power play for leadership. People who make suggestions, open themselves up for mocking or a put down, the result being an end to constructive ideas for change. The power to change migrates to the hands of the upper echelon personnel, who may not know that change is necessary or may not understand the situation because they are too remote from the scene. These understood rules of what can and can't be discussed, of who can and can't initiate change need to be exposed and abandoned.

11. Goal disagreement - If a group disagrees over its goals then an idea concerning an appropriate setting will also arouse conflict in the group. The inertia of the status quo will work to maintain the existing environment.

Mr. Lincoln said that a house divided can not stand. If that be true, then the organization had better clarify and firm up its goals and intentions to achieve a more harmonious operation. The alternative of constant bickering will lead to peril. IBM is an example of a company tha knows its goals and its area of concern - information processing.

12. Territoriality - the concept

of territoriality can innibit change. Seeing necessary change on someone elses 'turf', people are reluctant to call attention to it. They feel that they have no direct functional relationship with that space, that they would be overstepping their authority by offering their opinion. They see themselves as outsiders, even though the space may have some influence over them. A way out of this block would be to foster a closer group climate to enlarge the territory to include everyone.

13. Illogical rules - Illogical rules governing a space may limit its flexibility. Rules may label certain spaces as off limits to particular functions or personnel. The notion of the 'clean desk syndrome' for executives, results in squirreling away paper and taking work home. Ideas that occur at home do not have the benefit of immediate discussion with other personnel. A movie once satirized this notion, every Friday, one up and coming executive, would gather together all the unfinished work on his desk, place it in a large envelop and mail it to himself; leaving his desk clean at days end, thus impressing his superiors. Come Monday morning all his unfinished work would be delivered to his desk by the

mail clerk.

These rules or norms should be studied and questioned for any practical value. If they prove to be groundless then out they go.

14. We-they syndrome - Lastly, the degree to which a body of people perceive themselves as a group may determine how effective they are at concerted change. A person can work among other people but unless he feels 'of' them the mechanisms for group action may not exist. Most working situations do foster a sense of groupness by their common goals and problems. If a collectivity, not a group, does exist, perhaps cohesiveness can be established by introducing an artificial diversion to bind the personnel together. In other words provide the workers with something in common, maybe a dart board or the lunchtime card game.

Theory 'X' vs. Theory 'Y'

Even when these blocks to change are overcome the organization and management of the office must be conducive to receiving new ideas. People should not be treated as, nor should they think of themselves as, mere replaceable cogs in a machine.

They need to know their importance to the entire functioning family. An old concept in office management, here called theory 'X', is now being replaced by theory 'Y', that treats people more like human beings.[27]

THEORY 'X'

1. "People hate work"
2. "They have to be driven and threatened with punishment to get them to work toward organizational objectives."
3. "They like security, aren't ambitious, want to be told what to do, dislike responsibility."

THEORY 'Y'

1. "People don't hate work" It's as natural as work or play.
2. "They don't have to be forced or threatened. If they commit themselver to mutual objective, they'll drive themselves more effectively than anyone else can drive them."
3. Ambition, resourcefulness, curiosity, imagination, and an interest in shouldering responsibility can't be assigned to anyone; these qualities start inside a person. People need to feel good about having done a task, that they got smarter by doing it, and that it "makes a difference" in some larger context.

This new theory of office management is changing the climate of many organizations.

1. More open and free-flowing internal communication about organizational objectives.
2. Increased productivity through concerted group effort on complex problems.
3. Participatory decision-making.
4. Improved super-subordinate relationships.
5. Integration and improvement of corporate, technological and social objectives.
6. Enriched job content and individual freedom as increasingly important motivational factors.

It needs to be pointed out that these new procedures are not a necessity for all work situations. Old procedures may be working fine; what is being stressed here is the necessary willingness on the part of an organization to search for and allow better solutions, not necessarily 'new' ones.

Concerning the fourteen forces that inhibit change, it is unlikely that all fourteen characteristics exist in any one organization of people. It is also felt that there is no need to solve individually each of these forces. It would be hypocritical to talk about individual uniqueness on one hand and then attempt to force these people into a strict mold on the other. The point that is being stressed is the need for workers to be aware of their environment and that limitations to change should be minimized. By dealing with some of the social characteristics, an atmosphere or tolerance toward change will ensue, and hopefully individual characteristics will solve themselves.

the territoriality theory

In the past, business/organizational change was generally the sum total of small adjustments made over long periods of time, but today, the changes are more likely to be broader, more sweeping, and sometimes even chaotic. The organization now is reacting to two mounting pressures: the external pressures of a fast changing technological environment and the internal pressures of a new kind of personnel - better educated, with a higher technical training, and a keener awareness of its environment.

APPENDIX II

THE TERRITORIALITY THEORY

Does territoriality exist, does it exist for man? Behavorial studies of man and animals often conflict and it seems nothing can be said categorically, but for this study the theory will be accepted. For those who consider the theory valid, then some insight may be gained.

Man is a territorial animal. It is not out of choice but is a result of the struggle to survive through millions of years of evolution. There are many examples of territoriality expressed in the animal and human world. Studies have shown that office workers show a preference for territory in their work spaces. This concept of territory then is another reason for allowing workers to organize and design their own work spaces.

Territoriality in the Animal World

What exactly is territoriality? It is the setting up of property boundaries on a specific area or space and protecting it against other

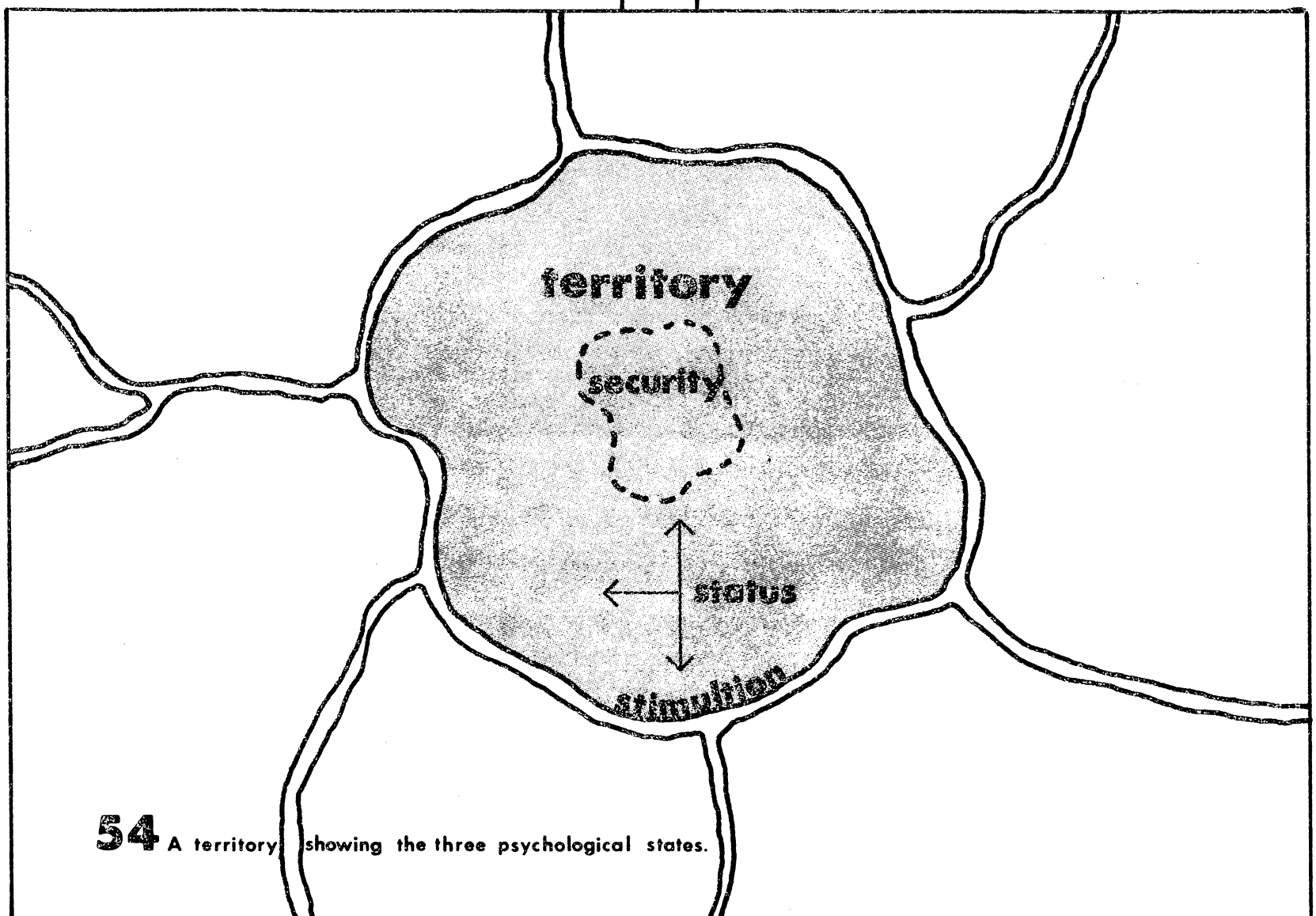
animals of like species. Why is there territoriality? Animals inately seek three conditions; status, stimulation and security. the holding of territory satisfies each of these conditions. (See Figure 54)

1. Stimulation is achieved through protection of the territory from outside adversaries.

2. Status is attained in a two-fold manner; one, it is derived from dominance over a territory; two, within a territory held by a group, status is derived from dominance within the group.

3. Security is obtained in the knowledge that one is safe in the center of his or her territory.

Stimulation and security are achieved at two different places in a territory, stimulation is found on the boundary where fighting occurs while security is located at the center of the territory. Futhermore, stimulation and status are the two dominant conditions, security will be forsaken in preference for the other two. Finally, for some mysterious reason, the majority of the time, the owner of a territory will be able to repulse any invader that is its equal; the invader must be of much greater strength to dominate a territory owner. A few examples will show this



54 A territory showing the three psychological states.

more clearly.

The bowerbird of Australia builds a hut complete with a front yard. The inside of the hut is painted black and the front yard is decorated with all kinds of paraphernalia, flowers, rocks, leaves, wood and especially things that are blue. No other bowerbird is allowed on the premises, male or female, except during mating season when females are welcome.

Callicebus monkeys live in the jungles of South America and are organized in troops. The troop acts as a unit in protecting the territory from outside enemies. Everyday they will have squabbles and fights with their neighbor monkeys in a usually vain attempt to enlarge their boundaries by a few trees. In these fights seldom does a monkey ever get hurt. There is a dominance hierarchy within the group that identifies the status of each individual. At night when all the fighting is complete all the monkeys retire to the center of the territory safe and secure until the next day's activities.

Robert Ardrey, author of The Territorial Imperative, offers numerous examples of territorial behavior in many different creatures, including: the albatross, the patas monkey, the green sunfish, the great

horned owl, also the wolf, the prairie dog, the arctic skua bird, plus the lungfish, the lion, the Chinook salmon, the ringed plover and man.[26]

Territorial Man

Contrary to today's emphasis by psychologist and sociologist on environment as the predominant influence on behavior, it can be shown that territoriality also has significant effects on how we act. Historically we can look at the example of powerful nations trying to conquer weaker ones and struggling or failing in their efforts: Japan attacking Pearl Harbor, Mussolini trying to conquer Greece, Hitler's Germany trying to destroy Russia and Britian. During America's Civil War a Union soldier asked a captured Confederate soldier why he was fighting a war that really didn't involve him, being that he didn't own any slaves. The prisoner replied "Because ya'll are down here", in other words 'this is my territory so keep out'.

In studies of offices this territorial concept has also been noted, quoting the conclusions of a study by the Environmental Analysis

Group, office workers showed a "...strong desire for clearly defined personal territory..."[29]

Robert Sommer, in his book Personal Space, also speaks of the affects of territory on human behavior. He includes the concept of dominance. He says that, "both territoriality and dominance behavior are ways of maintaining a social order, and if one system cannot function, the other takes over".[30] Why then should territoriality be favored over dominance? Sommer goes on, "With pairs incompatible in dominance, such as two highly dominant individuals, a stable order cannot be found",[31] the results are continued aggression. John P. Scott, in Animal Behavior, hypothesized that leadership and dominance are learned separately, that they may conflict since leadership is based on reward while dominance is based on punishment.[32] Change also affects aggressive behavior; it has been shown in dominance based social orders, that change increased aggressive tendencies. For an office to function efficiently it must be able to change; however, if change is going to cause aggressive behavior between co-workers than an alternative should be found - territoriality. Victor Hugo expressed a desired

relationship between dominance and territory when he said "Every man a property owner, no one a master."

What other benefits might there be if each individual designs his own territory. The three conditions of stimulation, status and security would be achieved.

As stimulation, workers would be challenged to respond to change in their own unique way, to organize and reorganize to solve problems that may arise.

As status, designing a unique work space could boost a person's sense of selfworth by being the product of his own imagination. A person could look at his space and take pride in the fact that he designed and built it.

As security, it can be a place that one can feel safe in because all around are elements that he can personally identify with. Sitting in the center of one's territorial work space, a person can feel safe from outside attack.

A sense of ownership may produce a happier and more productive worker. A worker who feels that he has a stake in the company will be more loyal to the organization and its goals. A worker that has a territorial feeling over a space and a place in the

company, may feel that he is working for himself and will work harder and enjoy it more than if he felt he were working for someone else.

Man is a creature that strives like so many other creatures to obtain a territory. It has been shown here that this territoriality is natural and indeed can be beneficial to the functioning of a modern office.

appendix 3

page 149

questionnaires and computer design

"Most people in responsible positions today, whether in government, in hospitals, in research labs or in business, spend most of their time scratching to get a little incorrect and unreliable information on what happened yesterday."
Peter Drucker - "Age of Discontinuity"

APPENDIX III

QUESTIONNAIRES AND COMPUTER DESIGN

The two previous sections have shown why office workers should organize their own work spaces. This chapter focuses on a widely used method of analyzing space use - questionnaires and computers.

