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ABSTRACT

Intrinsically safe design is presented as a logical extension of the principles of barrier free design, and as a higher level design strategy for effecting widespread implementation of the basic accessibility requirements for people with disabilities. Two fundamental planning procedures are proposed: including principles of safe and accessible design in transport systems, public and open spaces, and buildings; and structuring normal environments which are convenient for everyone, including those with disabilities. The building process in New Zealand is examined, and the process of marketing intrinsically safe home designs is explored. Commentaries are presented by two United States authors: "The New York Experience" by Julia Schecter, and "Priorities, Values and Attitudes of Society" by Paul Grayson. An appendix offers a set of guidelines on intrinsic design for safety in New Zealand dwellings, including site layout, structure, floor layout, fire safety, kitchen design, bathroom design, laundry design, entries, doors, windows, steps and stairs, electrical safety, and hot water. Includes 24 references. (JDD)

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FROM BARRIER FREE TO SAFE ENVIRONMENTS: THE NEW ZEALAND EXPERIENCE

By William Wrightson and Campbell Pope

World Rehabilitation Fund

International Exchange of Information in Rehabilitation

Monograph #44

FROM BARRIER FREE TO SAFE ENVIRONMENTS: THE NEW ZEALAND EXPERIENCE

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A set of guidelines forming the basis of a document on Intrinsic Design for Safety in New Zealand Dwellings for the Standards Association of NZ

PREFACE

The World Rehabilitation Fund through its International Exchange of Experts and Information in Rehabilitation is pleased to present this monograph in its current monograph series which is featuring disability topics and issues in the Asia-Pacific Region, with a particular focus on New Zealand:

Monograph #43—*Disability in New Zealand: A Study of Rehabilitation and Disability Organizations.* L.R. Newsome (1988)

Monograph #44—*From Barrier Free to Safe Environments: The New Zealand Experience.* William Wrightson (1989)

Monograph #46—*Prevention: The Beginning of the Rehabilitation Process: A View from New Zealand.* Ian Campbell (1989)

Plus a special issue of the *Interchange:* **"The Disabled Persons Assembly (New Zealand) Inc.: An Ecological Approach to Rehabilitation that Promises and Offers Action"**

This study by Wrightson and Pope will be of interest to a wide audience of people concerned with the rights of people with disabilities as well as architects and community planners.

To quote from Wrightson and Pope: "Good design must encourage and facilitate social usage of the built environment. The buildings and the networks that connect them are created for people, all people, to use. Designers have traditionally focused their trained professional skills on *the structure*—its appearance, its construction methods and materials...Genuine user participation in design planning will produce final decisions with more universal suitability and acceptability. User empowerment will result in a greater sense of individual control, ownership and responsibility for community facilities."

The reader will be interested in the recommendations the authors propose in the final chapter and guidelines which give direction for future research and action. Although the authors are from New Zealand writing about their experience as architects and community and disability activists in New Zelanad, they have a framework of knowledge about the experience of access in other countries.

The reader of this monograph will find the commentaries by U.S. experts in access and design: Julia Schechter and Paul Grayson particularly interesting additions to this monograph.

Originally, we were planning to include a short piece by an archiotect from Hong Kong, Joseph Kwan, with this monograph. The piece describes access for persons with disabilities and "the journey" (as it is referred to by Wrightson and Pope) in Hong Kong. However, instead of including it here it has been published in a Special Issue of the IEEIR newsletter, *Interchange: **Building Non-Handicapping Environments: Policies and Problems Related to Accessibility***, **"Examining Accessibility: The View from Hong Kong".** now available from the World Rehabilitation Fund.

The International Exchange of Experts and Information in Rehabilitation is a project funded by the National Institute on Disability and Rehabilitation Research for the purpose of sharing with the U.S. disability community and (interested others), ideas, experiences and knowledge from other lands which will expand the knowledge base here. We hope that this entry in the IEEIR monograph series will succeed in doing that.

As Paul Grayson has said in his commentary which appears at the end of this monograph: there are many paths of action. "These include developing design standards and guidelines, increasing public awareness, forming advocacy groups, creating educational programs for designers and users, establishing codes and legislation, instituting regulatory enforcement procedures, analyzing causes of accidents, maintaining a statistical data base on accident events, making post-occupancy evaluations and maintaining international contact for communication and exchange of information. All of the above have been well identified, referenced and detailed in this very valuable document, which should serve as a vehicle for international application and benefit."

Diane E. Woods
Project Director
International Exchange of Experts
and Information in Rehabilitation
July 1989

AUTHORS' ACKNOWLEDGEMENT

The Authors acknowledge that the production of this document was a cooperative effort and wish to thank all of the generous and helpful people whose inspiration, wisdom and patience have encouraged and helped to complete the task.

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Special thanks to Russell and Lorna Kerse—Disability Service Brokers—for their long time inspiration and practical assistance. Most of the ideas and achievements represented by this document can be traced in some way to Russell's vision and direction. Thank you Lorna for typing the draft manuscript. Thanks also to Terence Broad of the WORKS Corporation of New Zealand for his generous and helpful direction (including editing) over a number of years; and to:

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The Authors are indebted and appreciative.

