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Guidelines on performance criteria for the State University of New York consider two main types of handicapped: the ambulant and semi-ambulant, including some physically handicapped, the visually and aurally handicapped, and persons with cardiac conditions; and persons confined to wheel chairs. The handicapped and planning for them are discussed. Specifications are detailed for the following aspects of exterior design: entrances, ramps, stairs, doors, walks, intersections, gratings and manholes, parking, and bus service. Interior design criteria cited are for general university facilities, restrooms, bedrooms, stairs, elevators, doors, conveniences, and fire protection. Persons involved in or contributing to the study are named, and 19 references are listed. (JD)

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MAKING FACILITIES ACCESSIBLE TO THE PHYSICALLY HANDICAPPED



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PERFORMANCE CRITERIA

STATE UNIVERSITY OF NEW YORK
STATE UNIVERSITY CONSTRUCTION FUND

MAKING FACILITIES ACCESSIBLE TO THE PHYSICALLY HANDICAPPED

**U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION**

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**STATE UNIVERSITY CONSTRUCTION FUND
ALBANY, NEW YORK, JULY 1967**

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Paragraphs printed in color in italic type at the foot of various pages are quotations from the proceedings of the November 1966 Seminar.

FOREWORD

The State University Construction Fund is engaged in a continuing research program to develop Performance Criteria for the physical facilities of State University. It is the Fund's intention to promote, by means of Performance Criteria, an understanding of the broad principles, policies and requirements on which are based the planning, design and construction of these facilities.

More specifically, the objectives of these Performance Criteria are:

- To provide an objective basis for the Fund's approach to planning, design and construction, and for its review and approval of design submissions;
- To establish a system of communication by means of which the owner can make his preferences known to all members of the building industry team and still allow them sufficient flexibility to utilize available resources effectively;
- To create an administrative environment favorable to the development of design solutions, construction techniques and materials and products that respond to the functional and economic requirements of individual projects; and
- To document and make available the current significant results of research and experience in the building industry, particularly with respect to the Fund's program.

The Fund Performance Criteria serve only to establish minimum guidelines and to define adequately the performance requirements for State University physical facilities, in terms of the total program of education objectives and the objectives of function, environment and maintenance and operation. The aim is not to establish narrow limitations, but to provide the owner with a useful

tool for evaluating performance in areas of vital concern to him.

The Performance Criteria for the Physically Handicapped were developed with the help of a grant from the Vocational Rehabilitation Administration of the United States Department of Health, Education and Welfare. By collaboration with universities and with professionals of nation-wide reputation in physical rehabilitation--and by sponsoring and conducting an industry-wide seminar--the Fund has developed a guide that reflects and incorporates the best known practices in establishing educational environments favorable to the handicapped, while remaining cognizant, at the same time, of the owner's needs and problems.

The Fund does not intend these Performance Criteria to degenerate into static requirements. Rather, they will be continually evaluated to assure their relevance to the needs and requirements of the handicapped and to keep pace with new developments in planning, design and construction. It is anticipated that, by stating requirements as much as possible in performance language, these criteria will continue to be useful for a longer period than would be the case were they stated as specifications dictating or prescribing specific solutions to design and construction problems.

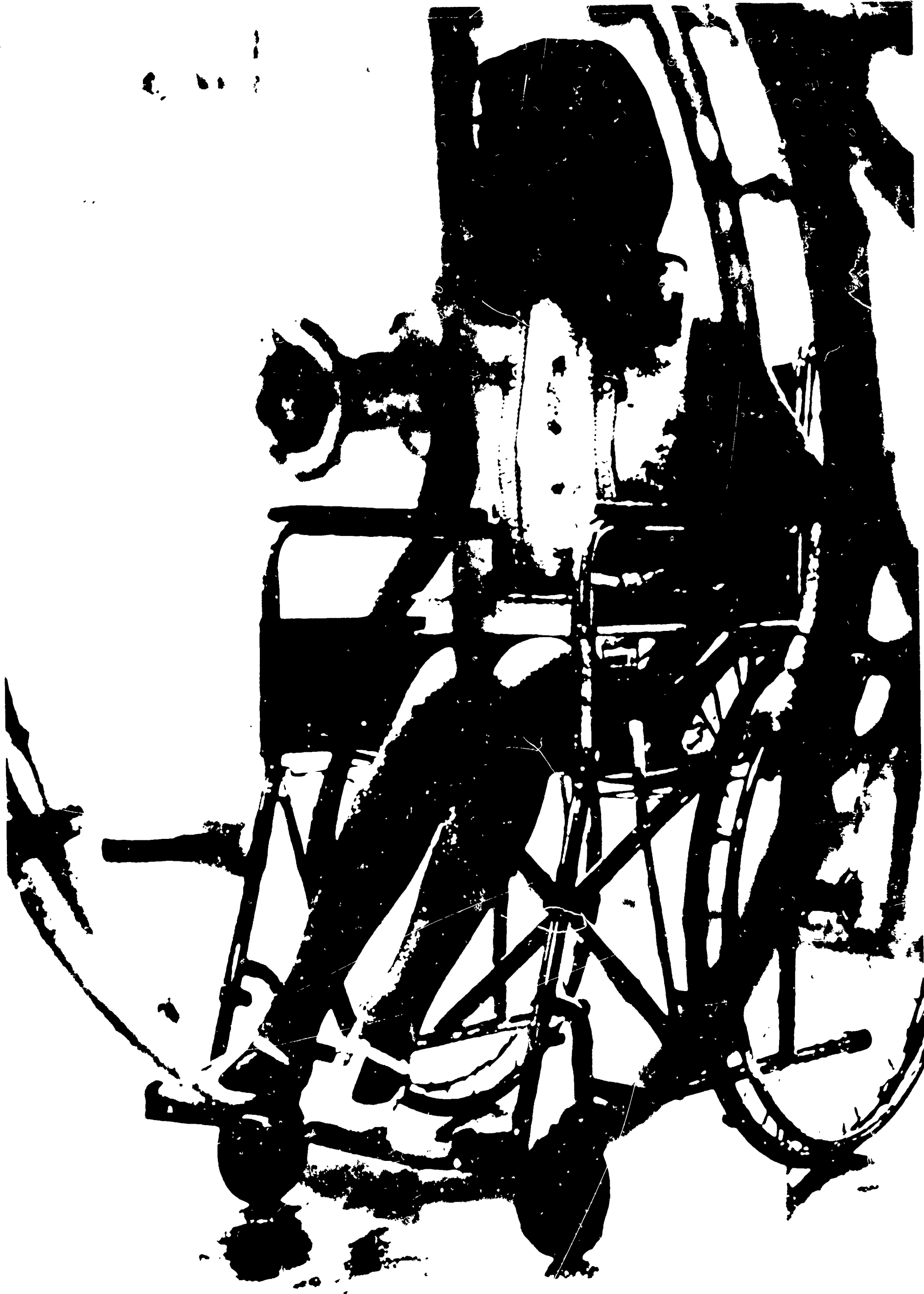
The universities, the design professions, the materials and product manufacturers and the building contractors are encouraged to achieve, through these criteria, an understanding of the needs of the handicapped and to translate this understanding into university environments in a practical, economical and creative way, to open for the handicapped an ever-widening vista of educational accomplishment.

We live in today's modern world through education and it's particularly important with these young people that they have the chance for that education because they, of all people, are limited to the knowledge in their heads, and their ability to communicate that knowledge through speech or through the use of their hands.

--Eugene Taylor

The future campus will be an educational environment which provides for the needs of both the disabled and the able bodied. The architect, using these criteria as a guide, can easily accomplish this task neglected for so long.

--Leon Chatelain





INTRODUCTION

In the past, architects have been content when the buildings they have designed have functioned satisfactorily with respect to "the average man." Unaware of the large numbers of the physically handicapped striving to make their way in the world as functional and productive citizens, architects have often inadvertently designed and built into their buildings elements that act as environmental restrictions to the handicapped. Hence this guide, which, first, seeks to analyze and explain some of the difficulties encountered by the physically handicapped in attempting to enter and move about functionally within college campuses and buildings, and, second, sets forth some of the design and equipment considerations offered by professionals in the field of physical rehabilitation.

Access to existing and future New York State-owned buildings is being provided physically handicapped persons through a program initiated by Governor Nelson A. Rockefeller in an executive order dated June, 1961. The Governor's program, based on recommendations of the Governor's Council on Rehabilitation and The Interdepartmental Health and Hospital Council, has required that State buildings be designed and constructed, or modified, where necessary, to facilitate their use by the physically handicapped.

Under this program, State University facilities are being so constructed or modified that provision is made for the handicapped to obtain for themselves the greatest possible benefit from higher education at State University campuses and thus more closely approach realization of their full potential as productive individuals in our society.

Since the handicapped should, as far as possible, participate in the broadest range of campus activities equally with those not handicapped, it is imperative

that the entire campus be brought into consideration, and not for the benefit of the handicapped student only, but also for State University staff and campus visitors with permanent or temporary physical handicaps or with sight, hearing, cardiac or respiratory disabilities.

Facilities designed to serve the handicapped also serve the non-handicapped. Able-bodied people find it easier to get around, and maintenance is facilitated, lowering operating cost.

Intelligent planning avoids extra expense, since a facility constructed from the outset with the problems of the handicapped in mind need cost little if any more than a similar facility planned without these considerations.

Ultimately, the long-range societal value of highly trained and skilled handicapped people more than offsets the comparatively slight design and construction costs attributable to a response to the needs of the handicapped.

Among the professionals and other authorities who have collaborated with the Fund to make these Criteria comprehensive, authoritative and valid, are:

Dr. Timothy J. Nugent, Director of the Rehabilitation-Education Center at the University of Illinois, a member of the President's Committee on Employment of the Physically Handicapped, of the National Rehabilitation Association, of the National Vocational Guidance Association and of the American Personnel Guidance Association. Dr. Nugent has published many articles and brochures on the acceptance of handicapped students in the University environment, pioneering in the movement to make facilities available to them.

Martin Feldman, Project Coordinator for the Human Resources Research and Training Institute, an organization set up as the research division of Abilities, Inc., of

There is a general agreement that, with the 60 per cent rise in population within the next 35 years, there will be a 68 per cent rise in the labor force and in jobs. Now, among the people who will be competing for these jobs among these 71 million--about ten million by reasonable estimates will be disabled by disease, by accident, or by old age and will need in the conduct of their work and in their public and private lives, facilities compatible with their disabilities

--Henry Viscardi

Albertson, New York. This institute is working on a project relating to the education of physically disabled children, under a grant from the U. S. Office of Education.