When designing offices, especially large ones, most environmental design firms use computer analyzed questionnaires. However, even by employing such sophisticated equipment as computers, the validity of the output suffers three deficiencies which are inherently incorrectible; one problem is change over time; the second involves interpretation of results; the third concerns the inability to measure intangible conditions. For these reasons computer analyzed data should not be relied upon as the principal tool for designing an office space. However, questionnaires do have a place in office design in coordinating large volumes of information and looking at hypothetical situations.

A - Change Over Time

Questionnaires lead to static results. When a questionnaire is filled in by office personnel it is only accurate for that particular period in time. A new design based on this data would be obsolete before it could be implemented. The very next day conditions in the office and world have changed and yesterday's truths are suddenly fallacies. People are hired, fired, and retired; a fight with a spouse, a political candidate, a rise or plunge in the stock market, a national or local news event, a bad breakfast, all these happenings and more may change how an office will function and how a person answers a questionnaire.

The longer the turn around time from initial questionnaire to analytical output, the less valid are the results. This is especially true when a design firm draws up a design program for a new building. The interim period from original measurement, through design, construction and finally move-in day may be three or four years or more. Many things will change in that period which will significantly affect the operation of the company. The only way for a questionnaire to measure

changing conditions would be to constantly submit questionnaires to the office personnel. Of course this burden would neither be economical nor tolerated.

B - Interpretation

Two different individuals reading over the output data from one questionnaire may honestly arrive at totally contradictory conclusions. The results of questionnaires are open to interpretation.

Environmental Planning, Inc., a New York firm, was engaged to measure employees attitudes concerning conditions that they thought an ideal work space should provide. A scale of 1 - 4 was developed to give a hierarchy to these attitudes, 1 indicated a low priority, while 4 indicated the highest regard. On the issue of privacy the average score of 120 people tested was nearly three, while openness was rated below two. The Environmental Planning people came to this conclusion.

"Noise and lack of privacy were distinct causes for concern in the test installation, and though the former may be controllable it is difficult to see how subtle architectural interior design can be substituted for a deep rooted belief in the safety behind a closed door."[33]

The Environmental Analysis Group,

a Canadian firm, was employed by the Province of British Columbia to render programmatic guidance to the architects who were designing a new provincial office building. Their information gathering technique was a 1 1/2 - 2 hour personal interview of 216 employees who would occupy the offices of the new building. As in the previous study, privacy was highly regarded. However, the more in depth study by the Environmental Analysis Group led to a different conclusion.

> "Top on the list of things being retained was privacy." "The feeling about the respondents immediate work environment, drawn from their comments to the open-ended probes, suggested strong desire for clearly defined territory and frequently for privacy. These same people, nowever, expected and wanted an environment that was "open" and that was "friendly".
>
> "The privacy that was sought seemed to be more symbolic than actual. Privacy, therefore, should not result in barriers to close personal contact. Employees seemed to need to "see", to "feel", people working. Employees tended to identify with the public, and felt that they had a good raport with the people who came into their offices. Employees did not want "barriers" between themselves and the visitors."[34]

Although these two firms were operating with the same basic information they arrived at contradictory conclusions.

C - Unmeasurable Conditions

Questionnaires may not be able to predict the impact of non-tangible, unmeasurable information. Output may look simple and clear cut when the computer sorts it out; however, there are many conditions which are extremely difficult to measure or judge.

An advertising firm in Houston needed a new central office. The owners wanted a prestige structure to impress possible clients, the building was to be an advertisement for the advertisement firm. The new building was quite successful, infact too much so, for it attracted so many new customers that the facility was overcrowded within six months after occupancy.

The affect of the building design caused many clients to choose that particular advertisement firm over others. A questionnaire has no way of measuring or predicting the aesthetic affect of a building. Similarly, a computer can analyze data and feedback various new organizations, but by doing so it creates new relationships which have affects beyond the narrow constraints that the computer was programmed for. Questionnaires work well within the guidelines that they

are set up for; however, because human beings are so broad and divergent, and since questionnaires have such a limited scope, questionnaires would be unsuitable as the primary method for designing offices.

Use of Questionnaires

Questionnaires can be valuable to the design of offices in two ways. First by utilizing the computer it is extremely useful in co-ordinating and analyzing large volumes of information. Correlating the data from 500 people can be accomplished in a matter of minutes. This fast turn around time should be valuable in looking at many specific aspects of the office environment.

A second way of using questionnaires would be to use them to establish a point of departure. A computer could be used to organize a space in terms of ergonomic and anthropometric data (a person's reach, height, weight, need to operate certain muscles, etc.), it could organize work flows and communication patterns, prescribe humidity, temperature, ventilation, noise levels, etc. At this point the office worker would take over correcting and

continuing to modify the office as needs and pressures demand. The output from the computer questionnaire would only be the starting point from which the office personnel would take over.

The function of the questionnaire is in providing information to the designer. In conjunction with the computer they allow the designer to look at many variables and assess how they may effect the office. It is not a tool that should be used for final design organization, this should be left up to the amazing computers that are located in the heads of the office workers.

Abingdon

This section exemplifies the use of questionnaires in programming the office. This particular project was a space planning study for the Virginia Polytechnic Institute and State University Extension Division, conducted by Charles Hildebrand, a graduate student in Architecture. Its goal was to aid in space planning for over one-hundred extension offices throughout the state. This office is the divisional headquarters for the southwest portion of the state. Its main functions are to make presentations to citizen groups,

especially farmers. It is also the administrative core for the local extension offices, assisting and aiding them in their programs.

The divisional office is located in Abingdon, Virginia, situated on the ground floor of the Martha Washington Hotel. The building itself is a large historic mansion, circa 1830, that has been converted to a hotel. Seven rooms of the hotel have been leased by the extension division for the temporary use of its dozen employees. The present facility is quite inadequate. There is an acute shortage of storage space; presently materials are being stored in the attaching bathrooms but it still overflows into the offices proper. Acoustics are very bad; noise resonates throughout the offices since there are no sound absorbing materials. The offices are poorly lighted. Finally, a beauty salon shares the same hallway and is the source of unwanted smells.

The six page questionnaires that were sent to the office obtained information in terms of a promimity priority hierarchy for each individual in the office. Each person evaluated their own necessary spatial ties to the other spaces and functions in the office setting. A grading scale of -2

through +2 was used to show relationships, +2 denoting the highest priority. Other information recorded dealt with number of visitors to the office plus other contacts such as telephone calls. Percentage of time spent by agents inside and outside the office was also obtained.

The information from the questionnaires was then fed into the IBM 370 computer at VPI&SU. The following diagrams are the feedback from a computer programming language called corelap. (See Figures 55, A-J)

These diagrams were then used as part of the information package used in designing a new extension headquarters.

Following is shown a copy of the questionnaire that was filled out by the office personnel, followed by several examples of the corelap print-outs.

EXTENSION HEADQUARTERS PROGRAM

Questionnaire Series B

The purpose of this questionnaire is to involve you in the planning of future extension headquarters. We want to know about your individual working space and your duties and responsibilities within the facility. The purpose of this information is to look at what you do and where you do it. Please answer all questions fully. Thank you.

1. Name _____ Unit No. _____

2. Position or Job Title _____

   a. Program Emphasis:
   - ☐ Agriculture and Natural Resources
   - ☐ Community Resource Development
   - ☐ Family Resources
   - ☐ 4-H
   - ☐ Other (Specify) _____

   b. Employment, Full ☐ or Part-Time ☐ (Please check one)

   c. How long have you been employed at present office? _____

3. Do you have a specific working space?
   - ☐ Yes
   - ☐ No

4. What kind of working space do you work in?
   - ☐ Workroom
   - ☐ Reception Area
   - ☐ Own Office
   - ☐ Work at Home
   - ☐ Shared Office
   - ☐ Other (Specify)
   - ☐

5. Which of these articles are contained in your workspace?
   - ☐ Work Table
   - ☐ Typewriter
   - ☐ Storage Cabinet
   - ☐ Desk
   - ☐ Book Shelves
   - ☐ Bulletin/Display Racks
   - ☐ Office Equipment
   - ☐ Chairs (No. _____)
   - ☐ File Cabinets (No. _____)
   - ☐ Other (Specify) _____

6. How much of an average day do you spend in your work space?
   - ☐ 0-2 Hours
   - ☐ 2-4 Hours
   - ☐ 4-6 Hours
   - ☐ 6-8 Hours
   - ☐ 8+ Hours

7. Indicate the following by placing a check beside the range that best describes the frequency of the activity:

   a. Average number of your visitors per day:

   0-5 _____

   6-10 _____

   11-20 _____

   20+ _____

b. Average number of phone calls you receive per day:

0-5 _____

6-10 _____

11-20 _____

20+ _____

c. Average number of phone calls you make per day:

0-5 _____

6-10 _____

11-20 _____

20+ _____

In an office, of course, not all spaces can be adjacent to each other, and so some trade-offs must be made. Considering your workspace, for each of the rooms or areas listed below indicate how close your workspace should be to each area so that your duties are easier and more efficient. If you do not have a room or area listed, please do not mark. Thank you.

(Rating Values: -2 = as far as possible; -1 = not close; 0 = does not matter +1 = close; +2 = as close as possible.)

	Please Circle One				
Agent (Others)	-2	-1	0	+1	+2
Unit Head	-2	-1	0	+1	+2
Management	-2	-1	0	+1	+2
Secretaries (Others)	-2	-1	0	+1	+2
Toilet Room	-2	-1	0	+1	+2
Meeting Room	-2	-1	0	+1	+2
Office Entrance	-2	-1	0	+1	+2
Display	-2	-1	0	+1	+2
Audio-Visual Storage	-2	-1	0	+1	+2
Mimeo-Address	-2	-1	0	+1	+2
Office Machine Workroom	-2	-1	0	+1	+2
Conference Area	-2	-1	0	+1	+2
Storage Area	-2	-1	0	+1	+2
File Area	-2	-1	0	+1	+2
Parking	-2	-1	0	+1	+2
Other (Specify)	-2	-1	0	+1	+2

Rank the following tasks or activities as to the length of time required in an average work week for the performance of each task. (0 = no involvement, 1 = one hour or less, 2 = one-two hours, 3 = two-three hours, 4 = three-four hours 5 = four hours or more). In the space to the right of the scale indicate where each task is performed. Place a check (✓) by those tasks which you perform in your workspace. Place an "X" (X) by those tasks which you perform in another area of the office. Place a zero (o) by those tasks which you perform outside the office.

	Please Circle One						
Reading Mail	0	1	2	3	4	5	_____
Casual Reading	0	1	2	3	4	5	_____
Reviewing Literature	0	1	2	3	4	5	_____
Writing Letters/Articles	0	1	2	3	4	5	_____

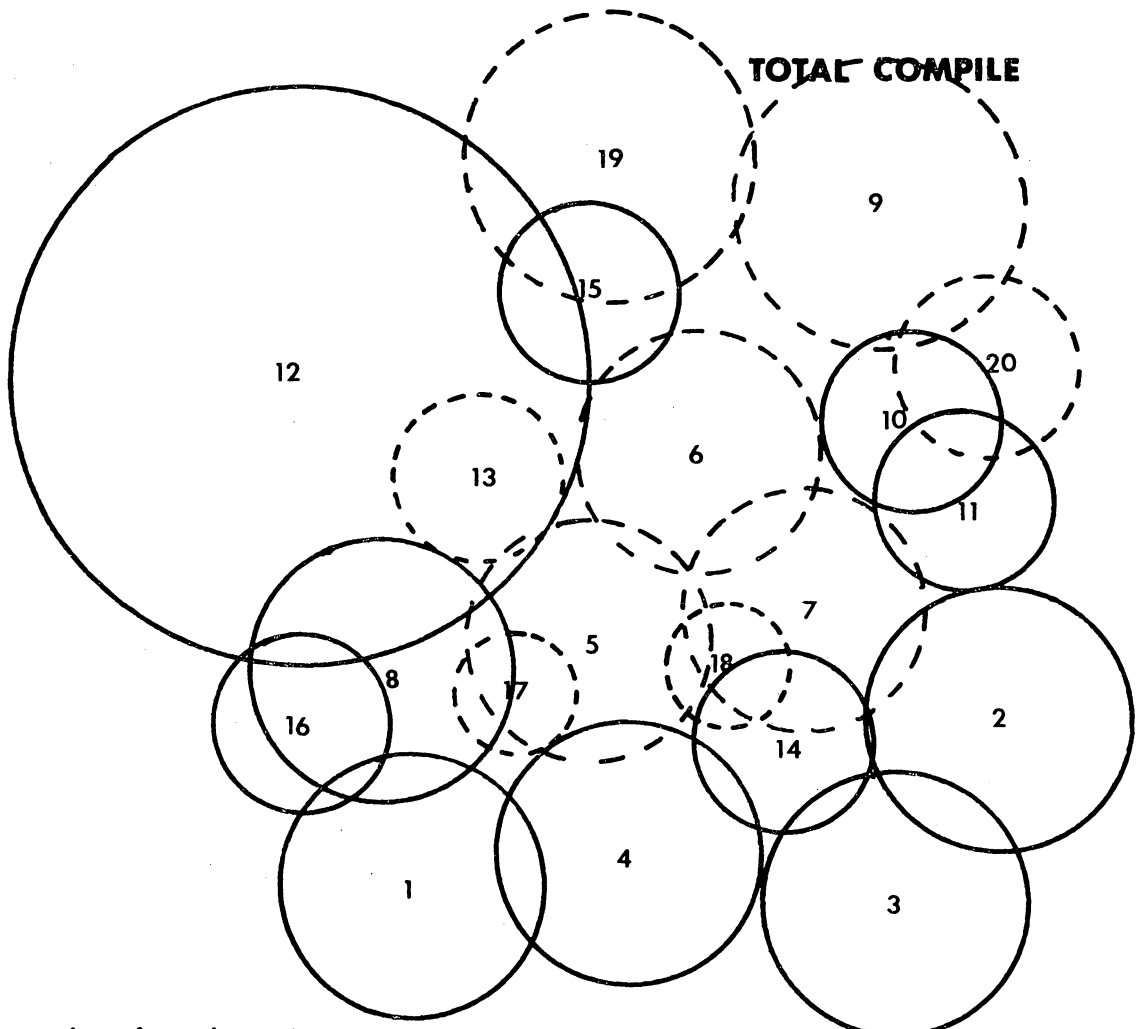
Taking/Giving Dictation	0 1 2 3 4 5	___
Typing	0 1 2 3 4 5	___
Mailing Publications/Letters	0 1 2 3 4 5	___
Project Planning	0 1 2 3 4 5	___
Consultation with Office Visitors	0 1 2 3 4 5	___
Consultation with Office Staff	0 1 2 3 4 5	___
Participation in Planning or Committee Meetings	0 1 2 3 4 5	___
Chairing a Meeting	0 1 2 3 4 5	___
Casual Conversation	0 1 2 3 4 5	___
Interviewing	0 1 2 3 4 5	___
Telephoning for Self/Another	0 1 2 3 4 5	___
Receiving Phone Calls for Self/Another	0 1 2 3 4 5	___
Xeroxing	0 1 2 3 4 5	___
Recording Radio-Tapes	0 1 2 3 4 5	___
Editing Audio-Visual Materials	0 1 2 3 4 5	___
Preparing Demonstrations and Talks	0 1 2 3 4 5	___
Scheduling Activities for the Day	0 1 2 3 4 5	___
Coordinating Events and Activities	0 1 2 3 4 5	___
Sorting/Distributing Mail	0 1 2 3 4 5	___
Collecting Duplicated Material	0 1 2 3 4 5	___
Editing Written Material	0 1 2 3 4 5	___
Filing Materials	0 1 2 3 4 5	___
Securing Materials from Filing Cabinets	0 1 2 3 4 5	___