June 1989

Bill Wrightson
Campbell Pope

ABOUT THE AUTHORS

Bill Wrightson has been a quadriplegic wheelchair user as the result of a motor vehicle accident since 1971. He has a B.A. in Education and Mathematics from Massey University (Palmerston North, New Zealand) and a Teachers College Diploma from the Wellington College of Education.

He worked for five years as a researcher on Education and minority groups at Massey University and was a member of the committee which redrafted the New Zealand Access Code (NZS 4121 : 1985) for the Standards Association of New Zealand.

He spent 6 years as the Director of the BARRIER FREE programme in New Zealand for the New Zealand Crippled Children Society and initiated and directed the Safe House Campaign in New Zealand during 1986 and 1987.

In 1987 he undertook a two month comparative study trip to Europe and the United States examining progress in implementing accessibility requirements. During the trip he presented a paper to the International Council of Building Research Studies and Documentation in Prague on Designing non-handicapping environments.

Campbell Pope is a Registered Architect with a B.A.(hons) in History from the Victoria University of Wellington. He is currently completing his Masters in Architecture. His publications include "Housing Design for Disabled People— Common Errors and How to Avoid Them", "Barrier Free Housing Design" (a series of 6 pamphlets) and "Intrinsic Design for Safety in New Zealand Dwellings".

He was Architectural Adviser to the New Zealand Crippled Children Society and the Accident Compensation Corporation of New Zealand for the Safe House Campaign. He has had practical experience on a wide variety of building types and has received many commissions to illustrate design documents for the Standards Association of New Zealand.

He is currently practicing architecture in Wellington.

In 1988 they formed Pope and Wrightson, a Design Consultancy for Barrier Free and Safe Environments. Their current research interest is the behavioural causes and the community cost of domestic injury.

NOTE TO THE READER

The concept of intrinsically safe design, as it is presented in this document, is *new*. The term itself has been extracted from the work done by Dr Ralph Sinnott in his *Safety and Security in Building Design* (Collins, London. 1985). It has been refined here as a logical extension of the principles of BARRIER FREE design, and as a higher level design strategy for effecting widespread implementation of the basic accessibility requirements for people with disabilities, across the built environment.

The authors' concern is to ensure that rights of physical access are secured for every member of the community, not only to public buildings but, in every reasonable instance, to private accommodation.

The phrase 'people with disabilities' has been used to cover the large group within every community whose freedom to participate fully in the activities of everyday life is impaired because of a medically defined condition. There may appear to be a bias in this document towards those with mobility disabilities. While this is unintentional, it is understandable because it is this disability group which is most disadvantaged, to the extent of being denied physical access when design priorities overlook accessibility requirements.

Design solutions which enhance use of the built environment for those with visual and hearing impairment, and which are often loosely included as part of the BARRIER FREE design approach, also enhance the concept of intrinsically safe design. They are a necessary part of BARRIER FREE design but there is no evidence, to date, that their ommission creates the same exclusive barrier to independent physical access as (say) a set of steps does for a wheelchair user. The title of the monograph suggests that there is an established process in New Zealand which links two commonly accepted design practices (creating BARRIER FREE and SAFE environments). It would be inaccurate to claim that such a process exists however it is possible to identify a pragmatic process of implementation of BARRIER FREE environments, through the medium of legislation and a community based introduction of intrinsic design for safety through housing development companies, which justifies the contention.

The New Zealand context for the process described here serves as a "pilot" programme for other countries. A pragmatic attitude which develops the solutions that 'work best' is characteristic of the New Zealand approach to problem solving. Other countries wishing to adopt the processes and models identified herein will need to modify them to suit their own research techniques, their own political and legislative structures and their own building procedures.

New Zealand is fortunate to have the kind of information on personal injury which is available from the databases of the Accident Compensation Corporation (ACC). The extensive data which has been collected since the ACC scheme began in 1974, and the collection process itself, have the potential to be used to identify new and innovative injury preventive measures.

CHAPTER 1
INTRODUCTION

The Importance of Safe and Accessible Design in Planning the Built Environment

Design is a planning process which results in the creation of the built environment. This monograph presents: a) a design concept of intrinsically safe and accessible environments; and, b) a planning process for incorporating the concept into the procedures for design of the built environment.

To create intrinsically safe environments requires two fundamental adjustments to current planning procedures. They are, the inclusion of:

Principles of Safe and Accessible Design. These will be described in detail later in Chapters II and IV and in the Appendix. Simply, they are design solutions to reduce the risk of personal injury using the detailed access requirements for people with disabilities as a planning priority. Successful implementation of safe and accessible design requires significant adjustment to the objectives of traditional design practice. The purpose of intrinsically safe and accessible design is to create environments that promote lifelong independent behaviour and reduce the likelihood of users engaging in unsafe behaviour. To acheive this, using refined Barrier Free design principles, there must be a change in the present community attitudes towards design for minority groups.