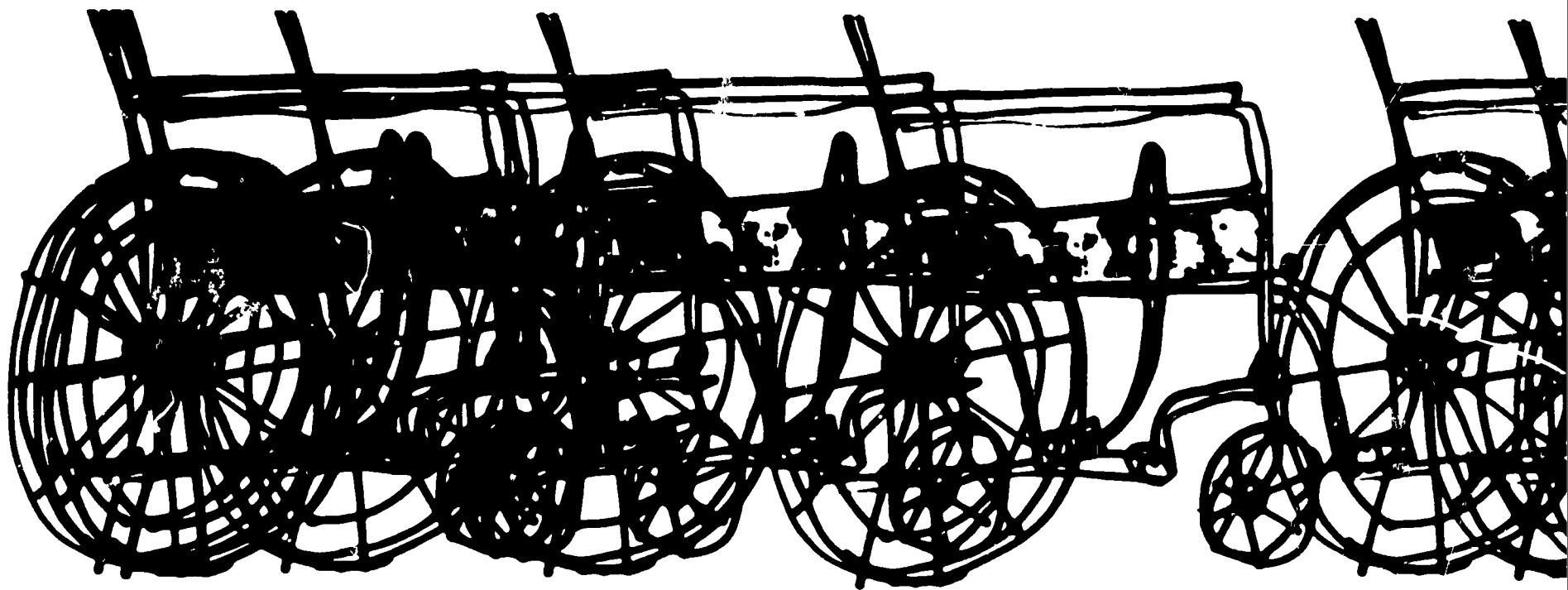
Adrian Levy, Assistant Commissioner of Education for Vocational Rehabilitation, New York State Department of Education, and active for many years in vocational rehabilitation programs at both national and state levels. He has served in elective and appointive positions in many of the associations dealing with rehabilitation and guidance, and is a member of the Advisory Panel on Rehabilitation Counselor Training and of the Rehabilitation Advisory Committee to the New York State Workmen's Compensation Board.

Dr. Alfred Cohn, Coordinator of the Program for Higher Education for the Disabled at Hofstra University. He has been working under a grant from the Vocational Rehabilitation Administration to make that University accessible to the physically handicapped.

Martha E. Schnebly and Muriel E. Zimmerman, respec-

tively Director and Associate Director of Occupational Therapy of the Institute of Rehabilitation Medicine, New York University, and Edith Buchwald Lawton, Director of Postgraduate Education for Paramedical Personnel of the same Institute. Familiar with problems of the handicapped, worldwide, they were instrumental in the conception and design of a structure, known as "Horizon House", which would provide accessibility and living convenience for the handicapped.

Dr. Joseph Fenton, Chief of the Division of Research and Training Centers of the Vocational Rehabilitation Administration of the Department of Health, Education and Welfare; until recently, Special Assistant to the New York State Interdepartmental Health and Hospital Council; and, since 1960, Special Assistant to the Governor's Council on Rehabilitation, directing the development of the "Master Plan" for rehabilitation in New York State. Dr. Fenton, has had a long and active career in his special field, and authored many reports and professional publications of interest and value to those ac-



tively concerned with providing educational opportunities for the handicapped.

Thomas Eldridge, School Specialist with the E. F. Hauserman Company. While with the Dormitory Authority of the State of New York, he performed the principal research in the field of dormitory and dining hall accessibility for the handicapped.

Additional thrust and meaning were supplied by the earlier pioneering efforts of such dedicated people as:

Henry Viscardi, founder of Abilities, Inc., pioneer in the field of rehabilitation of the physically handicapped. He has been instrumental in bringing about greater public awareness of the abilities of the handicapped.

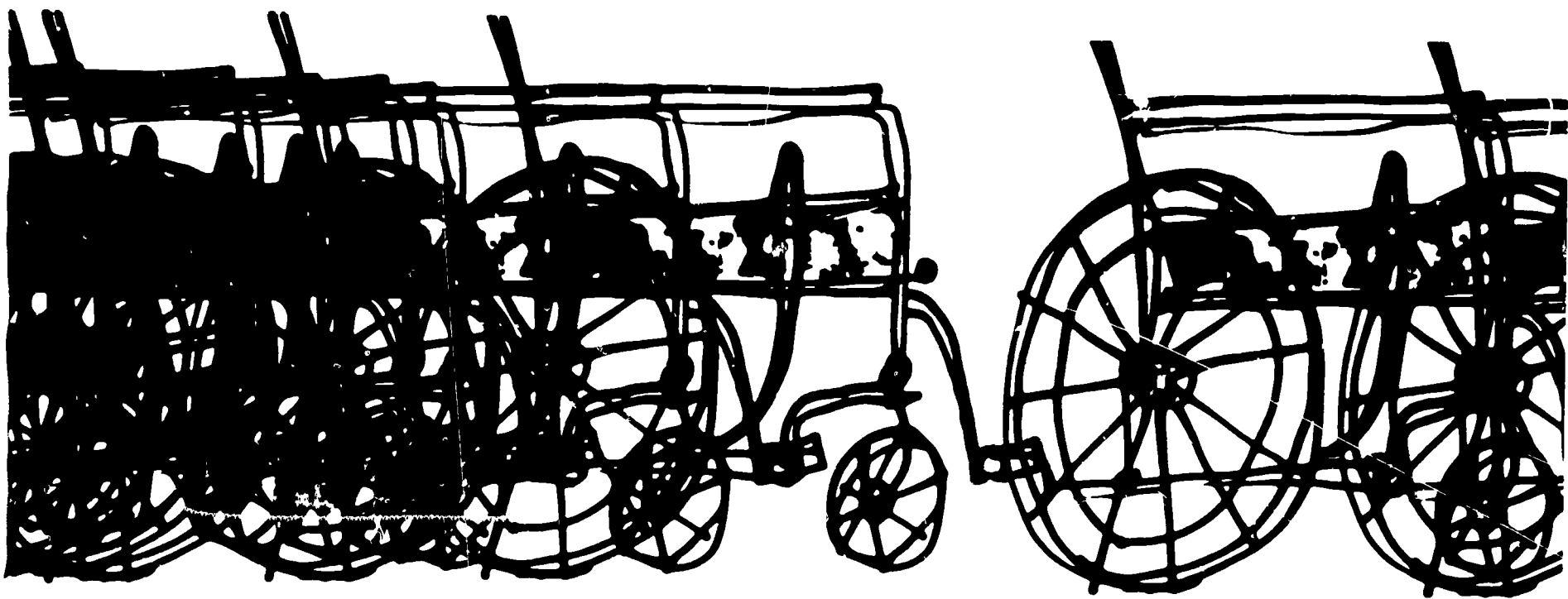
Eugene J. Taylor, Adjunct-Associate Professor of Physical Medicine and Rehabilitation, New York University, School of Medicine; Consultant to the Vocational Rehabilitation Administration, to the Human Resources Center and to the Health Resources Advisory Committee. Dr. Taylor's writings are of importance to

those seeking to meet the requirements in educational opportunity for the handicapped.

Dr. Howard A. Rusk, M.D. Professor and Chairman of the Department of Rehabilitation Medicine, New York University. Dr. Rusk is one of the foremost authorities in the field of rehabilitation.

Leon Chatelain, Jr., a member of the Executive Committee of the President's Committee for Employment of the Handicapped. His international reputation as an architect has not diverted him from contributing knowledge and time in service for the handicapped; he has long been associated with committees and organizations concerned with solving problems in this field.

The Honorable Mary Switzer, Commissioner of Vocational Rehabilitation. She encouraged the development of Fund Criteria and the preparation of this book by her personal counsel and through the award of a grant that made possible much of the research and the publication of the Criteria, in quantity.





THE HANDICAPPED

An estimated 2.5 million New Yorkers are in some way limited in their ability to move about and use public facilities. People in wheelchairs, or with leg braces and artificial limbs; individuals suffering from heart conditions, and those who are blind and aged find that flights of stairs, curbs, revolving doors, out-of-reach drinking fountains and telephones, narrow doorways and inadequate rest room facilities and other similar restrictions tend to deny them free access to buildings in which they otherwise might pursue valuable business, vocational, educational, social and recreational objectives.

Statistics of the National Safety Council indicate a yearly increase in the number of persons becoming disabled due to a wide variety of accidents. Millions of dollars have been spent in rehabilitating the handicapped so that they may become self-supporting and productive members of our society. Every year, automobile and industrial accidents, strokes, arthritis, nerve disorders, cardiac problems, old age and many other problems add to the list of handicapped. Those with permanent disabilities are often taught, through intensive rehabilitation, to overcome ordinary obstacles. However, a large portion of our population of the handicapped, who become temporarily disabled through fractures of the lower limbs or through surgery, present a special problem because they usually have recovered from their handicap by the time they have learned to live successfully with it. Consequently, as far as the

use of facilities is concerned, these people are more handicapped, during the period of their disability, than are those who are permanently disabled.