Formal/Informal Writing	0 1 2 3 4 5	___
Using Office Machines (Copying, Recording, etc.)	0 1 2 3 4 5	___
Out-of-Office Errand	0 1 2 3 4 5	___
Traveling to Locations Outside of Office	0 1 2 3 4 5	___
Out-of-Office Work	0 1 2 3 4 5	___
Snacking	0 1 2 3 4 5	___
Preparing Coffee	0 1 2 3 4 5	___
Activity Recording	0 1 2 3 4 5	___
Material Preparation	0 1 2 3 4 5	___
Other (Specify) _____	0 1 2 3 4 5	___
Other (Specify) _____	0 1 2 3 4 5	___
Other (Specify) _____	0 1 2 3 4 5	___

1	Unit Head
2	Agent A
3	Agent B
4	Agent C
5	Secretary A
6	Secretary B
7	Secretary C
8	Toilet Room
9	Office Entrance
10	Equipment Storage
11	Office Machine Workroom
12	Conference Area
13	Kitchenette
14	Storage A
15	Storage B
16	Storage C
17	File Area
18	File Area
19	Parking Area
20	Display Area

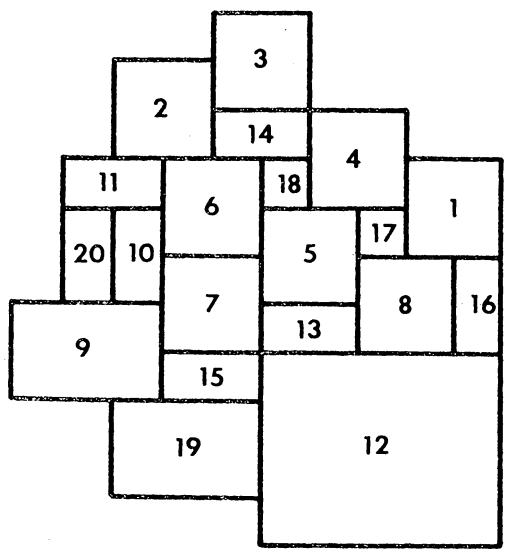
55

Corelap key

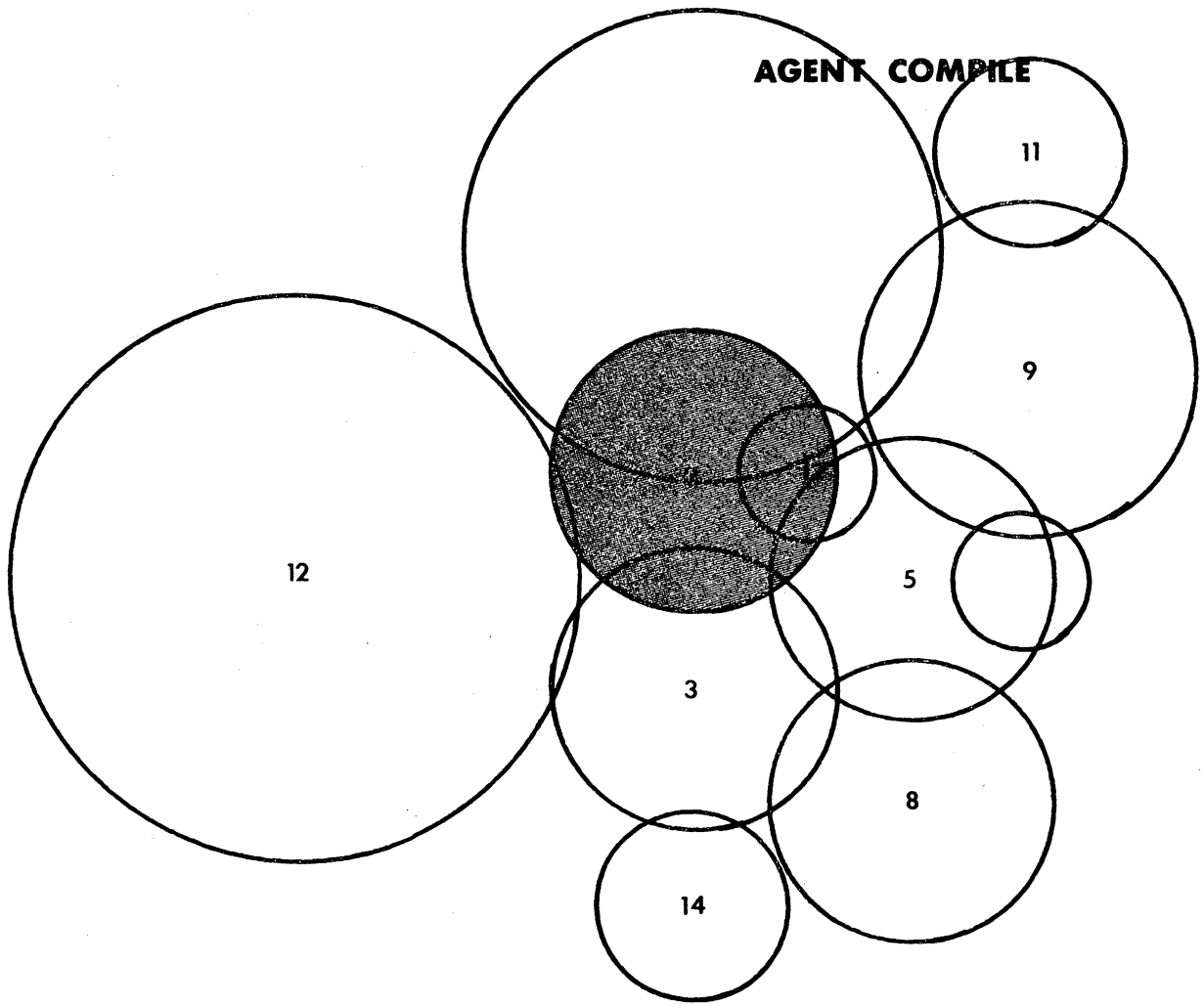


55 a. Examples of corelap printout

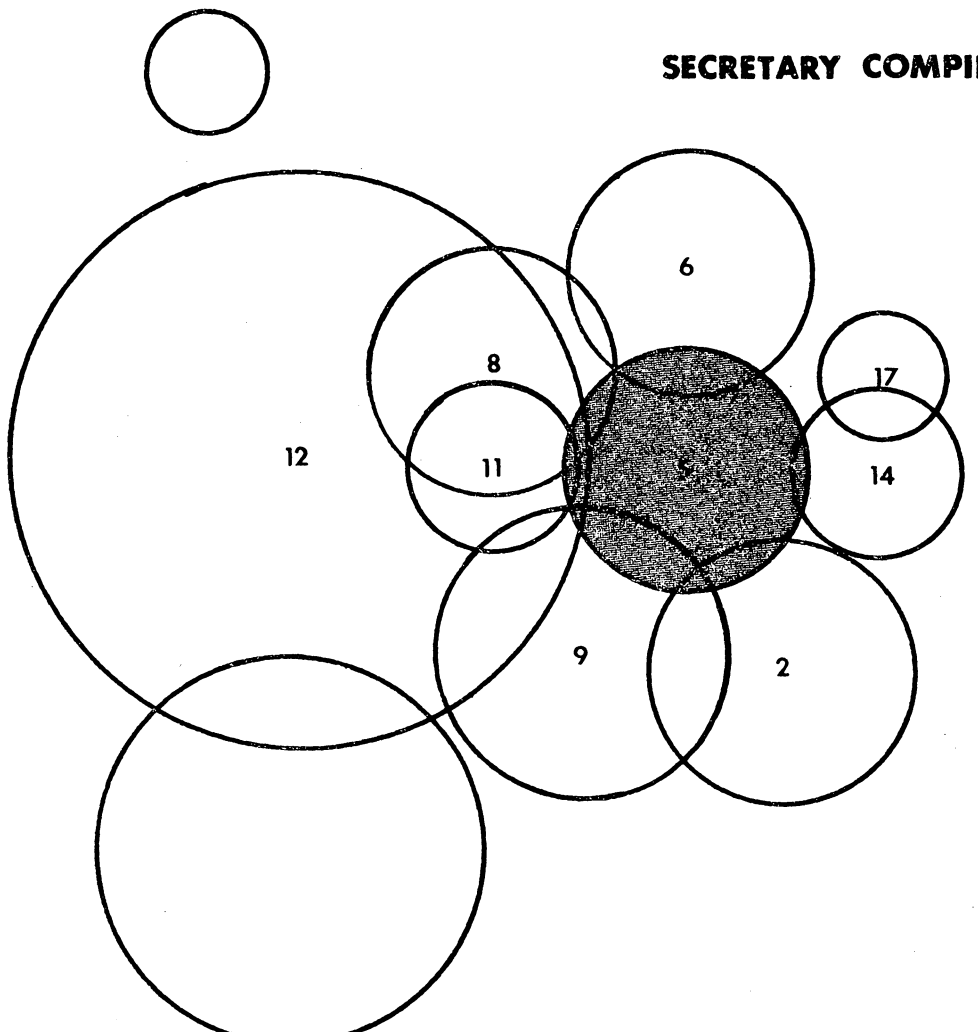
TOTAL COMPILE



b.

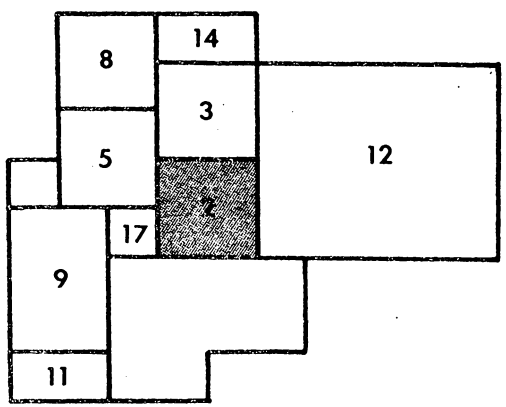


c.



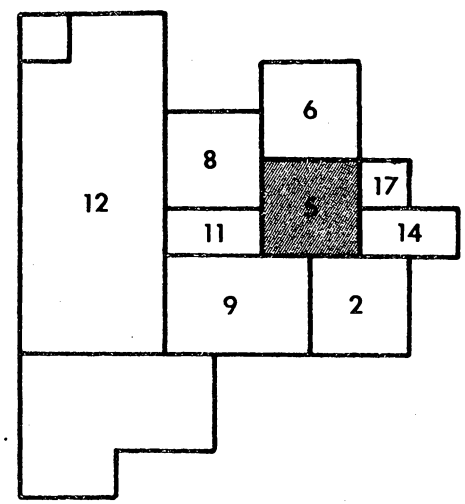
d.

AGENT COMPILE



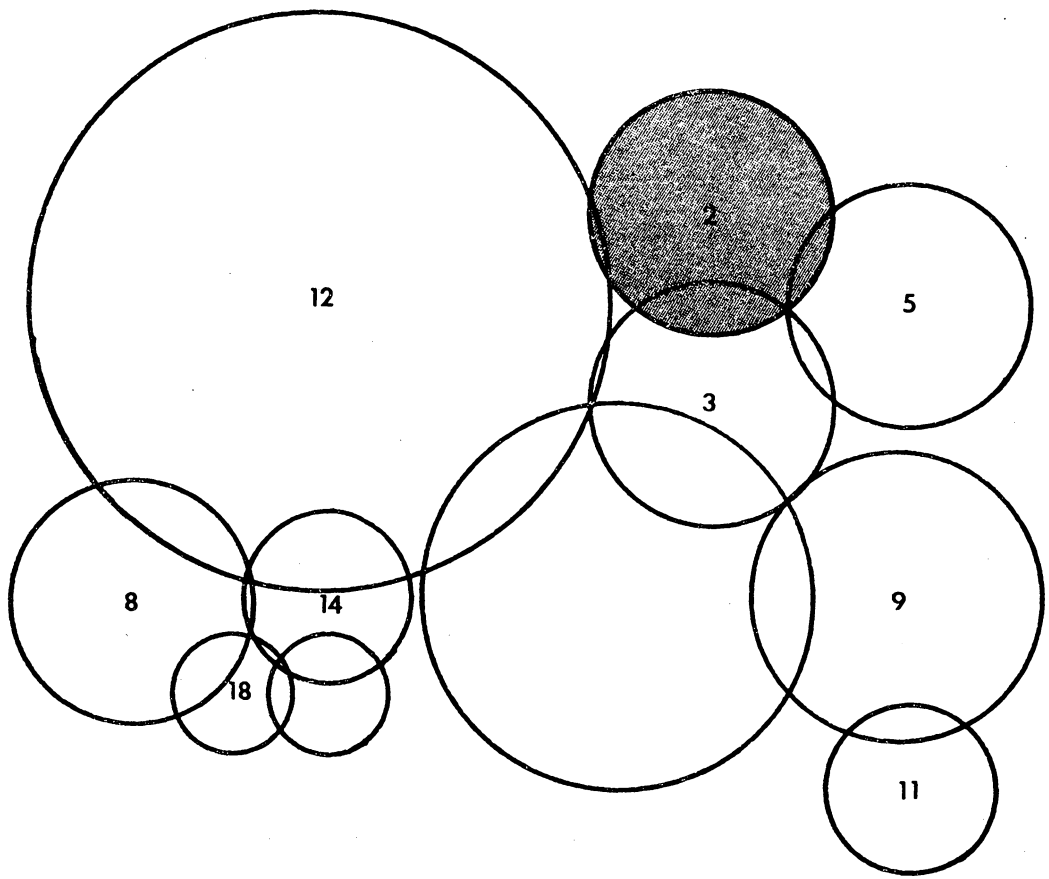
e.

SECRETARY COMPILE



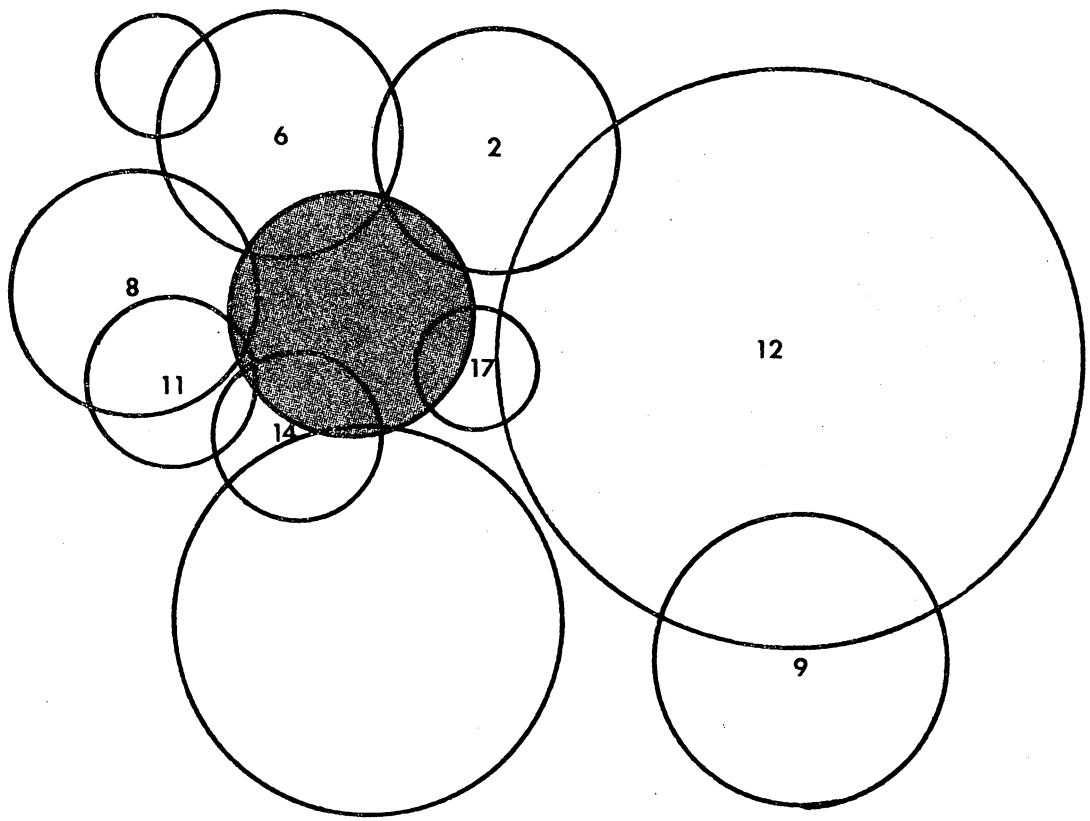
f.

AGENT SINCLAIR



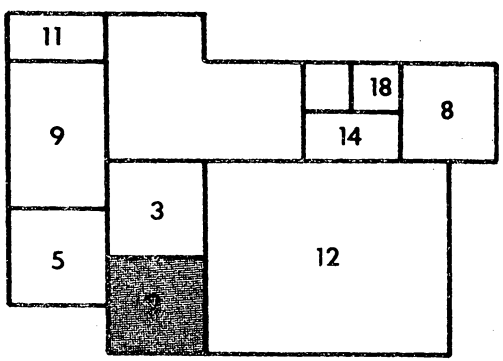
g.

SECRETARY FISHER



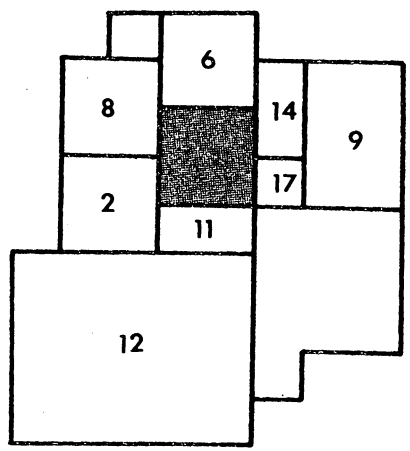
h.

AGENT SINCLAIR



i.

SECRETARY FISHER



j.

appendix 4

page 171

space programming via observational techniques

"The Business Enterprise" is a system of the highest order: a system the "parts" of which are human beings contributing voluntarily of their knowledge, skill, and dedication to a joint venture."
Peter Drucker - "Age of Discontinuity"

APPENDIX IV

SPACE PROGRAMMING VIA OBSERVATIONAL TECHNIQUES

This section, like the preceding one, is an example of a data gathering method for designing the office environment. The study was conducted by Herman Miller Research Corporation (HMRC) of Ann Arbor, Michigan.[35]

This study differs from the Abindgon project in two significant respects. Scale - whereas the Abingdon project investigated the entire office, measuring and recording general functions of the office in terms of time scheduling and proximity hierarchies; the HMRC study concerned itself with one individual's space use and body motor activities over a three day time span. Method - the Abingdon data was gathered using a six page questionnaire, that asked each employee about his or her functions and activities; HMRC utilized time lapsed photography in studying its subject, actually looking at these functions and activities first hand.

The specific aim of HMRC was to use the information that they gathered to design a new office furniture system. The results of this study and

similar ones would eventually lead to Herman Miller's 'Action Office' concept.

The subject of the study was a computer programmer for the Bendix Corporation, also located in Ann Arbor. An accoustically sealed movie camera was set up in one corner of the room where the programmer worked. From the camera's vantage point all actions by the programmer, including entraces and exits, as well as visitors could be recorded. The first three day session was used to study the programmer in his usual facility using standard equipment supplied by the Bendix Corporation. Using the information gathered in the first filming session, the researchers designed equipment to better (hopefully) respond to the subject's needs. The subject was given time to acclimate himself to the experimental facility before the second photo session was commenced. The second filming period allowed a check of the new equipment and also a comparative analysis with the old set up. If there were any observed actions that the researchers didn't understand, these were explored in an interview with the programmer afterwards. This interview was not to gather data, but was only ment to clarify any obscure

situations.

Some items looked at in the study are noted here:

Facility related factors - This concerned a detailed description of the equipment, such as desk properties (size, number of drawers, location; auxiliary equipment such as telephones and their location). (See Figure 60)

Body related factors - Included how a person moved about in the facility, his posture, how he operated at various task, also his entrances and exit patterns were observed. (See Figure 64)

Conference related factors - This delt with interaction between individuals and among groups. It looked at postural organization such as side by side, front to front, one standing one sitting, etc. Number of visitors and frequency of the visits were noted. (See Figure 62)

Material related factors - Distribution and transportation of work tools was recorded. (See Figure 61)

Work generation factors - This is an activity-space use category. How the desk top was used during the course of a day as well as how it was zoned for that use. Time spent on each activity was monitored such as telephone conversations, writing,

clearing away material, etc. (See Figure 59)

This study method allows a microscopic look at a much broader situation that would be very difficult to study on a larger scale. The study focuses on one programmer for a total of 24 hours. From this, a new work station is designed. The validity of the study is suspect due to its brevity. In a five day work week system, there are 2080 hours of work in a year, 20,800 in ten years and 40,160 in twenty years. Observing an individual for 24 hours is only 1.1% of the time that he spends in the office over the course of a year, and only .01% of the time in a ten year period. It is doubtful that a suitable functioning work station can be designed from this miniscule bit of information. What will be learned from this is how one individual operates during a short specific period of time. A problem with this type of study is that it may overlook considerations of functions and actions that by chance did not occur during those three days. Some activities may be seasonally controlled, occuring perhaps only two or three times in a year. Futhermore, the study examines the activities and functions of only one specific

programmer; a study of another programmer would undoubtedly generate different data. So the application of the data is quite limited.

A final drawback to this information gathering technique is the method itself. How much influence does the presence of a camera have on the individual. A worker might appear more diligent (either by actually working harder or putting on an act) than he would if not in such an exposed situation. So again the validity of the data is suspect.

A way to be more accurate and objective, would be to candidly view each individual for a much longer period of time. This would allow the worker to be observed under more varied conditions. However, this covert filming technique may be objectionable to most workers. This information then would be used by the worker himself in aiding and understanding his own work space.

OPEN CHANNEL – NEUTRALITY – STEADY STATE INVOLVEMENT

SINGLE CHANNEL – POSITIVE – ALERT – PROCESS ACTIVE

RESISTANCE INDICATION – AUTHORITY CHALLENGE – WEIGHING

AGGRESSIVE – BRIGHT – ACTION ORIENTED

ENERGIZED REFLECTION – MENTAL LANDSCAPE REFRESHER – TENSION RELIEF

INTERIOR PROCESS DOMINATING – ISSUE EXPANDING – TESTING – QUIZZING – REFLECTING

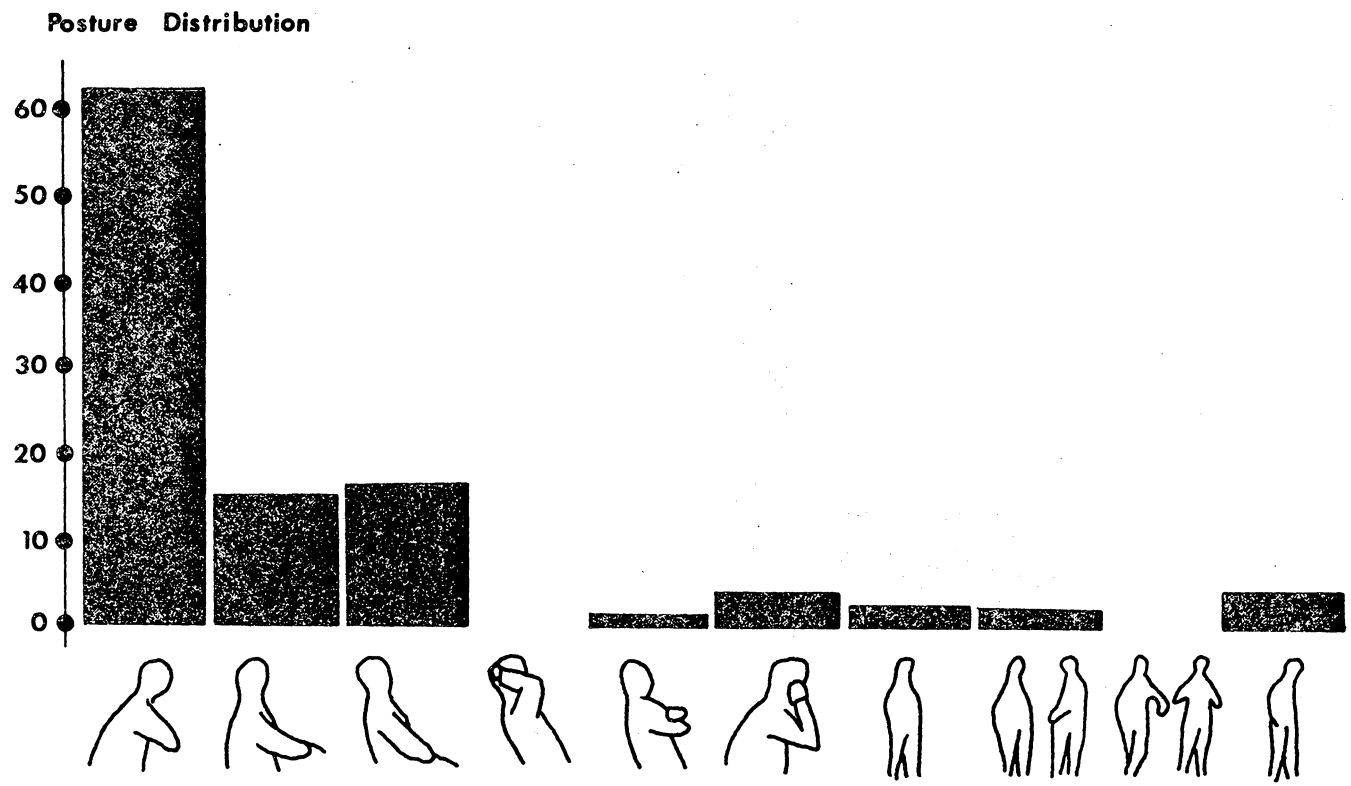
RESOURCE COUPLED REFLECTION – RELAXATION – PARTIAL UNLOCK FROM EXTERIOR INVOLVEMENT