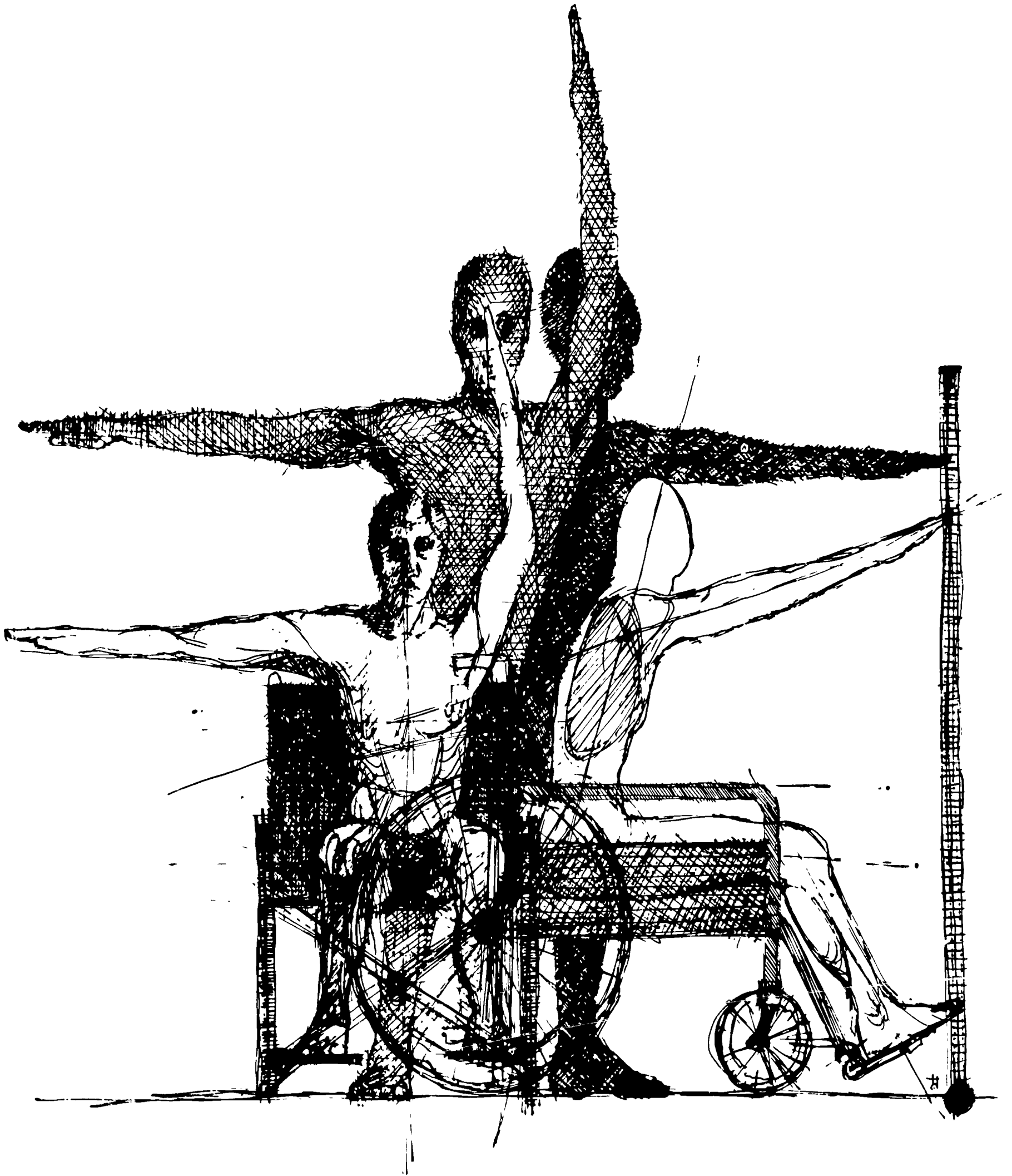
Despite the individual and specific effect of a handicap, certain general planning considerations must be taken into account if facilities are to be made accessible. Most basic is the need to provide wheelchair users and other handicapped pedestrians with access to and ease of movement to and within the exterior and interior spaces of any facility, and to make the use of equipment and conveniences possible to them. In planning, two main types of handicaps are to be considered:

- The ambulant and semi-ambulant--including persons with crutches or walking sticks, the blind, individuals with cardiac conditions, and the deaf.
- Paraplegics, amputees and hemiplegics--all of whom are handicapped in the upper and/or lower extremities to an extent which usually dictates their confinement to a wheelchair.

The wheelchair with its different mode of movement, requires the most stringent standards with respect to clear spaces, grades, the size of openings, and the accessibility of equipment and conveniences. Therefore, the criteria set forth in this publication are largely devoted to the needs of wheelchair users, not meaning to create an effortless atmosphere for them or for other handicapped, but rather to provide environmental assistance.

I would like to say that there is no common denominator to disability, not only by cause and manifestation, but also by age at onset, duration of disability, station in life, and a multiplicity of other things. The problems which accrue to the disabled early in life or at birth may be uniquely different from those which accrue to the individual who may be disabled later in life or at the prime of life.

--Timothy Nugent



PLANNING FOR THE NEW DIMENSION

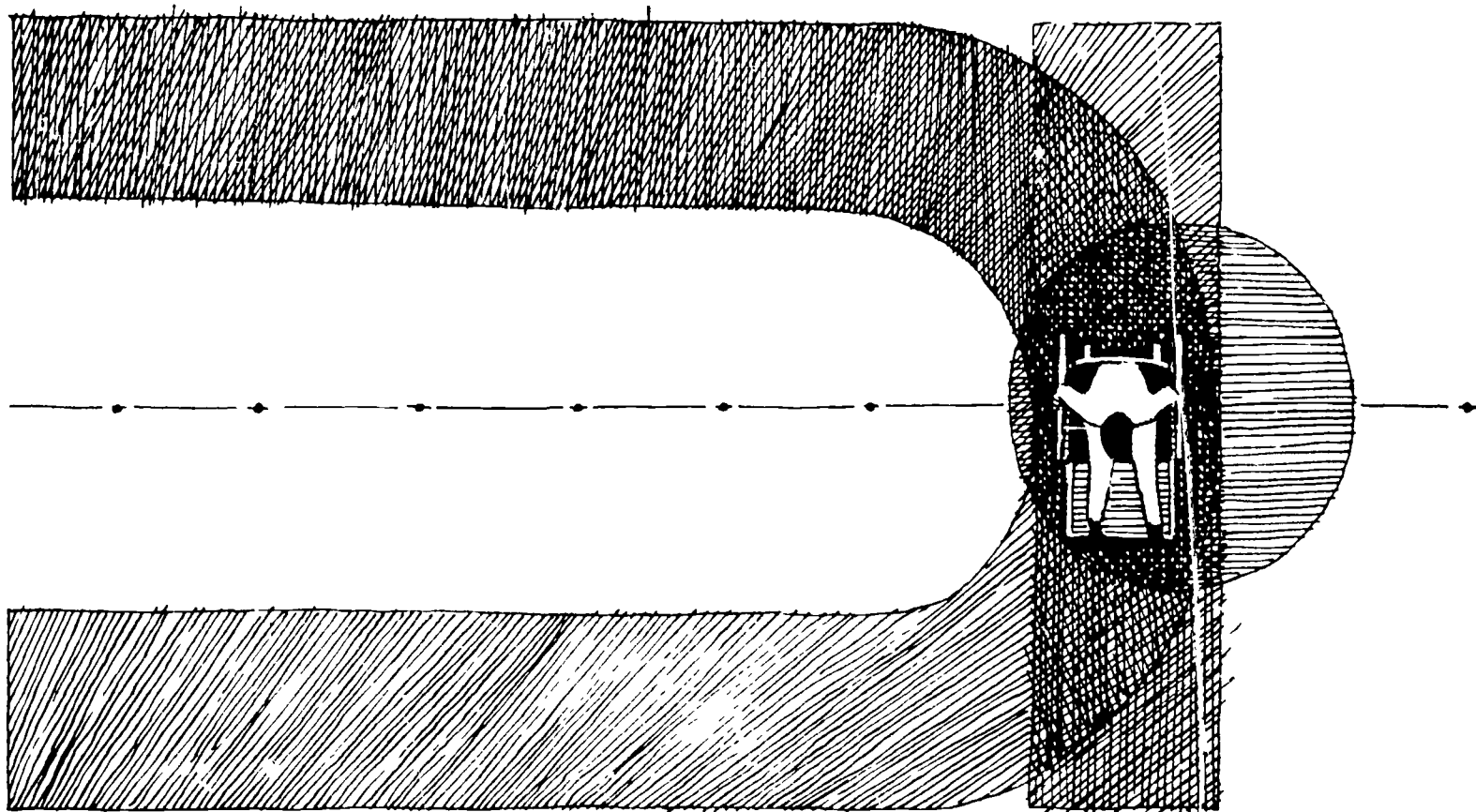
The "average man" has been the prime concern of designers for centuries. The products, equipment and environments of the world have been designed in response to his needs and desires--his efficiencies and deficiencies. Now he has a rival. New attitudes towards the physically handicapped and new techniques of therapy and prosthesis have added a new dimension to human life and, thereby, a new unit to challenge the designer--the man in a wheelchair.

In a wheelchair a man's height is decreased by one-third--his width is doubled. His reach is limited by his inability to get his body into close proximity with ob-

jects, because of the way the wheelchair is constructed. He needs more room to carry on normal everyday activities. He cannot climb steps. He can go forward and backward at will, but cannot move abruptly to either side.

To travel in a straight line he needs a path three feet wide, and he needs almost five feet of straight travel before he can negotiate a turn. Twenty-seven square feet of clear area are needed to permit him to turn about.

This is the new entity to be considered when identifying and solving exterior and interior design problems.





EXTERIOR

1. ENTRANCES

At least one main or principal entrance is to be provided at grade level for each building that must be accessible to the handicapped, in accordance with the program. In multi-level buildings, this entrance is to be located on a floor serviced by an elevator.

Approaches to the designated entrance are to be free of steps and as level as possible, since many wheelchair users are unable to negotiate steep grades, independently. Slopes at these entrances should be kept within the acceptable gradient limit of 5 per cent.

2. RAMPS

A ramp should be provided wherever it is not possible to have a principal entrance at grade level, due to unusual site or other conditions. The ramp surface should be of non-slip material having a high coefficient of friction. Ramps more than 30 feet long should be provided with an intermediate, level, rest platform at least 4 feet 6 inches in length.

The approach to a ramp should be level and at least 6 feet long. Where the top of a ramp enters the building, there should be a level platform large enough to accom-

modate circulation, allow doors to swing out, and provide wheelchair rest space; the platform width should be a minimum of 5 feet, and it should extend at least 1 foot beyond the door opening on each side. Handrails should be provided wherever there are significant drops from, or grades away from ramps or platforms.

- Ramp Gradients. For the safety of the able-bodied as well as the physically handicapped, the grade of a ramp should not exceed 8 per cent. Where the gradient of a ramp does exceed this maximum, a number of additional requirements must be met. The ramp must be wide enough to accommodate normal traffic and contain, as well, a curbed aisle 30 inches wide. Such an aisle enables a wheelchair user to stop quickly a wheelchair that is out of control, by braking one wheel, turning the chair against one of the curbs. Curbs should be at least 2 inches high and 4 inches wide to provide effective control. Handrails 32 inches high should also be provided on both sides of ramps for their full length. Ramps in exposed locations should be covered by canopies and/or provided with built-in electric cables or other snow-melting devices, to prevent the ramp surface from becoming slippery.

The so-called "service entrances" are not a desirable means of in-and-out movement of the handicapped. This type of entrance implies a movement of inanimate objects, supplies and so forth, so that wherever possible the use of that kind of access should be avoided

--Adrian Levy

I would emphasize that the one foot in twelve feet that is specified for ramp gradients in our American Standards was put there not for disabled people, per se. That's shallower than what we have proven even our quadriplegics can manipulate. It was put there with the intent of making a ramp usable by all people, and the knowledge that the ambulatory are in greater hazard on a ramp than are wheelchair persons.

--Timothy Nugent

3. STAIRS

An easy gradient for exterior stairs is assured by keeping the riser under 5-3/4 inches in height, and the stair tread at least 14 inches wide. Stair treads and nosings are to be non-slip.

Handrails 32 inches high should be located on both sides of the stairs. All rails should be uninterrupted for the full length of the stairs, and should extend 30 inches on the level, at top and bottom.

Exterior stairs should be well lighted at all times.

4. DOORS

All entrances designated to be used by the handicapped are to have doors providing a minimum clear opening of 3 feet, and operating manually, by power, or with power assistance.

Power-operated or power-assisted doors may be electrically, hydraulically or pneumatically operated. Their maximum closing tension must not exceed 8 pounds, even under conditions of power failure.

The most suitable triggering device for power-operated doors is the pressure-sensitive contact floor mat, which opens the door and holds it open as long as the mat is occupied on either side of the door opening. Time-lapse devices that close doors automatically after a prescribed delay are considered hazardous to wheelchair users and the slow-moving, semi-ambulatory

handicapped.

5. WALKS

In an ideal situation, the handicapped person can move independently, safely and unhindered along at least the key routes and major walks of the campus circulation system. Although the natural barrier of steep grades, and the presence of unavoidable man-made obstacles can militate against achieving an ideal solution, a real effort to minimize hazards and barriers can produce a workable situation in most cases.

Pavement materials for major walks should be fixed and firm, not slippery when wet. Joints should be few and filled. Unsealed gravel surfaces and cobbles are to be avoided.

Circulation routes with gradients of 3 per cent or less can be negotiated without great difficulty by wheelchair users. It is of primary importance that major pedestrian walks be kept within this gradient limitation if at all possible. Routes with gradients of from 3 to 5 per cent can be negotiated independently, but with difficulty that increases with distance.

An occasional level rest area in the midst of long stretches at this gradient is a help; frequent level rest areas become a "must" if the gradient exceeds 5 per cent.



6. INTERSECTIONS

Where walkways intersect other walkways or roads that are constructed at different elevations, the surfaces should be made to blend by means of a ramp, for the benefit of wheelchair users. This requires design treatment of the curb, which not only constitutes a safety feature for all, on roadways, but also represents a safety signal for the blind.

One acceptable solution is that of dropping the curb to the level of the roadway, for the width of the intersecting walkway. This permits ramping without completely eliminating the curb. The ramping, plus the continuance of the curbing at the path's edge acts to signal blind pedestrians that they are approaching a vehicular crossing. Additionally, special rough or textured surfaces may be utilized on and approaching such ramps to act as an additional signal for the blind.

A number of alternative solutions are possible; however, many have undesirable characteristics. For example: short ramps from the top of a curb to the street level represent a hazard to all and add to the difficulties of street maintenance. In cases where the solution is to turn the street curb along the edge of the walkway for the length of the ramp, great care must be taken to guard pedestrians against the hazard of tripping on or over the ramp's curb. It may be necessary in such in-

stances to erect barriers or establish plantings that will discourage pedestrians from walking anywhere except on the walkways provided, in these ramped locations. Certainly, every precaution should be taken to assure that provisions made for the benefit of wheelchair users do not become hazards to others.

Proper sight distances at intersections are also of critical importance to wheelchair users and other slow-moving handicapped. The appropriate location of intersections, site furniture, plantings and trees; the need for signal and warning devices; and the adequacy of illumination levels, all constitute key considerations in the effort to provide free and unobstructed views to both pedestrians and the operators of vehicles, and to help eliminate safety hazards.

7. GRATINGS/MANHOLES

Any grating, manhole or other surface aberration constitutes an inconvenience and a safety hazard to any handicapped who must use a wheelchair, crutches or a cane. The simplest solution is to avoid locating such obstructions in walkways, crosswalks or other circulation areas used by pedestrians.

Gratings of parallel metal bars are extremely hazardous and must be avoided. Openings in screen-type gratings, manhole and other access covers located where





there is circulation, should be flush with the surface of the pavement.

Road drains necessarily require openings larger than 3/4 inch square, to keep from clogging. Where there is a curb, the capacity of the grating openings may be enlarged by extending them into the vertical curb surface; however, the best solution is to avoid locating them in pedestrian circulation areas if at all possible.

8. PARKING

Special driving and parking privileges are generally accorded students, staff and faculty with either temporary or permanent handicaps; they are usually allowed to use any campus roads and to park in spaces most convenient to their destinations.

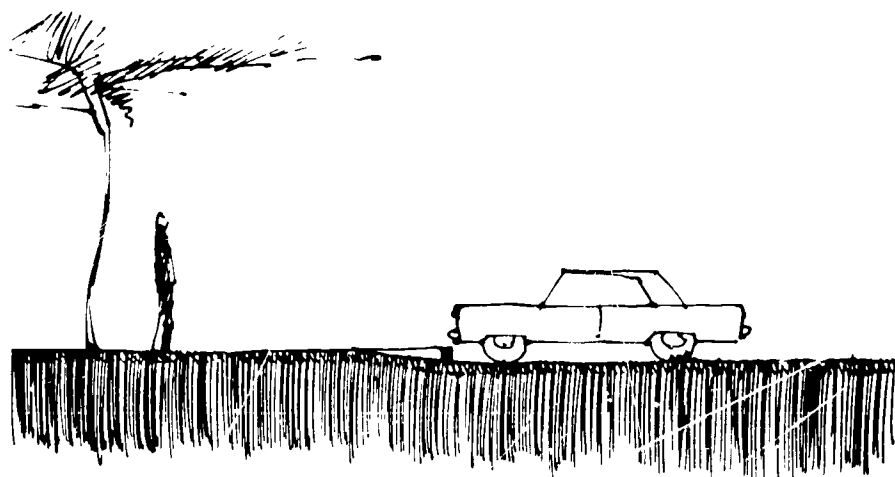
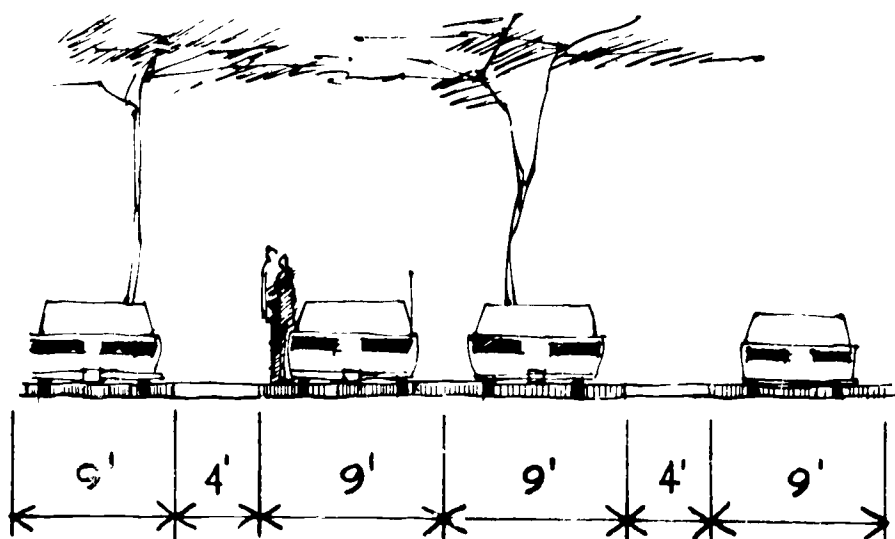
The number and location of parking bays and spaces for the handicapped are generally listed in the site program for the campus. Such spaces must be specially designed to facilitate movement by users of wheelchairs and crutches, and they must be properly identified with signs or markings that restrict them to their intended use.

Wherever possible, parking spaces for the handicapped should be designed parallel to the curb, and located at the edge of the parking area nearest the desired building or destination point, to provide direct, easy and unobstructed access. It is dangerous for the handicapped to have to go through the parking area or cross traffic lanes in moving to or from their cars.

Where parallel parking is not feasible, bays at least 9 feet wide are necessary to provide adequate room for parking and getting in and out of the car. An aisle 4 feet wide, located between every two spaces, is necessary to facilitate movement and to insure that the handicapped are not required to travel behind parked cars, to enter or leave the parking area. Clear, level or ramped access should be provided between each aisle and the adjacent walkway or roadway leading to the destination sought.

9. BUS SERVICE

Specially designed buses, equipped with a hydraulic lift at the front door and appropriately designed steps and rails at the rear door, are now commercially available. They enable the physically handicapped, including those in wheelchairs, to assume more responsibility for themselves and to get about even large campuses independently and with dignity, on their own initiative. Such buses, running on regular schedules and routes, like other buses, open up broader opportunities in program and a wider variety of extra curricular activities for the handicapped by freeing them from complete dependence upon others. Moreover, the provision of bus service for the handicapped not only alleviates official concern for individual welfare regarding transportation about the campus, it also reduces the problem of the liabilities that might exist were other students or staff expected to be responsible for individuals in wheelchairs.





INTERIOR

1. GENERAL

- Dining Halls. The handicapped should be able to obtain food without special services, segregated facilities or the necessity of traveling through a high-hazard area such as the kitchen or the dishwashing area. In the serving line, the serving tray slide can be at the conventional height of 34 inches. The clear area between the serving tray slide and the control railing should be a minimum of 34 inches.

Self-service beverage or water faucets should be of a type permitting the glass to rest upon the counter while being filled.

There should be an appropriate number of rectangular dining tables providing a clear space of 30 inches from the floor to the underside of the table top; such tables should not be equipped with aprons.

Access to tables is provided when there is sufficient aisle space for a wheelchair, between tables in normal use. This necessitates an aisle of 5 feet 6 inches although, under some situations, this space could be less.

- Laboratories. Several student stations should be designed for the handicapped in wheelchairs: The underside of the work surface should be a clear 30 inches from the floor; the width of the knee space should be at least 28 inches. Wherever possible, aprons should be eliminated from tables, and service outlets, faucets and outlets for gas should be side-mounted, rather than rear-mounted.

- Lecture Halls and Classrooms. In all lecture halls,

space for wheelchairs should be provided in front of the fixed seating in an accessible, level area within optimum hearing and viewing range.

In classrooms with movable seating, peripheral space can be provided for the wheelchair of the handicapped student.

- Field Houses/Theaters. Special sections of theaters and field houses should be set aside for wheelchair users. At the University of Illinois, an extra-wide cross aisle makes it possible to station wheelchairs out of the circulation pattern. Any space provided for wheelchairs should be level.

Physically handicapped students will be participants, as well as spectators, in theaters and auditoriums. Therefore access should be provided to stage and participation areas, and part of the dressing room area should be adapted for the use of the handicapped.

- Gymnasium/Physical Education Areas. The Physical education program plays a very important role in the rehabilitation and well-being of the physically handicapped. Access to facilities should be provided as most of them can readily be used by the handicapped, although swimming pools and workout rooms may require some special adaptation before they become usable. Consideration must be given to the handicapped person's role as a spectator as well as a participant.

Locker rooms should be so designed that at least part of the area is accessible to a person in a wheelchair. Showers and toilets connected with the physical

May I suggest a simple criterion--that is you design a facility that is accessible to the disabled person and usable by him, he'll manage. It's like cafeterias, I never yet saw a charming young lady with a crutch under each arm starve to death because she couldn't carry a tray of food, if she could get into the cafeteria.

--Timothy Nugent

education program should conform with the general performance criteria for such facilities. (See below, p.23)

● Libraries. It is not economically or functionally feasible to design book stacks so that all may be utilized satisfactorily by a wheelchair operator. However, reachers, hung at the end of each stack, may prove helpful to the handicapped in reaching books on upper shelves.