INTERIOR PROCESS – LOW STEADY STATE INTEREST – REFLECTIVE – TENSION RELIEVING

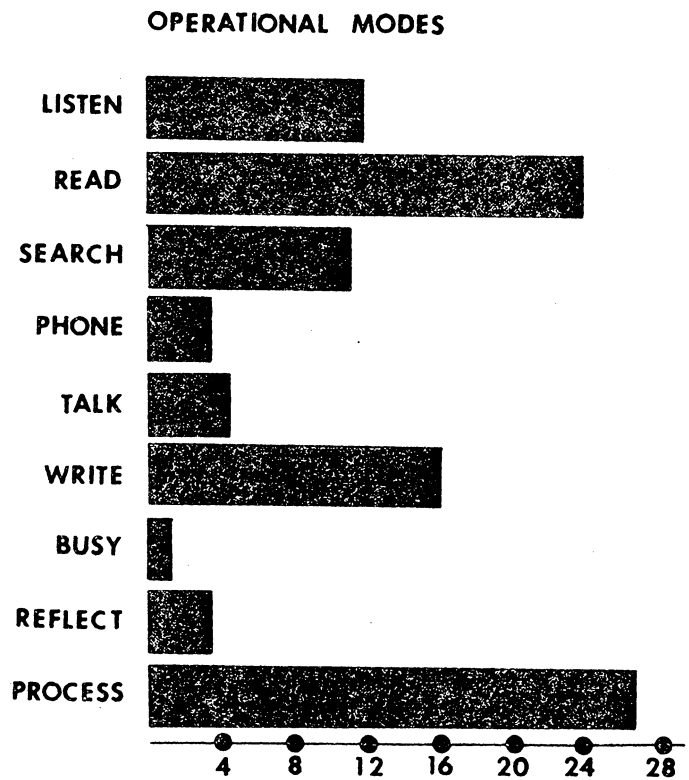
ATTENTION MAINTENANCE – MILD REFLECTIVE QUALITY – FATIGUE RELIEVING

OPERATIONS DOMINATED – TIME AND ENERGY CONSCIOUS – BRIGHT EXECUTION ORIENTED

56 Postural indications of thought characteristics

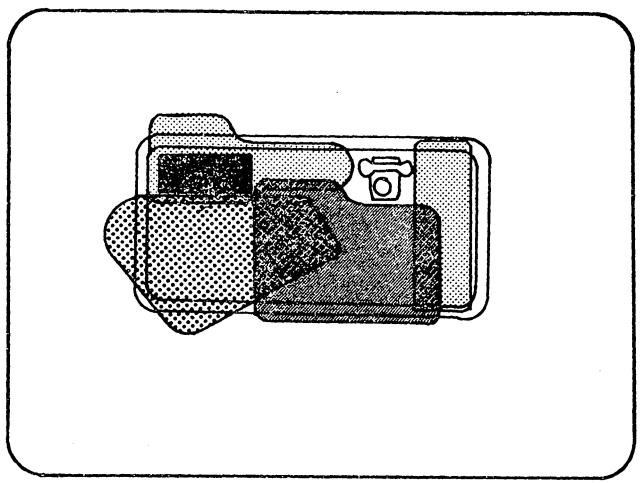


57% of time in office

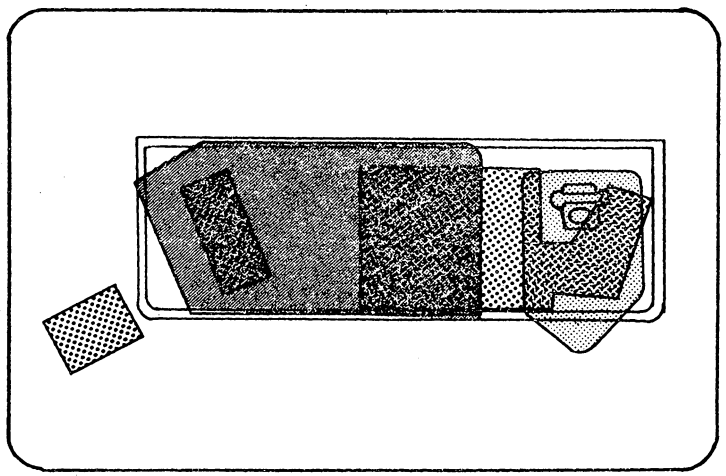


58

% of time spent in office



a. old facility



b. new facility

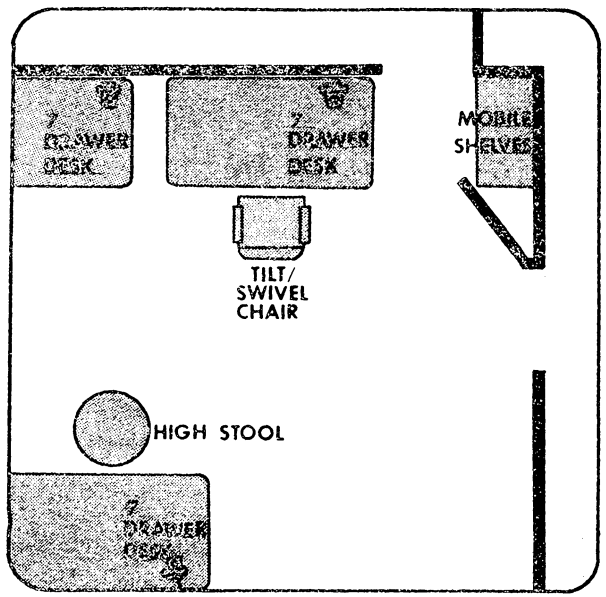
HIGH INTERACTION AREA

REFERENCE

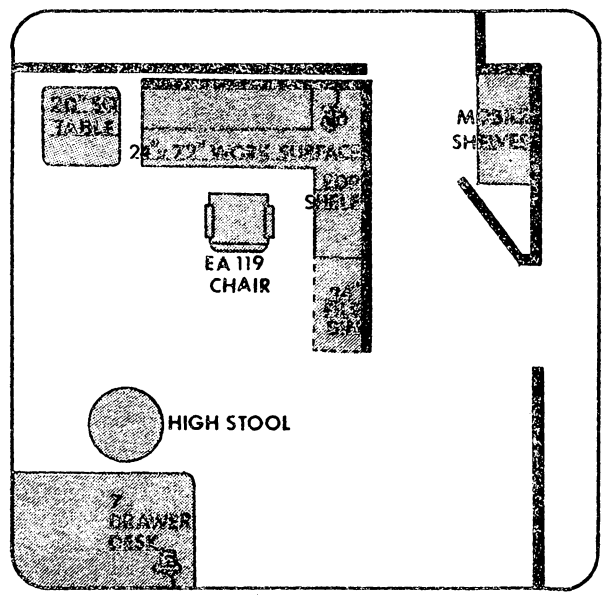
ACTIVE STORAGE

PASSIVE STORAGE

59
Zonal priorities



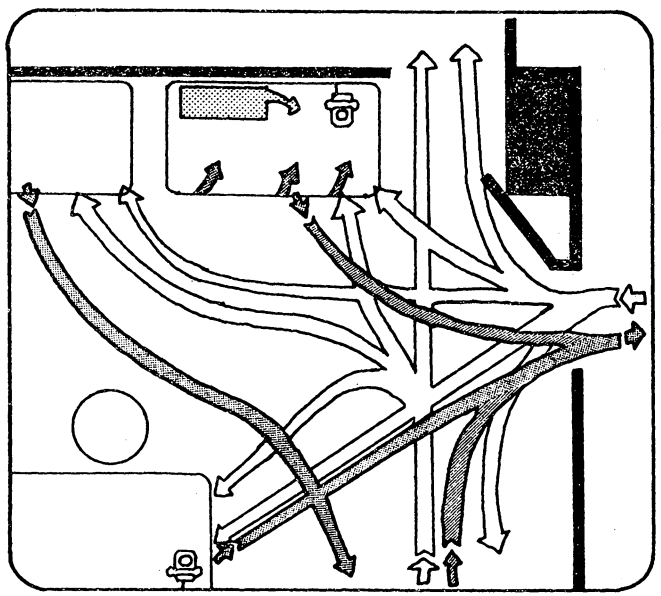
a. old facility



b. new facility

60

Facility Factors – Equipment



a. old facility

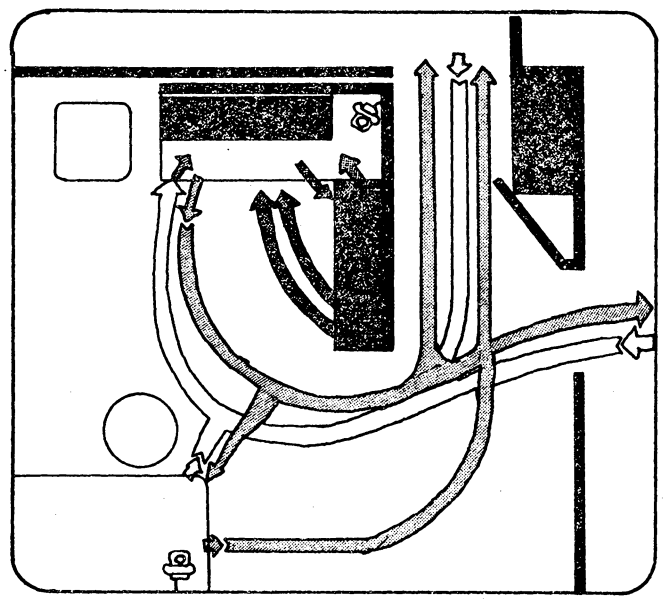
MATERIAL ENTRANCE

MATERIAL EXIT

DRAWER USE

FORMAL STORAGE

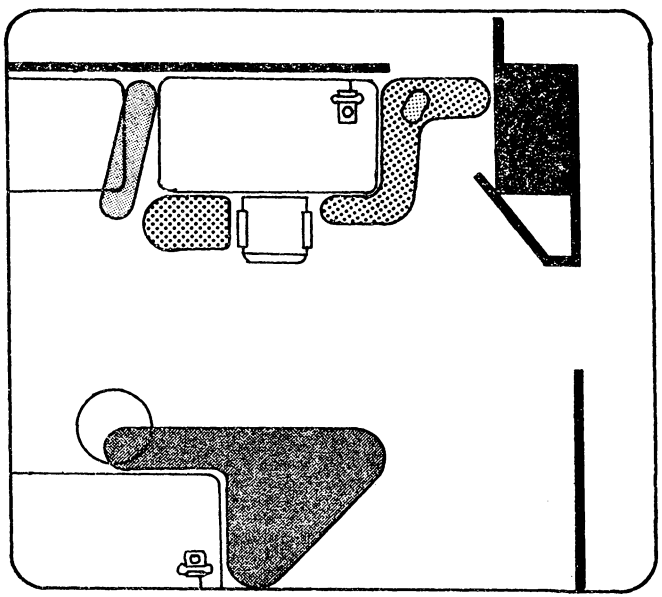
INCIDENTAL STORAGE



b. new facility

61

Material Factors, Flow & Storage Use



a. old facility

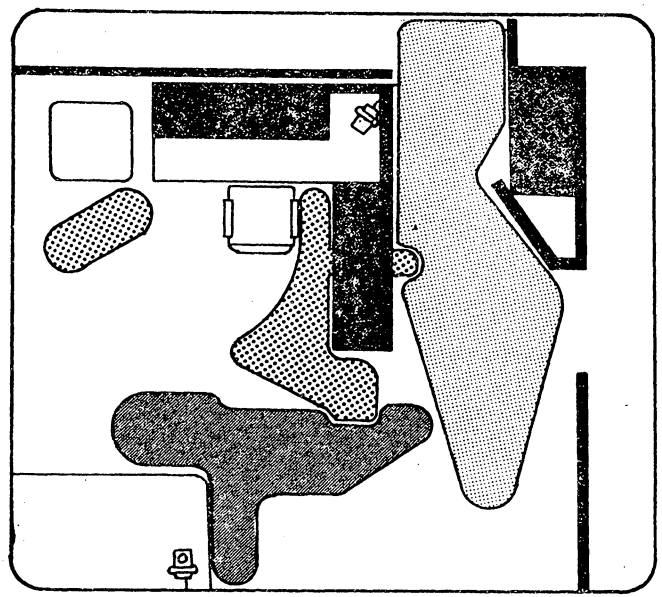
CONFERENCE WITH ONE

CONFERENCE WITH TWO

CONFERENCE WITH THREE

OTHER CONFERENCE

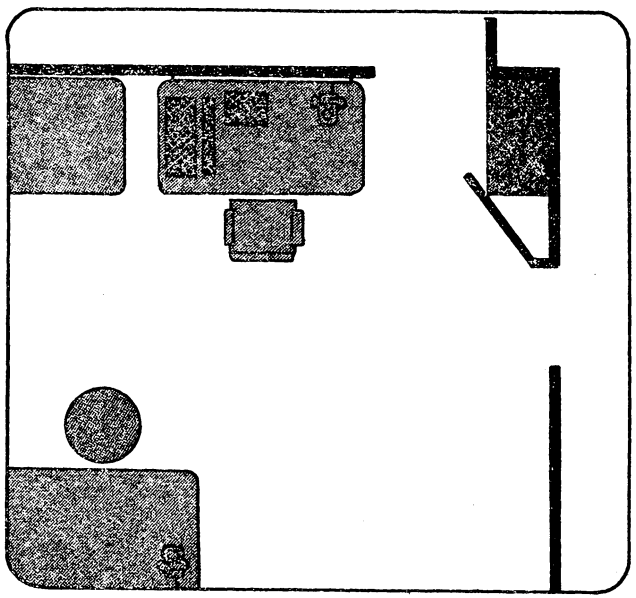
FORMAL STORAGE



b. new facility

62

Conference Factors & Zones

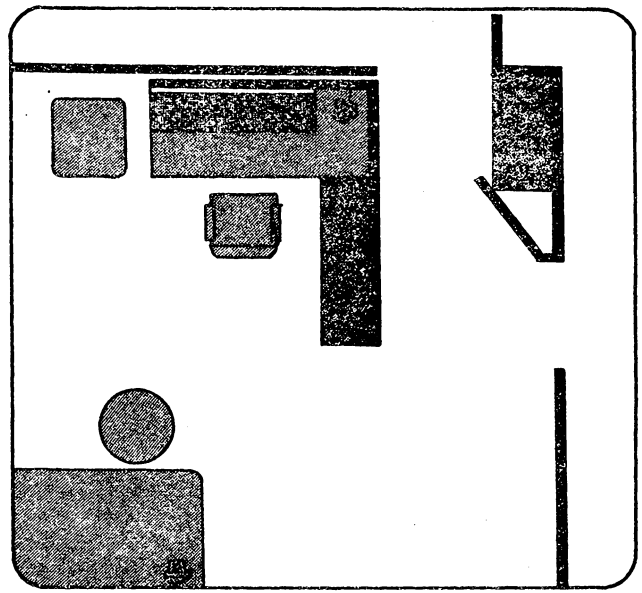


a. old facility

DISPLAY

FORMAL STORAGE

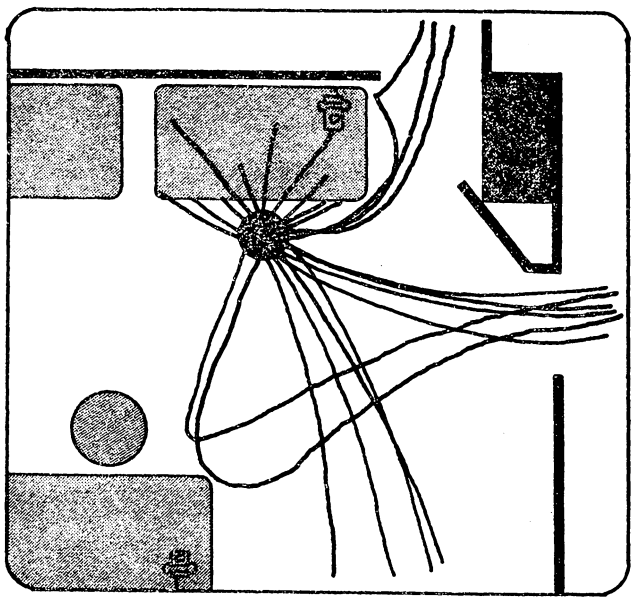
INCIDENTAL STORAGE



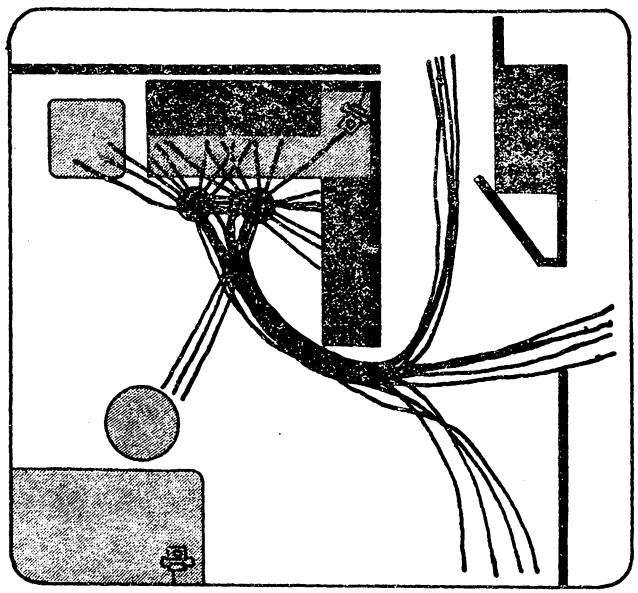
b. new facility

63

Facility Factors – Storage



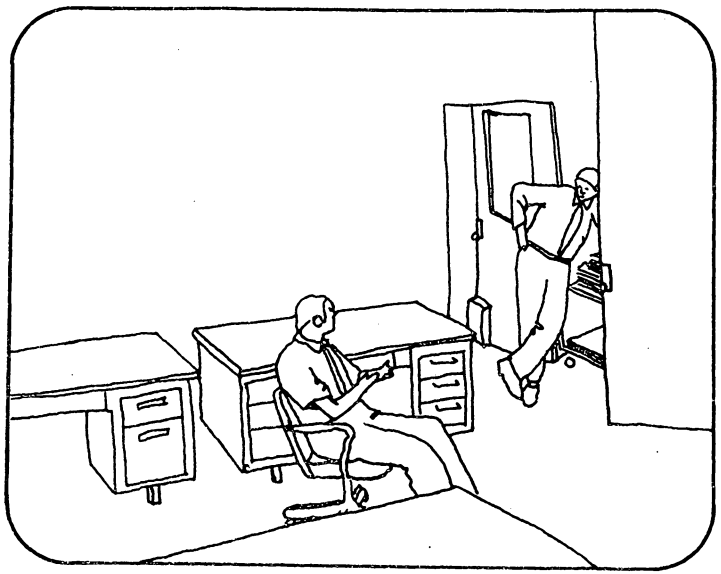
a. old facility



b. new facility

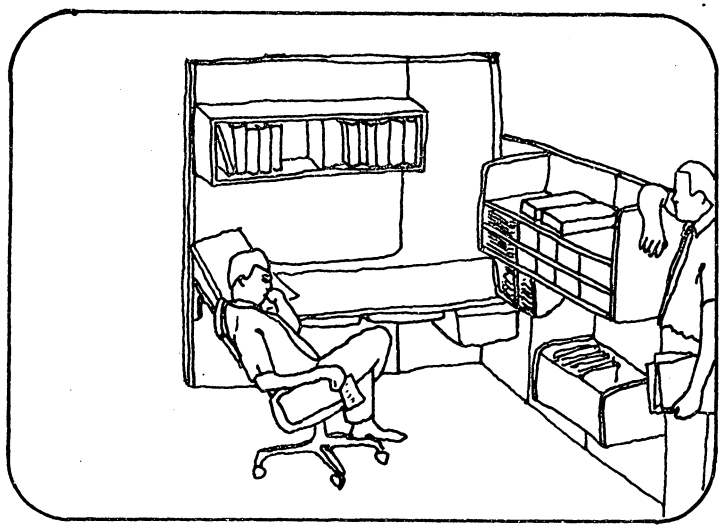
64

Body factors – Distribution, Exit and Entrance



65

a. Camera angle showing existing arrangement



b. New arrangement and equipment

light and reflection

"We begin by eschewing the role of specialists who deal only in parts. Becoming deliberately expansive instead of contractive, we ask, "How do we think in terms of wholes?" If it is true that the bigger the thinking becomes the more lastingly effective it is, we must ask, "How big can we think?" One of the modern tools of high intellectual advantage is the development of what is called general systems theory. Employing it we begin to think of the largest and most comprehensive systems, and try to do so scientifically. We start by inventorying all the important, known variables that are operative in the problem."
R. Buckminster Fuller - "Operating Manual for Spaceship Earth"

APPENDIX V

LIGHT AND REFLECTION