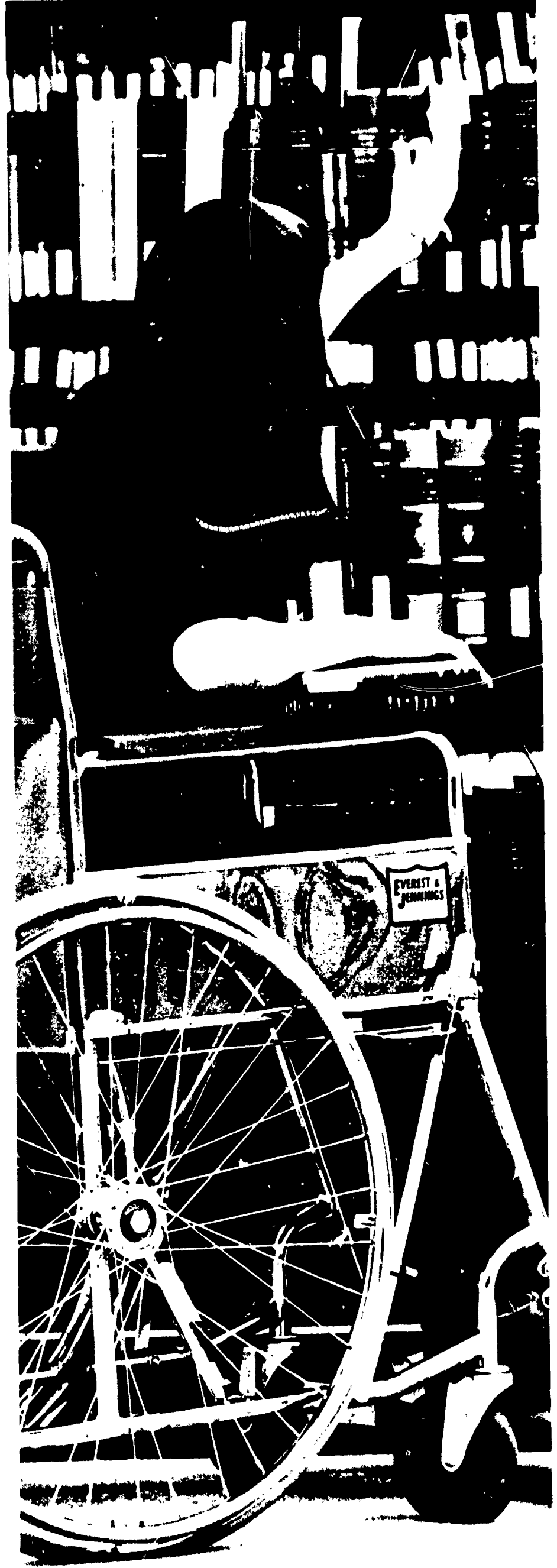
The aisle between stacks should be at least 4 feet wide, for wheelchair users. Provision should also be made for soundproof booths or study carrels, within the library, where the blind may use tape recorders or talking-book machines -- or student readers, should such be available.

● Room Identification. For the blind, each room should be identified by a plaque bearing raised or notched numbers. This plaque should be located on the wall next to the door, on the handle side, not upon the door, itself, since the blind person trying to feel-read the plaque on a door is subjected to a hazard should someone open the door from the other side. Also, for the blind, embossed tape, in braille, should be affixed to panic bars on doors which have them, to indicate the place to which the door leads.

In World War I we had 400 paraplegics. One third of them survived transport back to the United States, and of that third, 90 per cent died within a year. Only three survived more than eighteen months; the others died of a urinary infection

What happened in World War II? There were over 2,000 paraplegics. Ninety per cent of these survived transport back to the United States. Now, twenty years later, between 1700 and 2,000 are still alive. Over 50 per cent of them are gainfully employed in competitive industry, despite the fact that they have rather substantial pensions. So, we make a medical advance, we create a rehabilitation problem.

--Eugene Taylor



2. REST ROOMS

- Toilet Enclosures. There should be at least one specially designed closet-type toilet enclosure or stall in a men's rest room and one in a women's rest room, in each building used by the handicapped, on the floor most easily accessible to them. Preferably, this stall or enclosure should be in that area of the rest room furthest from the entrance door. In buildings of three or more stories, such a special enclosure should be provided on every other floor and, in one-story buildings extending over large areas, consideration should be given to having more than one enclosure for each sex.

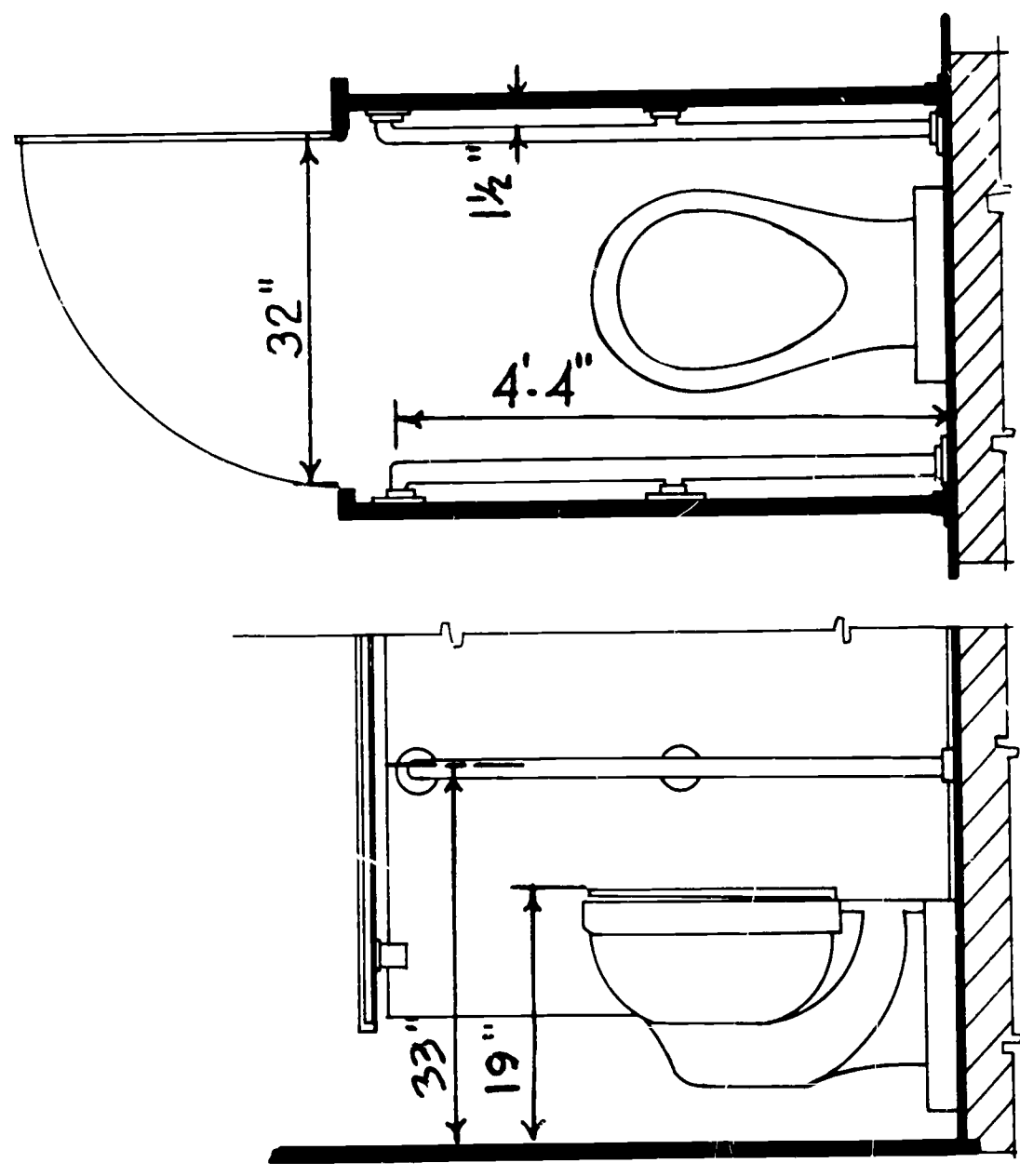
Where possible, in buildings where allowance is being made for wheelchair users, sufficient space should be allowed in the toilet enclosure to permit a lateral transfer from wheelchair to toilet, on either side. However, this is not essential, since the necessary transfer can in most cases also be made from a wheelchair positioned obliquely or directly in front of the toilet. About one in three of those unable to place weight upon their feet can transfer from the frontal oblique position; some can transfer frontally to use the toilet back to front; others can remove the chair backrest and slide through

the back of the chair onto the toilet.

A larger toilet enclosure is particularly beneficial in the case of a handicapped individual who cannot transfer from wheelchair to toilet without assistance from a second person, to whom additional space is a necessity.

In cases providing only enough space for a frontal approach by a wheelchair user, the minimum acceptable size for the toilet compartment is 3 feet wide by 4 feet 10 inches to 5 feet 6 inches deep. The stall door should be 32 inches wide and should swing out.

- Toilets. The toilet should be centered in the rear of the enclosure; a toilet set to one side may not be usable by a hemiplegic. The toilet seat should be 19 inches from the floor. A wall-mounted toilet is preferred over a floor-mounted toilet, for wheelchair users, because, leaving room for footrests, it permits a close frontal approach by the wheelchair. Such toilets also facilitate floor cleaning. If it is necessary to use a floor-mounted toilet, its exterior front surface should recede quickly to the pedestal, so that a close frontal approach is possible, before the footrest of the chair strikes the toilet pedestal.



- **Grab rails.** Each toilet enclosure for the handicapped should be equipped with horizontal grab rails, one on each wall. These rails should be 33 inches from the floor; should extend at least 4 feet 4 inches, front to back; should be 1-1/2 inches in diameter; and should clear the wall by 1-1/2 inches.

The diagonal rail, satisfactory primarily to ambulant handicapped, rather than wheelchair users, may also be used, although it has some disadvantages. It is unsatisfactory for a person with a poor grip (arthritic patients, etc.); it is unworkable for the handless person who can support himself on a horizontal rail; and its downward slope, of advantage in one direction, proves disadvantageous in the other.

- **Urinals.** Since the majority of wheelchair users prefer the privacy of the toilet enclosure, provision need not be made for the use of urinals by them. Semi-ambulant individuals will, however, use urinals. Wall urinals are preferred to the stall urinals. The front rim of the urinal bowl should not be more than 19 inches from the floor.

- **Dormitory Bathrooms.** It is most desirable that dormitory bathrooms for the handicapped be private or semi-private and directly accessible from the bedroom served.

Patients with bowel and bladder complications require more bathroom facilities and occupy these facilities for longer periods. In planning dormitories specifically for use by handicapped students, a larger toilet stall is advantageous. Grab rails in this case would be

on a base attached to the floor and would swing out.

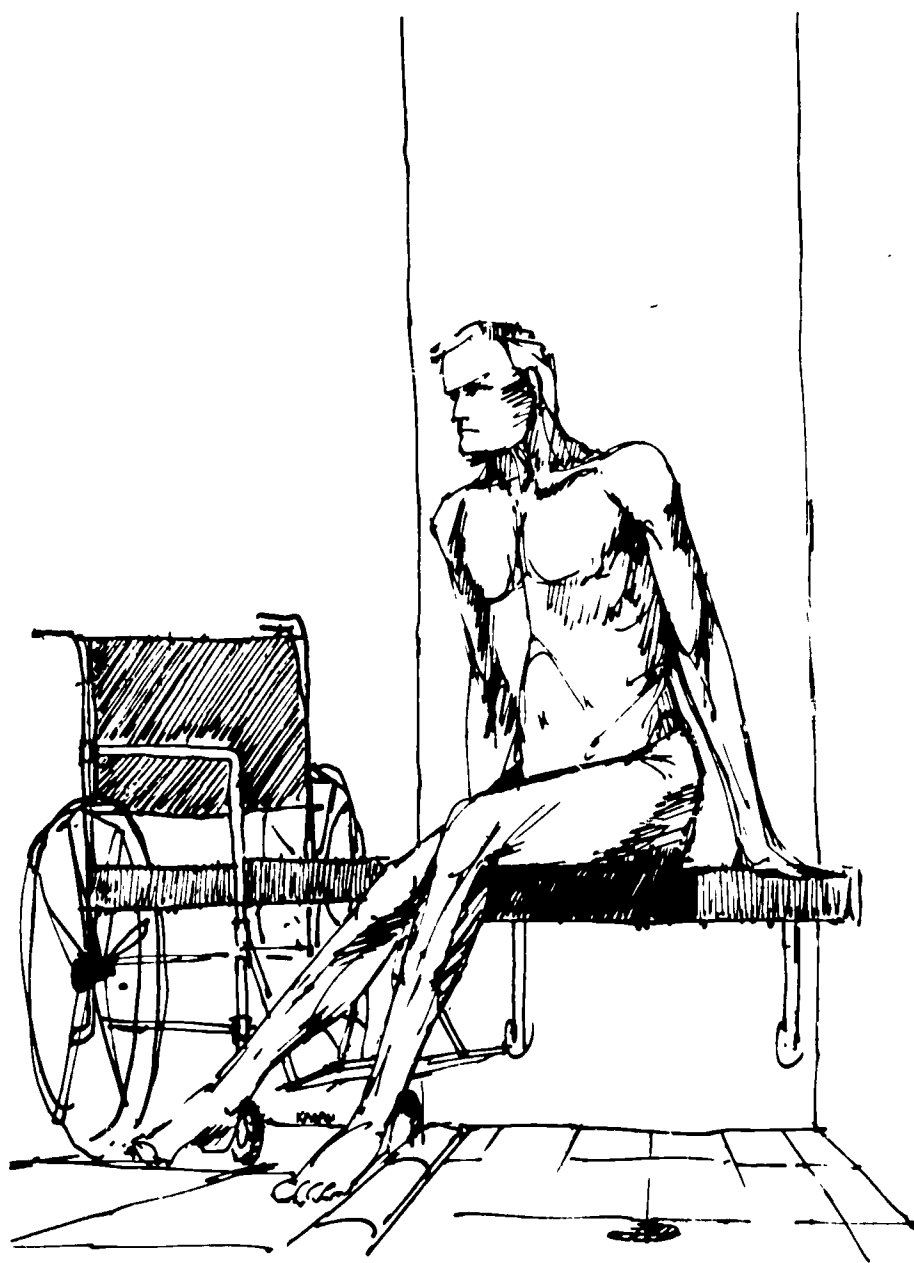
- **Lavatories.** To avoid interference with wheelchair maneuvering, lavatories should be wall mounted on brackets or contained in a counter top. There should be a minimum clear space of 26 inches below the sink, and the sink or counter apron should be shallow. Since many wheelchair users may have limited or no feeling in the legs, hazardous contact with hot water lines or drain piping under the sink should be guarded against by mechanical separation or by insulation.

Lavatories for the handicapped should not be equipped with self-closing faucets; faucet handles must be easy to manipulate and should clear the adjacent wall surface by 1-1/2 inches. The hot water faucet should always be placed on the left and the cold water faucet on the right of the user of the sink, to permit reliable, automatic location by the blind.

- **Mirrors.** Normally, the top of a fixed mirror will not be less than 6 feet 6 inches above floor level. However, for wheelchair users, the bottom edge of a mirror should not be more than 3 feet above the floor. Where space allows, a full-length mirror starting 2 feet from the floor is useful.

In dormitory bathrooms, a duplex electrical outlet should be located no more than 4 feet from the floor, adjacent to the mirror.

- **Showers.** Every shower room used by the physically handicapped should contain at least two specially designed shower cubicles, one with a seat positioned on



the left cubicle wall, the other with the seat on the right. Seats should be hinged so that they can be folded back against the wall when not in use; they should be positioned on the side wall to facilitate transfer from the wheelchair; and they should be at approximately the same height from the floor as the wheelchair seat (19 inches).

The shower cubicle should be 3 feet wide by 3 feet deep, with a suitably drained, non-slip floor surface. The curb at the threshold of the cubicle should be no more than 2 inches high, which is high enough to confine surface waterflow and most splash, but low enough to allow wheelchair footrests to pass over, bringing the chair seat closer to the seat within the cubicle, for safer and easier transfer.

A horizontal rail or grab bar attached to the cubicle wall opposite the seat, and extending around on the back wall is desirable for wheelchair users. Wrist-type handles should be used for water control, aided by a water thermostat to prevent scalding. A diversionary shower spray consisting of a flexible hose to which is attached a shower head may be provided to permit the testing of actual water temperature before entering the cubicle. The soap tray should be set 3 feet 6 inches from the floor.

3. BEDROOMS

Rooms should be designed and furniture designed and located for the benefit of the wheelchair user, which would also provide a convenient environment for the ambulatory handicapped.

The bed is a key element in the plan. The minimum distance between a dresser or desk and the side of a bed should be at least 4 feet 3 inches; the distance between the foot of a bed and any wall surface should be at least 4 feet; and the distance between the side of a bed and any wall surface should be at least 3 feet 2 inches.

Indirect lighting above the head of the bed is recommended; ceiling lights are not. A reading light incorporated into the indirect lighting unit at the head of the bed makes a practical arrangement.

Closets and wardrobes should be designed to permit the partial entrance of a wheelchair. Doors should slide, with the riding rail either at the top, or sunk beneath the surface of the floor. The door width may be less than that normally required for a wheelchair, because only partial entrance is required. The hanging bar may either be specially adjusted to fit the needs of the student, or a trapeze bar may be utilized to lower the height of the closet bar to meet the student's individual needs.

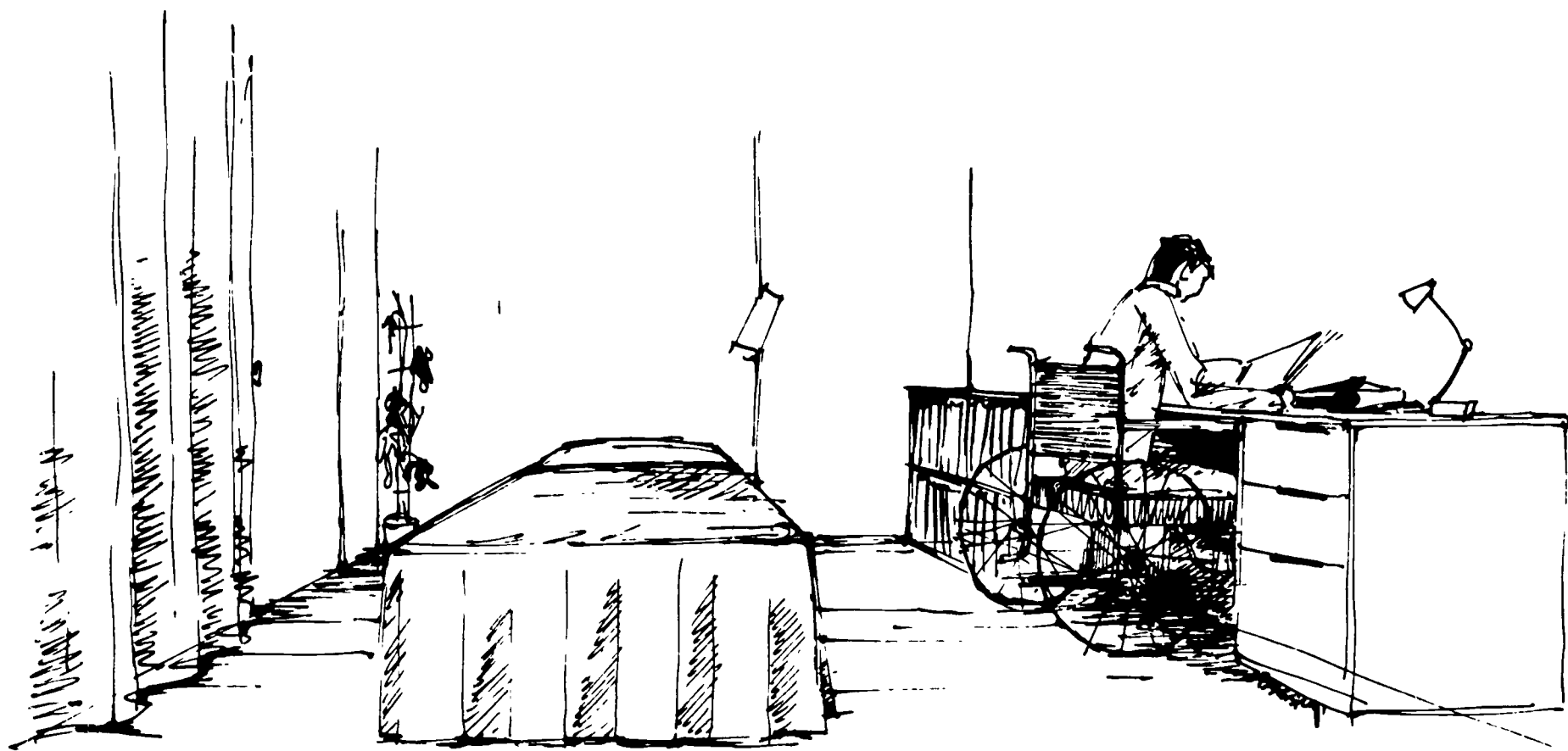
• **Dormitory Bedroom Furniture.** Although furniture specifically designed for use by the handicapped should demonstrate certain unique design characteristics, it should also be so designed as to be usable, without

alteration, by students who have no handicaps.

The bed should provide cupboard or drawer-type storage space beneath that is easily accessible to the person lying in bed. Drawers or doors should not be self-closing or spring closed. Easily accessible space should be provided for storage of a bed pan. The boards or slats supporting the springs and mattress should be treated with waterproof sealant and all assembly hardware should be rust proof.

The mattress top should be at least 22 inches above the floor. The mattress should be a medium firm or firm double-core foam mattress 5-1/2 inches thick. This type of mattress lets air circulate more readily around the pressure points of the body.