Sitting at your office desk at night, suddenly you wonder what's going on outside. Shifting you attention from your brightly lighted office, you look toward the large expanse of glass that separates you from the outside. What do you see? Probably yourself!

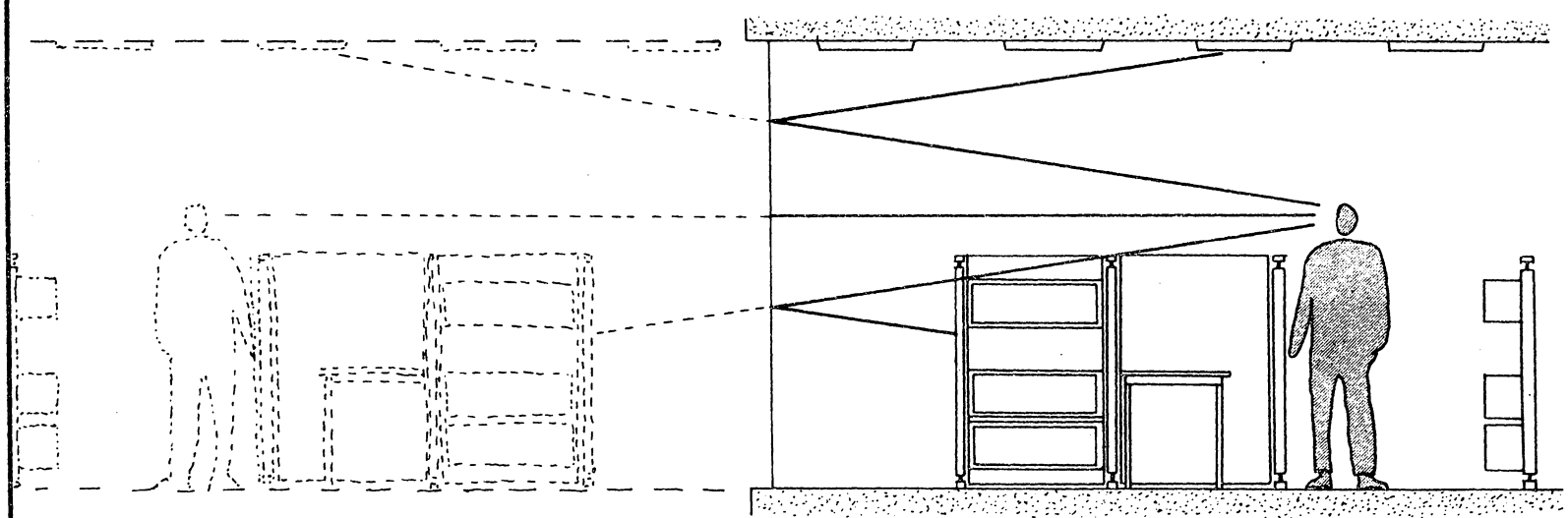
Windows at night, instead of being transparent, are transformed into mirrors. The low light levels outside are still coming in but they are being masked by the high intensity reflections of the interior space. To peer outside is no longer a simple matter of receiving all the visual information and processing it. There are two possible gestalts existing, the primary - high intensity reflection, and the secondary - actual light originating from the outside. The interior reflection is the primary because it is loaded with easily discernable information. To see outside one has to consciously suppress the primary source and concentrate on and assemilate the secondary source. Another factor operating against you is that your

eyes are accustomed to the brighter interior light level.

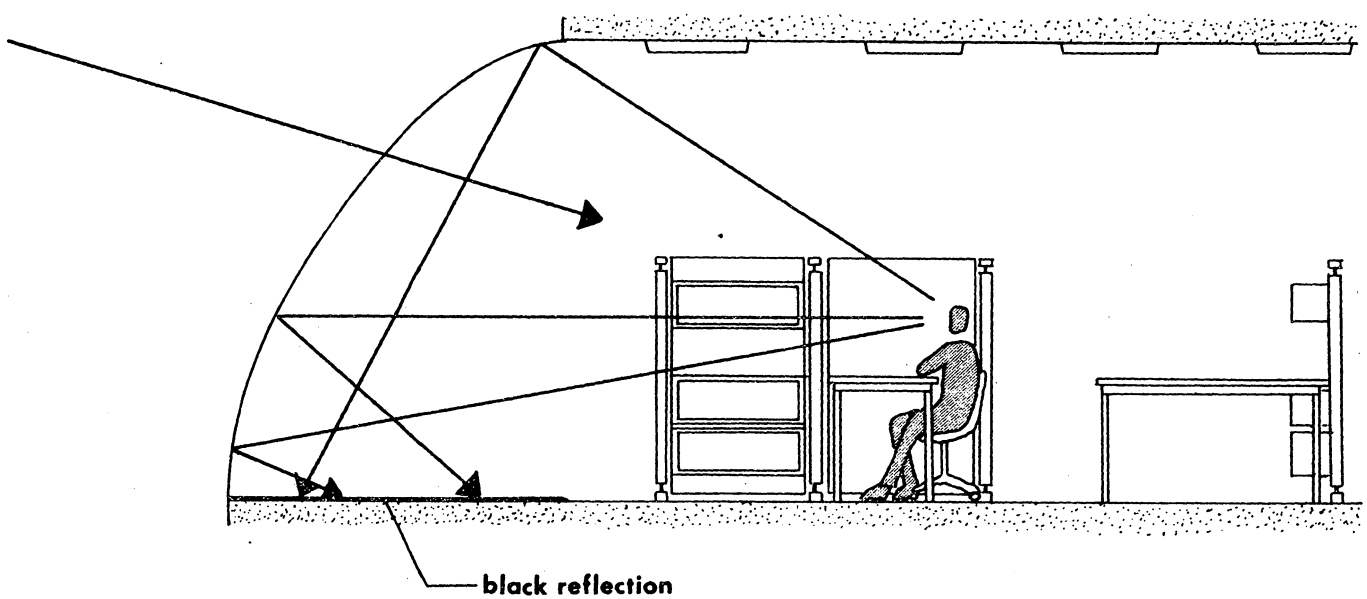
How then do you see outside? As far as eye adjustment there is nothing that can be done. The only alternative then is to get rid of the reflection, leaving only the light coming in from the outside. The reason we see a reflection is because the reflected surfaces are in the angular plane of sight from the observer to the glass to the reflected surfaces. The vertical glass reflects everything as though there were another room beyond the glass. (See Figure 66) If everything in the room were painted black there would be no reflection since black surfaces absorb all light and reflect none; not a practical solution. However, by locating black surfaces at specific areas and then changing the angle of the glass to reflect (or not reflect) the black surface to the observer, then a person would be able to see outside. The illustrations that follow show numerous ways that this can be done. (See Figure 62 A - D) The black surfaces should be of adequate size and the angle of the glass should be such that the black reflection is seen from a sitting down position (3' - 9" for women) through a standing position (5' 7" eye level for

men). Consideration for people on either side of these parameters should be taken into account.

Obviously this technique is not limited to offices, but offers a way to see out of many structures whose limits have been reduced when the sun goes down.

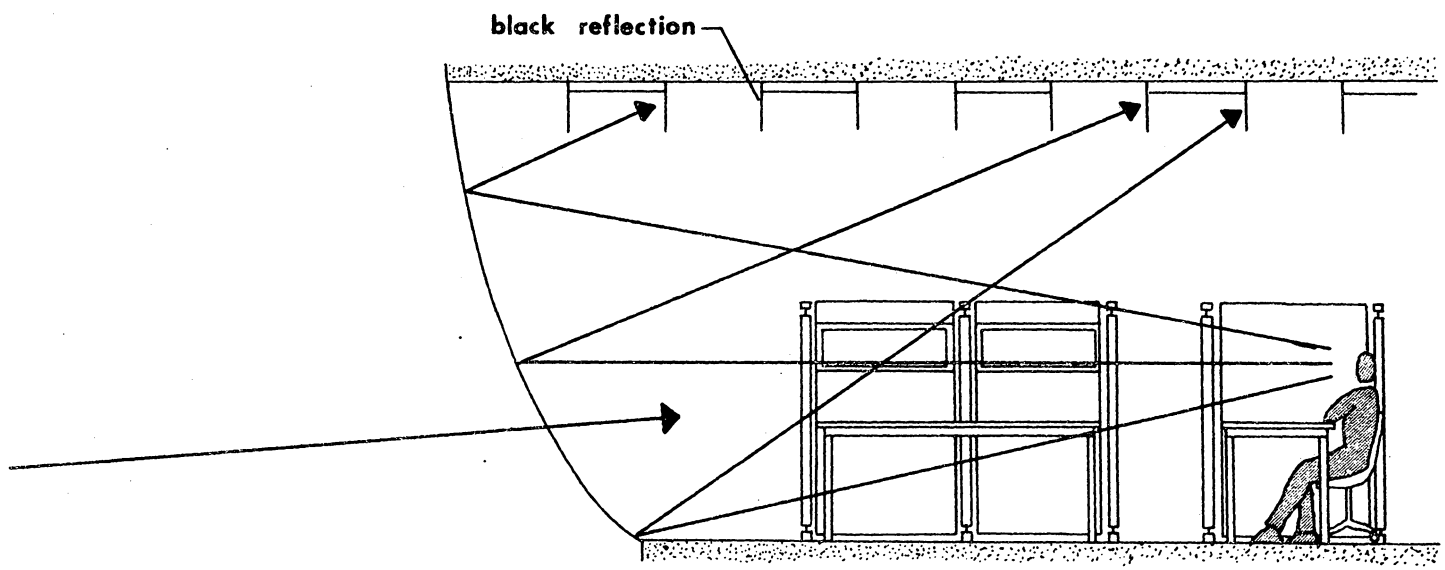


66
Light and reflection at night

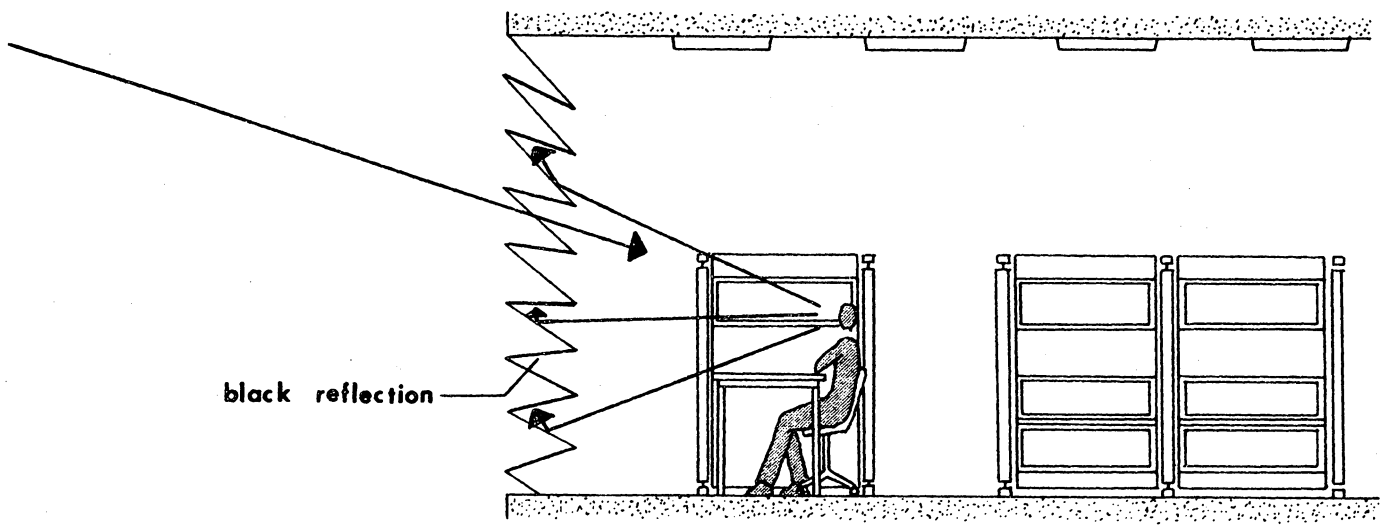


67
Black reflection methods

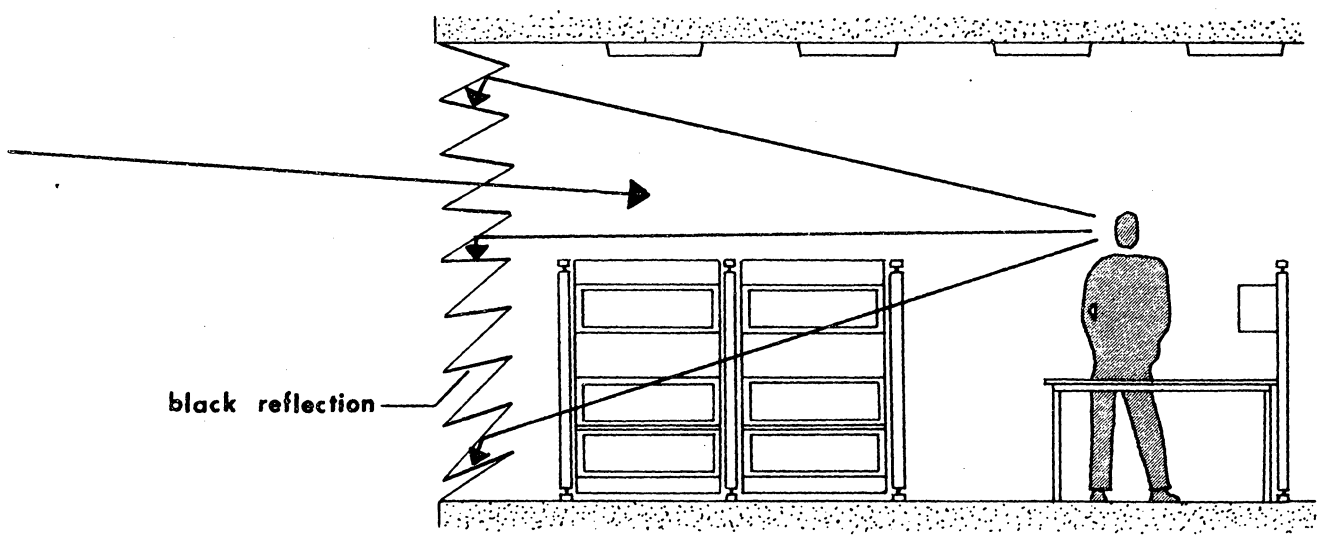
a.



b.



c.



d.

cost factors

"Francis Bacon told us that "Knowledge...is power." This can now be translated into contemporary terms. In our social setting, "Knowledge is change" - and accelerating knowledge - acquisition, fueling the great engine of technology, means accelerating change."
Alvin Toffler - "Future Shock"

APPENDIX VI

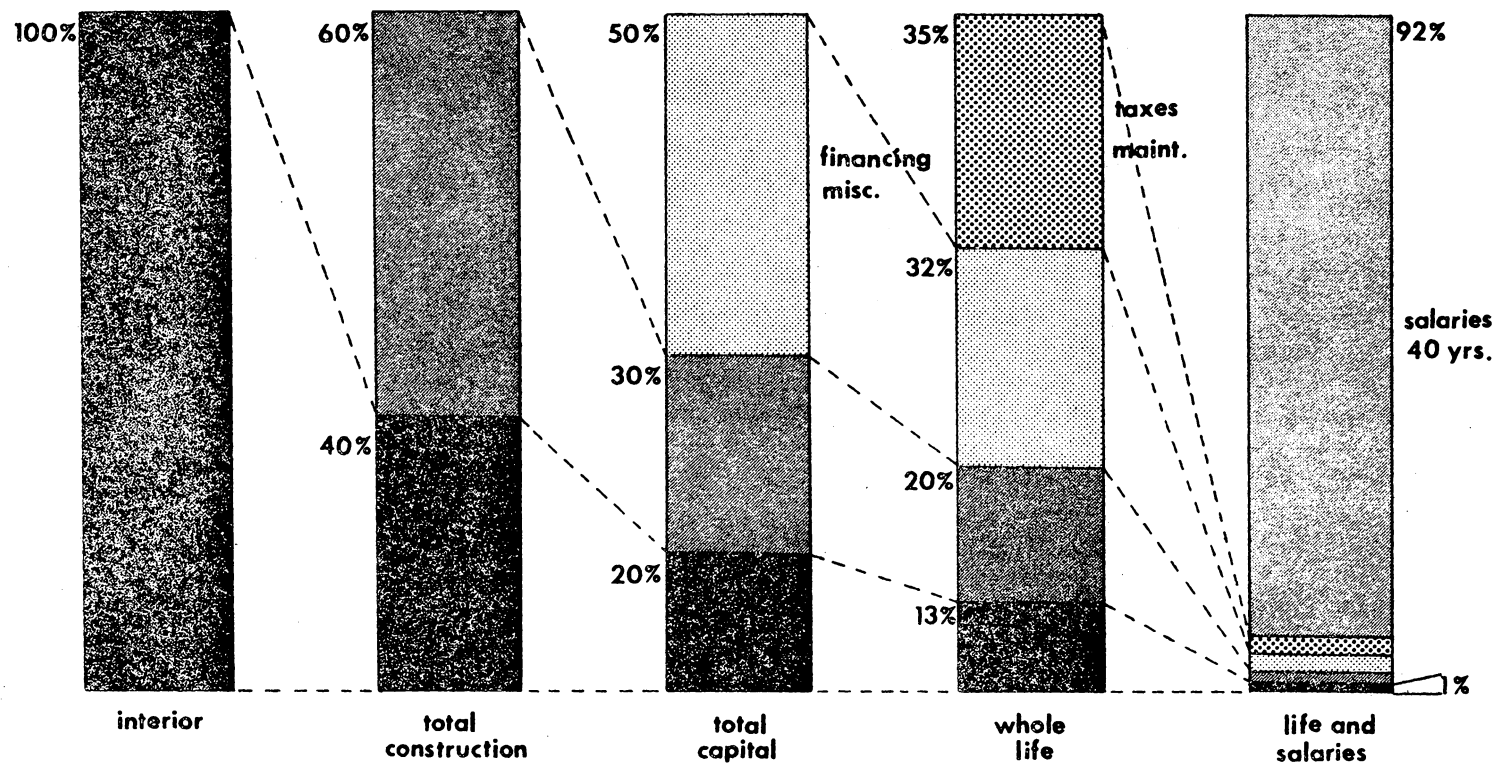
COST FACTORS

On first examination of this system it would appear to cost more than conventional furnishing methods. It may be equivalent in cost to some of the more prestigious equipment systems around (Knoll - Stevens Plus, Herman Miller - Action Offices). However, its economic benefits are in hidden savings that would be realized later as it is used. As the system is changed and adapted, its long term cost will average out to less than the cost of a conventional system which must be 'manipulated' at a high cost.

A second factor to look at in terms of cost are 'whole life' cost of the entire building. This would include construction cost, mechanical systems, interiors, maintainance, taxes and personnel. A look at the bar diagrams on the next page illustrate the minimal cost of the interior of a building as compared to the total operating cost over an expected forty year life span of a building. Interior components here include furnishings, as well as HVAC, electrical, and communications subsystems. The cost of the interior

of a building is approximately 1% of the whole life cost.[36] (See Figure 68)

In other words, considering the benefits that an adaptable office system can provide, and taking into account its relative low cost percentage of the corporate operation, it becomes clear that such an environment is worth the small additional cost over conventional systems.