The student desk should provide knee-hole space at least 28 inches wide, which permits a wheelchair to be moved up close to the desk. The under side of the desk top should be at least 30 inches above the floor; aprons are to be avoided on all desks and tables for wheelchair users. The desk telephone should be so positioned as to be readily accessible from the bed. Special telephone equipment is available to help the hard-of-hearing conduct a normal telephone conversation.



4. STAIRS

- **Illumination.** All stairways should be well illuminated by means of windows and/or artificial light. A landing midway between floor levels serves as a safe stopping place for invalids subject to dizziness or breathlessness, and for cardiacs and others who must conserve energy. For the benefit of those with partial sight disabilities, landings should be distinguished from stairs by contrasts in color or surface texture where they meet.

- **Risers.** Staircases with open risers are to be avoided as hazardous to elderly people and to those subject to dizziness. Risers should be no more than 7 inches in height; 6 inches is much preferred, in facilitating use by the ambulant handicapped. Any projecting nosing is to be avoided as posing difficulty for individuals with leg restrictions (artificial leg, leg brace). A splayed riser with a non-projecting chamfered nosing is recommended.

- **Handrails.** The vertical distance from the riser nosing to the top of the handrail should be 32 inches. Handrails must be securely fixed and easy to grip. They should continue at least 18 inches on the level beyond the stairs, at both top and bottom. Because many handicapped people cannot negotiate stairs or landings without the



The one thing that is so wonderful about the Vocational Rehabilitation Program is the emphasis on the positive. It's not what you can't do that counts, it's what you can do. And those things you can do, and can do well, will remove any aura of handicap.

--Adrian Levy

help of handrails, these should not be discontinued at half landings or where windows occur.

Preferably, handrails should be provided on both sides of the stairs, for the benefit of all users. Where a rail is provided on one side only, hemiplegics or others with weakness on one side of the body may be able to negotiate the staircase or ramp in only one direction.

A handrail with a circular or oval section 1-3/4 to 2 inches in diameter is most satisfactory. Arthritics and others with hand weakness or disability find it difficult to grip properly rails with sharp edges or with dimensions greater than 2 inches deep or 2-1/4 inches wide. Studs, fixed at proper locations on the inner surface of handrails, help the blind become aware of the presence of landings or the end of the stairs.

5. ELEVATORS

In planning for vertical circulation in multi-story buildings, today, the inclusion of elevator service is a reasonable design assumption quite apart from any consideration of the needs of the handicapped. For the handicapped, however, elevator service is a must. In dormitories to be used by the handicapped, where there are no rooms for students on the ground or entrance floor, and in multi-level academic and service buildings, there should be at least one elevator accessible to and usable by the handicapped. This should serve the level used by them for entrance into the building and all other levels normally used by students and faculty.

Elevators should, wherever possible, operate automatically; they must stop precisely at the floor level, and must be automatically self-levelling. Elevator doors that open and close automatically must be fitted with a

sensitive safety edge and should be controlled as well by photoelectric cells that cause the doors to stop closing and return to the open position whenever closing is in any way obstructed. On opening, doors should be timed to remain open at least 8 seconds, their closing speed should be slow, requiring from 3 to 3-1/2 seconds. A slow closing speed not only benefits the handicapped, but also helps when the elevator is being used for the moving of supplies, furniture and equipment.

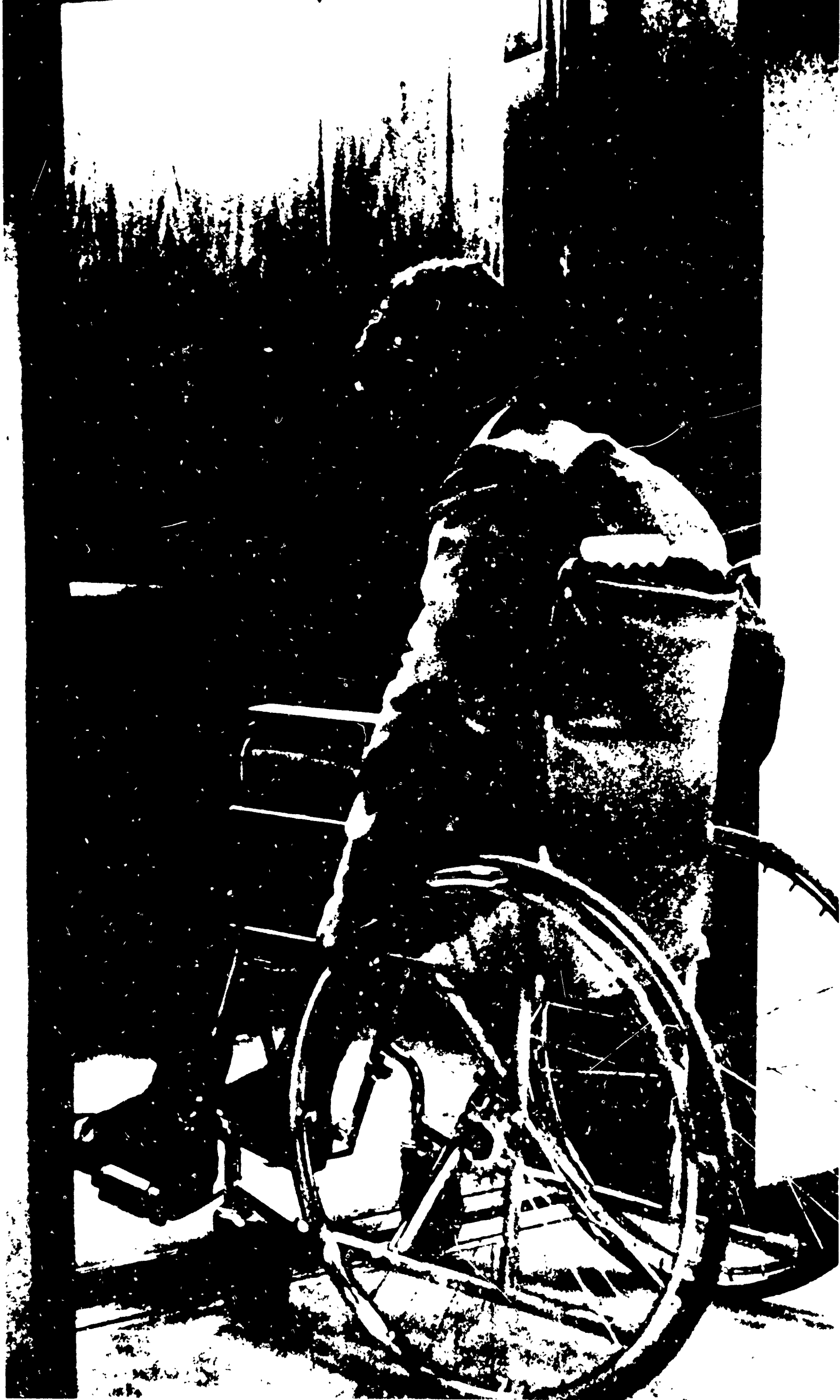
The interior of the elevator cab should be at least 61 inches deep by 66 inches wide, to permit a wheelchair to turn around inside. At the entrance floor, where traffic is heaviest, an unobstructed, level area at least 5 feet by 5 feet should be provided in front of the elevator door.

To make specific allowance for wheelchair users, elevator controls must be at a height that is accessible to a seated person and must be easy to operate. An emergency call button or switch must be included among the controls. Controls located in the side walls, rather than on a panel beside the door, are more convenient for wheelchair users and work no disadvantage to others using the elevator. Horizontal grip rails fixed to side walls about 3 feet from the floor are also helpful to the handicapped. Interior surfaces should be tough enough to resist marring by wheelchairs.

- **Wheelchair Lifts.** The problem of providing vertical transportation for wheelchair users in a multi-story building otherwise without elevators, may satisfactorily be solved by means of a wheelchair lift attached to the exterior of the building. Such equipment is operated by a key given only to handicapped students and faculty.

There is always a physical hazard to be considered, whether the person is handicapped or, as in the case of a group from a dormitory who were going to use a service elevator to reach the dining room. This meant routing the group through the kitchen, where everybody was working. I think such a solution is totally unsatisfactory. It may be useful in an emergency, but I can't see it as a planned method for handling the traffic of the disabled.

--Adrian Levy



6. DOORS

Doors are important to all handicapped, but they are particularly important to those in wheelchairs and on crutches. Their needs, therefore, have been considered paramount in the development of performance criteria on doors.

Both side-hung and sliding doors are usable by these physically handicapped, if properly located and provided with proper hardware. Side-hung doors create a problem when they are located in awkward or inaccessible positions. Conventional sliding doors with recessed handles present a problem, since even able-bodied people sometimes have difficulty gripping handles of that type.

All doors to be used by the handicapped should provide a minimum clear opening of 32 inches. This will take care of a wheelchair approaching at a 90-degree angle. If the location of the door or obstructions to entering it make an oblique approach necessary, the clear opening will have to be larger than 32 inches. Obstructions further than 4 feet 2 inches from the door opening will not prevent the wheelchair user from making a direct, right angle approach. All door widths cited in these criteria represent clear openings, not the overall width of the door, itself.

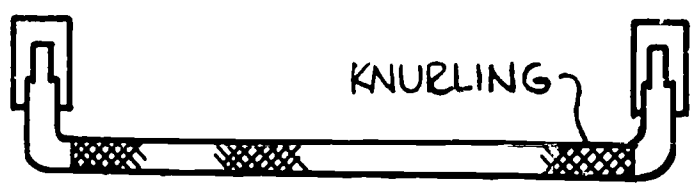
Doorway approaches should be level for a distance of at least 5 feet; the level area should extend at least 1 foot on each side of the doorway. Whenever possible,

doors opening into corridors should be recessed sufficiently to avoid the hazard of accidents.

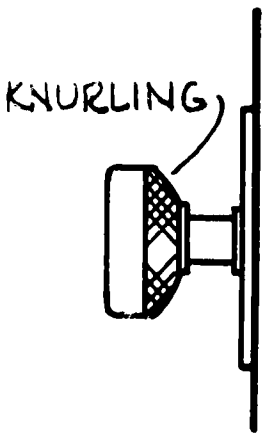
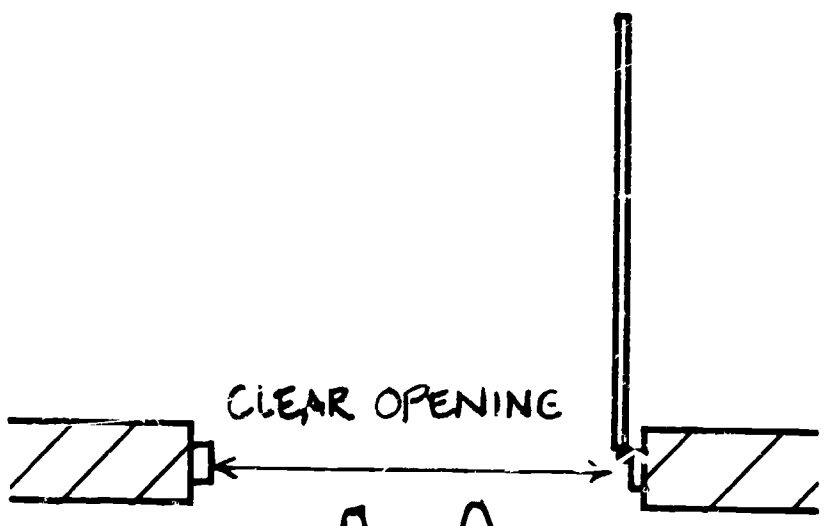
- **Side-Hung Doors.** The clear opening width provided by side-hung doors is generally about 2 inches less than the width of the door itself. This disadvantage can be partly overcome by the use of swing-clear hospital hinges. A side-hung door located in a corner position should be so hinged as to swing toward the wall surface that creates the corner. Where a wheelchair user must pull upon the handle of a side-hung door, in order to open it, any obstruction along the wall adjacent to the handle will cause problems. Consequently, an unobstructed area at least 15 inches wide should be planned next to the handle side of the door; a larger area is preferred.

When a door is located on the side wall at the end of a passageway, the handle should be positioned away from the corner. If this is not possible, the door frame must be at least 6 inches from the wall surface at the end of the corridor.

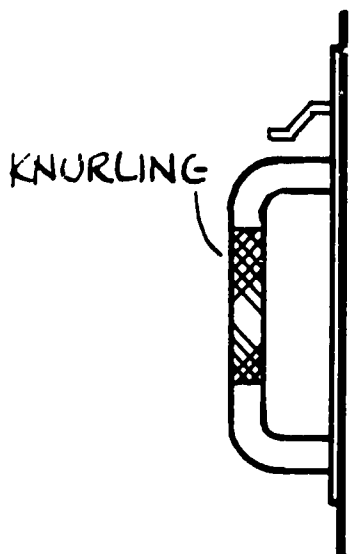
The pressure required to open a door should not exceed 8 pounds; the preferable maximum is 5 pounds. If automatic door closers are used, they should provide an adequate time delay (about 4 to 6 seconds) before closing. A longer interval is preferable for wheelchair users and the ambulant handicapped, but conditions in specific rooms (e.g., an air conditioned laboratory) may necessitate a shorter delay.



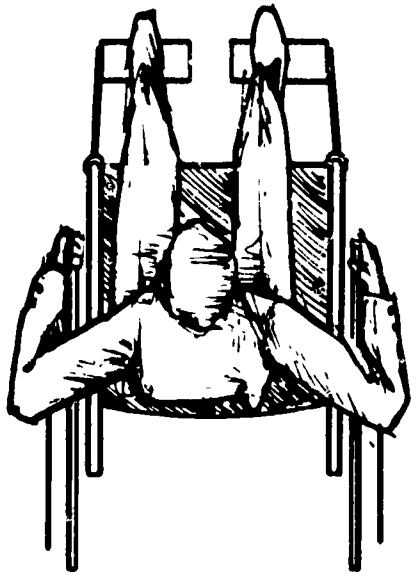
PANIC BAR



KNOB



HANDLE and LATCH



- **Sliding Doors.** The single-leaf straight sliding door is the most easily operated. If there is not sufficient in-wall recessed space for a single-leaf door, bi-parting doors that operate sympathetically on a single track are adequate. Protruding handles on bi-parting sliding doors are more useful to the handicapped, but they cut down the width of the opening by preventing the doors from being fully recessed. Also, when such handles protrude from both faces of each door, they must be at least 3 inches apart when the doors are closed.

- **Swinging Doors.** If possible, double action swinging doors, either single or double leaf are to be avoided. They are hazardous for wheelchair users, for semi-ambulant users using braces, artificial limbs and/or crutches and canes, and for the blind. Where their use cannot be avoided, proper glazing helps avoid accidents. For wheelchair users, visibility is provided if the glazing starts no more than 3 feet from the floor; an effective alternative solution is a strip of safety glass, 6 to 8 inches wide, commencing just above the kickplate and extending up the door toward the free-swinging edge, to a point slightly above eye height for a standing person.

In existing buildings, where a side-hung door can only be located awkwardly for wheelchair users, a double-action swinging door may be substituted as the only acceptable solution in this situation.

- **Revolving Doors.** Wheelchair users, users of crutches and canes, and the blind cannot satisfactorily use revolving doors. Where they are installed, an additional side-hung door should be provided.

- **Thresholds.** Raised thresholds should be avoided if at all possible. Where they are unavoidable, their height and shape must be dictated by the needs of the handicapped. Wheelchair users cannot negotiate a threshold higher than 3/4 of an inch, and any threshold should be gradually beveled to its full height, front and rear, to avoid any abruptness or bluntness that would constitute an obstacle to a wheelchair user. Sliding-door guides or rails that project above the floor surface across the width of the door opening are also to be avoided.

- **Hardware.** Door handles should be positioned not more than 3 feet 6 inches above floor level. Horizontal level handles are preferable, although large, serrated door knobs are also recommended. Door handles that are slippery or difficult to grip may be modified to a rougher texture by coating with a special adhesive. Widespread use of such treatment may be disadvantageous, however, in the case of the blind, for whom the use of such an adhesive serves primarily to signal the existence of a hazard area.

- **Kickplates.** Doors in areas serving the handicapped, particularly wheelchair users, may advantageously be

equipped with kickplates, preferably 16 inches high. A kickplate of this size helps prevent marring and damage to doors from wheelchair footrests and hand rims, crutches, canes and prosthetic devices, and is an aid to maintenance.

7. CONVENIENCES

Accessibility to the wheelchair user remains the pre-eminent design consideration in the location and design of items of equipment that must serve efficiently the handicapped and non-handicapped alike.

- **Light Switches.** No more than 2 switches should be located on a single plate, at a point between 3 and 3-1/2 feet above the floor. The action of switches should be simple and positive; a pushpad clipped over a rocker-action switch permits easy operation by forearm or elbow; a large push button may also be convenient for those with finger or hand disabilities.

- **Outlets.** Normally electric outlets are placed 18 inches above the floor. In an area planned specifically for use by the handicapped, outlets should be located at least 24 inches above the floor.

- **Drinking Fountains.** Each floor of any building used by the handicapped should be equipped with a drinking fountain that is usable by a wheelchair operator. The upper edge of the fountain basin should be located 3 feet from the floor. If it is necessary for the fountain to





be set back out of the way of traffic, the recessed area should be at least 2-1/2 feet, and preferably 3 feet wide.

Controls and spouts should be up front and operable by hand alone; spouts should not point obliquely to the rear, but should parallel the front surface as closely as possible.

Where special fountain arrangements cannot be made, a paper cup dispenser should be provided; however, this causes maintenance problems.

- **Public Telephones.** Wherever public telephones are provided they should be wall mounted, without legs or enclosure prohibiting access. The dial should be push button, if possible, and located no more than 4 feet from the floor. A volume control should be incorporated wherever possible. The underside of any shelf that is positioned under the phone should clear the floor by at least 30 inches.

- **Vending Machines.** The reach height of a person in a wheelchair should be one of the criteria governing the selection of vending machines. Also, pull knobs or controls should provide a good grip and operate easily.

8. FIRE PROTECTION

Time is the essential factor to be considered in any steps taken to assure life safety from fire. Every technique used and every building element considered can be evaluated for its contribution to life safety in terms of its effect on time in one of two ways:

Will it increase the critical time before intolerable conditions are reached?

Will it decrease the reaction time required for an occupant to achieve life safety?

As long as the reaction time (to achieve life safety) is less than critical time (to reach intolerable conditions), life safety may be assured. Any valid system for assuring life safety will, therefore, be based on the principle of "buying time," by decreasing reaction time and increasing critical time. Reaction time may be decreased by providing automatic detection units sensitive enough to detect the products of combustion early, and give the alarm. Critical time may be increased through the use of fire-inhibiting devices, such as fire doors and walls, and devices to control or extinguish fire, such as automatic sprinklers.

The question as to what may happen to the handicapped, in a fire, is moral as well as technical. Elevators have made high-rise or multi-level facilities accessible to the handicapped. Since elevators are neither a legal nor a safe means of egress, in a fire, the handicapped person, particularly a wheelchair user, is unable to exit unassisted.

- **Area of Refuge.** One solution would be to provide, within the area accessible to the handicapped, an area of refuge on each floor. This area of refuge could be either on the side of a fire wall that is away from the

potential fire source, or in an area within the enclosure of a fire stair. It should be located out of the way of main traffic circulation, particularly in a stairwell; added benefit would be achieved if this space were equipped with a break-glass alarm device to signal, by bell or light at the base of the stairwell or elsewhere in the fire alarm system, the presence of a handicapped person in the area of refuge.

- **Fire Extinguishers and Alarm Boxes.** Fire extinguishers should be located on walls at a height accessible to the wheelchair user. If the extinguisher is enclosed in a wall recess with a glass door, the handle of the door should be easily operable and the top of the extinguisher should be about 4 feet from the floor.

The fire alarm box should have a pull-type handle, easily grasped. Where possible, for the sake of the deaf, the alarm system should provide visible, as well as audible signals.

- **Automatic Door Closers--Fire Doors.** Where automatic door closers are adjusted for the sake of wheelchair and crutch users, there is danger that a fire door, so adjusted, may not remain effectively closed in a strong draft. Fire doors, under such conditions, may advantageously be equipped with electro-magnetic smoke-and-heat-sensitive door holders, which would hold the fire door open during normal use and would close it during a fire.



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It's been proven over and over and over again that, for each dollar invested in rehabilitation services, whether raised by taxation or voluntary contribution, we get back from eight to ten dollars in the Federal income taxes alone which the handicapped pay during their working lives.

--Eugene Taylor

The following contributed their opinions and thoughts either in interviews or by letter. While this report attempts a consensus, opinions varied, and, therefore, statements in the text should not be attributed to any of these persons, unless they are quoted directly.

Prof. Raymond D. Caravaty
 Director of the Center of Architectural Research
 Rensselaer Polytechnic Institute
 Troy, New York

Dr. Joseph Fenton
 Chief of Division of Research and Training Grants
 Vocational Rehabilitation Administration
 Department of Health, Education and Welfare
 Washington, D. C.

Dr. Alfred Cohn
 Coordinator of the Program for Higher Education
 for the Disabled
 Hofstra University
 Hempstead, New York

Adrian Levy
 Assistant Commissioner of Education
 for Vocational Rehabilitation
 162 Washington Avenue
 Albany, New York

Thomas Eldridge
 E. F. Hauserman Co.,
 207 State Street
 Schenectady, New York

Dr. Timothy Nugent
 Director
 Rehabilitation Center
 University of Illinois
 Urbana, Illinois

Martin Feldman
 Project Coordinator
 Human Resources
 Research and Training Institute
 Albertson, New York

Muriel Zimmerman
 Edith Buchwald Lawton
 Martha E. Schnebly
 New York University Medical Center
 Institute of Physical Medicine and Rehabilitation
 400 East 34th Street
 New York, New York

As an old British philosopher 300 years ago said, "If every man would mend a man, the world would all be mended". Well, some of us have been menders for a long time and we're awful happy to invite the rest of you over into the mending business, because we need you.

--Eugene Taylor



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**Making Facilities Accessible to the
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