68

Cost comparison of interior office systems[36]

references

REFERENCES

1. Peter Cowan, The Office - A Facet Of Urban Growth (New York, 1969), p. 14

2. Mason Haire, Psychology in Management (NY., 1959), p. 91

3. Regina Belz Armstrong, The Office Industry (Cambridge, 1972), p. 10

4. Cowan , p. 18

5. Ibid, p. 16

6. Ibid

7. Armstrong, p. 9

8. Cowan, p. 21

9. Ibid. p. 22

10. Lewis Mumford, The Culture of Cities (New York, 1938), p. 228

11. 1970 Office Building Experience Exchange Report (Chicago, 1971), p. 4

12. Kay Barlet, "Empire State a Has-Been," Roanoke Times, March 15, 1976, Section E., p. 1

13. Armstrong, p. 15

14. Elanore Carruth, The Skyscraper Losses in Manhattan Office Building, Fortune Vol. XCI, No. 2 (February, 1975), p. 79

15. Cowan, p. 33

16. 1970 Office Building Experience Exchange Report, p. 4

17. Armstrong, p. 11

18. Cowan, p. 35

19. Ibid., p. 36

20. Armstrong, p. 17

21. Armstrong, p. viii

22. Energy Conservation Design Guidlines for Office Buildings, GSA/PBS (Washington, 1974), p. 9 - 36

23. Ibid.

24. Ibid.

25. The Office That Changes

Gracefully, Office Design Vol. 6, No. 4 (July, 1968), p. 27

26. Fred Steele, Problem Solving in the Spatial Enviroment, Environmental Design Research Association I (North Carolina, 1970), pgs. 129 - 132

27. Michael Brill, The Management of Change and Productive Interiors (Cleveland, 1972), p. 7

28. Robert Ardrey, The Territorial Imperative (New York, 1966)

29. Gerald Davis, Using Interviews of Present Office Workers in Planning New Offices, EDRA III (Los Angeles, 1972), p. 14-2-7

30. Robert Sommer, Personal Space (Englewood Cliffs, N. J., 1969), p. 13

31. Ibid, p. 14

32. John P. Scott, Animal Behavior (Chicago: University of Chicago Press, 1958)

33. Malcolm Brookes, Changes in Employee Attitudes and Work Practices in an Office Landscape, EDRA III (Los Angeles, 1972). p. 14-1-5

34. Davis, p. 14-2-5, 14-2-7

35. Robert Propst, The Human Performer In the Machine Related Office, Environment Vol. 8, No. 1, (January - February, 1970) pgs. 24-31

36. Brill, p. 39

bibliography

BIBLIOGRAPHY

BOOKS

Ardrey, Robert, The Territorial Imperative. Dell Publishing Co., Inc., N.Y., 1966

Armstrong, Regina Belz, The Office Industry - Patterns of Growth and Location. MIT Press Cambridge, Mass., 1972

Berne, Eric, Games People Play Grove Press, Inc, N.Y., 1964

Berne, Eric, Transactional Analysis in Psychotheropy. Grove Press, Inc., N.Y., 1961

Brill, Michael., Terry Collison., and Harvard Eileen, The Management of Change and Productive Interiors. Prepared by Bosti (Buffalo Organization of Social and Technological Innovation, Inc. - for E. F. Hauserman., 1972

Brooks, Malcolm J., "Changes in Employee Attitudes and Work Practices in an Office Landscape." EDRA III - 1972 pp. 14-1-1, - 14-1-9, Copyright - Regents of the University of Calif.

Cowan, Peter, The Office - A Facet of Urban Growth, American Elsevier Publishing Co., Inc., NY, 1969, pgs 22-45

Davis, Gerald, "Using Interviews of Present Office Workers in Planning New Offices" EDRA III, 1072, Copyright- Regents of the University of California, Pages 14-2-1 - 14-2-9.

Delpit, George H. and Stephen B. Johnson, Electronic in Action, Chas A, Bennett Co., Inc., Peoria, Illinois, 1966.

Duffy, Frank, Office Landscaping, Randal Press Ltd., London England, 1969.

Energy Conservation Design Guidlines for Office Buildings, GSA/PBS Publication, 1974 - January, Prepared by Dubin - Mindell - Bloome Associates, in Coop. with AIA Research Corp. Heery & Heery, Arch's.

Gottschalk, Ottomar, Flexible Verwaltungsbouten, Verlag Schnell, Eberhard and Wolfgang Schnelle GMBH, 1968, Germany.

Haire, Mason Psychology in Management, McGraw-Hill Book Co., N.Y., 1959).

Harris, Thomas A., I'm OK - You're OK, 1967 Avon Books - the Hearst Corp., N.Y.

Hewitt, Harry and A. S. Vause, Lamps and Lighting, American Elsevier

Pub. Co., Inc., N.Y., 1966, pgs 163 - 175, 287 - 304, pts tot 566.

Hohl, Reinhold, Office Buildings, Publishers - Frederick A. Praeger, Inc., N.Y., Printed in Germany - 1968.

Hudson, Richard D. Jr., Infrared System Engineering, John Wiley & sons, N.Y., 1969.

HVAC Guide for Commercial Buildings, Buildings - The construction and Building Management Journal, Stamats Publishing Co., 1971, Cedar Rapids, Iowa.

Latner, Joel, The Gestalt Therapy Book, Batom Books, Inc. NY., 1973.

Manassch, Leonard and Roger Cunliffe, Office Buildings Reinhold Publishing Corp., N.Y., 1962

Mcluhan, Marshall, Understanding Media, McGraw-Hill Book Co., N.Y., 1964

Mumford, Lewis, Culture of Cities, Harcourt Brace & Co., N.Y., 1938.

1970 Office Building Experience Exchange Report, Building Owners and Managers Assoc. Inter., Chicago, 1971.

Mid-Continental Banker Mag., "Open Landscaping Furnishing Concept Saves Space, Improves Efficiency", 1972

Propst, Robert, The Office - A Facility Based on Change, The Business Press, Elmhurst, Ill., 1968.

Ripner, Kenneth Henry, Office Building and Office Layout Planning, McGraw-Hill Book Company, Inc., N.Y., 1960.

Saphier, Michael, Office Planning and Design, McGraw-Hill Book Co., N.Y., 1968.

Sloan, Sam A., "Translating Psycho-Social Criteria into Design Determinants", EDRA III, Copyright - Regents of the University of California, 1972, pa. 14-5-1 - 14-5-10.

Smith, P. S., 50 Photoelectric Circuits & Systems, Butterworth & Co., Ltd., London, 1972.

Sommer, Robert, Personal Space, Prentice-Hall, Inc., Englewood Clifts, New Jersey, 1969.

Steele, Fred I. "Problem Solving in the Spatial Environment," EDRA I, Editors and Copyright - Henry Sunoff, Sidney Cohn, pp. 127 - 136.

Stuttgart, Julius Hoffman, Buro-und Verwaltungsge Baude, Germany, 1956.

Weber, Samuel, Optoelectronic Devices and Circuits, McGraw-Hill Book Company, New York, 1964.

MAGAZINES AND NEWSPAPERS

"Banks Discover OPEN Plan Offers Wide Flexibility in Office Design", Bank Systems & Enquipment, 1972 Grolla Publications.

Barleet, Kay "Empire State a Has-Been," Ronoke Times, March 15, 1976, Section E, p. 1.

Beckman, Ronald "Synergy and Simulataneity In Design" Office Design, July, 1969, Vol. 7, No. 4, pp 22 - 28.

Brill, Michael "A System approach to Environmental Design," Environment, Vol. 8, No. 1, Jan, 1970, pp. 38-41.

Camp, Holly "The Serious Business of Show and Tell" Signature Magazine, 1970, diners Club, Inc.

Carruth, Elanore "The Skyscraper Losses in Manhattan Office Buildings" Fortune, Vol. XCI, No. 2, (Frbruary, 1975), pp. 78-83, 162 164,166.

Charter, S. P. R. "The Technological Imperative," Office Design, Vol. 7, No. 4, July 1969, pp. 29-33.

Cihlar, Caroll "Environment is the Message," Office Design, Vol. 6, No. 3, (May, 1968), Business Press International, pp. 38, 40, 42.

"Containing the Paperwork Explosion," Office Design, Vol. 7, No. 3, (May, 1969) pp. 34-39.

"The Effects of Filing on Design," Office Design, Vol. 6, No. 3, (May, 1968), pp. 34-37.

"Energy Distribution in the Open Plan," Environment, May/June, 1970, Business Press Int, Inc.

Feigen, Richard L. "Art and Business a Happy Marriage," Office Design, Vol 7, No. 3, (May, 1969), pp. 28-29.

Gueft, Olga "1 Room, 1000 People," Interiors, Vol. CXXXV, No. 2, Olga Gueft, Sep. 75, pp. 98-103.

"Herman Miller," Industrial Design Magazine, June 1974, Whitney Pub., Inc.

Kelley, Ted "Smoothing the Way to Word Processing Via an Improved Environment," Interiors Magazines, 1974, Whitney Pub, Inc.

McQuade, Walter "The New Look at the Office," Fortune Magazine, Jan. 1974, Vol LXXXIX, No. 1, Pub. Time Inc., Chicago, pp. 88-97. ,br

"The Office that Changes Gracefully," Office Design, Business Press Publications, Inc.

Palmer, Alvin E. "Graphics in the Landscape," Office Design, Vol. 7, No. 3, (May 1969), pp. 30-33.

"Partition Planning Pays Off," Modern Office Procedures, Feb. 1974.

Propst, Robert "The Human Performer in

the Machine - Related Office," Environment, 1969, Business Press International, Inc.

Propst, Robert "Office Function and Equipment," Building Research Magazine, 1972, National Academy of Sciences.

Rota, Paul R. "Computer Software Company's Office," The Office, 1972, Office Publications.

"Silk Purse Out of a Sows Ear," Industry Week Magazine, Nov., 1974.

Smith, C. Ray "Technical Series-workstations With up and down Lighting," Interiors, Vol. CXXXV, No. 2, Sep. 75, pp. 87-97.

Steele, Fred I. "Organization Development and Sticks and Stones," Office Design Magazine, Sept. 1969, pp. 26-29, 38-40.

"Systems D'AMENAGEMENT DE BUREAUX EN "OPEN SPACE," from CREE, June - July - 75, Regie MMC Maison de Marie Claire 261.S1.01, pp. 58 & 59.

BULLETINS AND PAMPHLETS

Dreyfuss, Henry, The Measure of Man, N.Y. Whitney Library of Design, 1967.

Fisher, Robert Moore, Boom in Office Buildings, Urban Land Institute Technical Bulletin - 58, 1967.

Kodak Filters for Scientific and Technical Uses, Kodak Publication, No. B-3, Cnt. 152 8108, Printed in U.S.A., 1973.

Spaces Allowances for Offices and Ceiling Heights in Office Buildings, Building Research Institute - National Academy of Sciences, Technical Reprint, No. 7, Washington, DC., 1956.

UNPUBLISHED DISSERTATION

Steffan Robert F., Cable Television: a New Technology, 1975, Master of Architecture Thesis.

COMPANIES CONTACTED

Abstracta Structures, Inc.
101 Park Avenue, NY 10017

All-Steel, Inc.
Aurora, Illinois

Armstrong Cork Company
Lancaster, PA 17604

Choralia International, Ltd.
Postal Bos 426, Laval, Quebec
H7S 2B2 Canada

Cole - distributed by:
P & M Office Speciality Company
260 Market Avenue
Waynesboro, VA 22980

conweb Corporation
332 Minnesota Street
St. Paul, Minnesota 55101

Designcraft
Kero road, Carlstadt
Carlstadt, New Jersey 07072

Eppinger Furniture, Inc.
155 Fairview Park Drive
Elmsford, NY 10523

Executone, Inc.
29-10 Tomson Avenue
Long Island City, NY 11101

GF Business Equipment, Inc.
Youngstown, Ohio 44501

H&H Tube & Manufacturing Company
245-275 N. Forman Avenue
Detroit, Michigan 48209

Harbor Universal, Inc.
1900 Marina Blvd.
San Leandro, California 94577

Hardwood House
569 Lyell Avenue
Rochester, NY 14606

Hauserman, Inc.
5711 Grant Avenue
Cleveland, Ohio 44105

Haworth, Inc.
545 E. 32nd Street
Holland, Michigan 49423

Haws Corporation
2621 Phillips Street
P. O. Box 631
Elkhart, IN 46514

Herman Miller, Inc.

Office Furniture Group
Zeeland, Michigan 49464

Hesco
601 Industrial Road
Hesston, Kansas 67062

Hiebert, Inc.
23605 TElo Avenue
Torrance, Calif. 90505

Interstate Industries, Inc.
Thomas & Fairfield Avenue
Michigan City, IN 46360

JG Furniture Co., Inc.
121 Park Avenue
Quarkertown, PA 18951

Knoll International
745 Fifth Avenue
New York, NY 10022

Kwik File
2845 Harriet Avenue South
Minneapolis, Minnesota 55408

Modulo 3, Inc.
100 Progress Parkway
Maryland heights, MO 63043

Inter/graph Limited
979 Third Avenue Suite 1803
New York, NY 10022

OMNI Division
Hoover Ball and Bearing Co.
P. O. Box 669
Vernon, Alabama 35592

Ordibel, Inc.
90 Park Avenue
New York, NY 10016

Reff products Limited
400 Oakdale road
Downsview, (Toronto)
Ontario, Canada
M3N 1W5

Smokodor Products Division
Baylis Industries, Inc.
470 West First AVenue

Shaw - Walker
Muskegon, Michigan 49443

Staff Lighting
103 Dutchess Turnpike
P. O. Box 1164
Poughkeepsie, NY 12603

Steelcase, Inc.
P. O. Box 1967
Grand Rapids, Michigan

Swivelier Company, Inc.
Nanuet, NY 10954

Systems Furniture Co.
2012 West 139th Street
Gardena, Calif. 90249

Tecno Collection, Inc.
595 Madison Avenue
New York, NY 10022

Thinwall Partitions
Adalock Jamestown Corp.
Jamestown, NY 14701

Tivoli Industries, Inc.
1802 W. fourth Street
Santa Ana, Calif 92703

Tsao Designs
108 Main Street
New Canaan, CONN 06840

Tuohy Furniture Corp.
U. S. Highway 52 south
Chatfield, MINN 55923

Vogel-Peterson Co.
route 83 and Madison Street
Elmhurst, IL 60126

Westinghouse Electric Corp.
Architecture Systems Department
4300 36th St. S.E.
Box 8010
Grand Rapids, Michigan 49508

Wiremold Company
West Hartford, CONN 06110

vita

The vita has been removed from the scanned document

ADAPTABLE USER SYSTEMS IN THE OFFICE LANDSCAPE by

Carroll Clinton Skinnell

(ABSTRACT)

Offices exist in a changing world. They need to be able to adapt to these changes. Present office equipment (furniture, electrical power and communication distribution systems, and lighting) maintain the office in a state of permanence. The goal of this thesis was to re-design present equipment and to design new equipment that will be flexible and that is understandable and simple to operate by the average office worker. Technological solutions were found for technological problems.

Secondary supporting data concerning behavorial inhibitions to change as well as response to change were examined. Also, present techniques for space planning were looked at to ascertain their usefulness and validity in a frequently changing environment.

Finally, comparative cost factors were examined to place in perspective the cost of the new systems presented in this thesis.