Universality: Design for All Users. Goldsmith has identified two fundamental ideologies for approaching the design needs of "special populations":

"The *Micro* ideology is that which relies on special provision 'for the disabled.' The sheltered workshop, the house adaptation and the wheelchair kitchen are micro artifacts. The *Macro* ideology by contrast, is that which relies on structuring normal environments which are convenient for everyone, including those with disabilities."[1]

Micro: This approach is restorative, with legislation to ensure that access rights 'for the disabled' are secured. There is no wider vision of design for community advantage, or acknowledgment of community failure to provide in the first instance, instead the focus is on the disabled minority group as the original 'problem.' The emphasis is on society doing things 'for the disabled' in a way that compartmentalises problems and solutions. Micro thinking identifies " access for the disabled" as the only issue rather than as one element in an integrated system of components.

Where a Micro approach is adopted the universal advantage of the design solutions is lost. They become stigmatised because of their association with disability. When disability requirements are seen as additional to 'normal' design solutions they are often resented by a building owner and avoided by the able-bodied user. The "wet-area" shower, described two paragraphs below, is seen in Micro oriented societies as a 'paraplegic' shower but in others, has universal acceptability.

Macro: Barrier Free Design is a Macro approach to the issue of physical rights of access for people with disabilities. Macro thinking encourages self reliance and independence within a framework of already recognised rights and freedoms for every member of the community. The challenge of the Macro approach is to condition public demand to accept a 'changed' design as normal and desirable on both functional and aesthetic grounds.

Universal design aims at accommodating the needs of all users. The *wet-area shower* is a good example of universal design. Simply, a wet-area shower is a bathing area, partitioned by waterproof curtaining, where the shower floor is continuous with the rest of the floor area in the room. The whole floor is given a gentle fall to the shower drain. Such showers are common in Scandinavian countries particularly in hotel accommodation. The advantages of this arrangement over a bath or stepped shower tray and cubicle are:

• The shower floor doubles as usable floor space when the shower is not in use. Floor space is therefore used as efficiently as possible.

• There are no hazards or obstructions at floor level which can restrict movement and cause possible injury.

• The shower is accessible for the complete range of age groups, mobility differences and emergency situations.

• Maintenance work including cleaning and even building alteration is more quickly and easily executed.

• Seating, either fixed or movable, can be conveniently incorporated with existing decor. The design and application of the wet-area shower merges function and convenience so that no one is excluded from usage of the facility. The shower becomes *universally usable* with implications for injury prevention and the maintenance of good health and independence for all age groups.

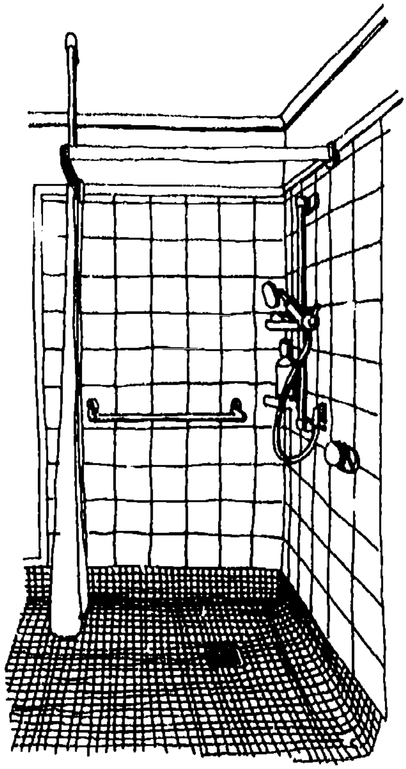

Figure 1. Diagram of a Wet-Area Shower

If designers *begin with the intent* to make built environments universally usable, final design and construction is more likely to achieve this and result in longterm cost savings for the community.

Health Maintenance and Injury Prevention

Above we have presented an approach to design based on the universal application of the principles of intrinsically safe environments. Goldsmith's Macro and Micro ideologies were introduced to distinguish between environmental planning approaches which offer comprehensive coverage for universal need and those offering segregationist solutions for specialist need. These ideologies are also relevant to this section.

In this section, the principles of intrinsically safe environmental design are linked to the basic understandings about maintaining community-health. Like Design, the systems which maintain the Good Health of a community are created as the result of a traditional planning process. The health system has always aimed to produce its 'Good Health' outcome through a process of rehabilitation. The concept of rehabilitation has the same philosophical base as the Micro ideology. It is restorative, based on the presumption of an existent ideal state of 'Good Health' within the community. Health systems operate on a model of ameliorative treatment of illness or disease in a segregated medical environment. Rehabilitation processes, by definition, require a person to be removed from mainstream community life and gradually returned by application of remedial medical measures.

Basic assumptions about the rehabilitation process include:

- Definition and control of the process is the preserve of the medical profession.

- The process can be concluded when the ideal state of 'Good Health' has been theoretically regained.

- Its principles can be applied across all age groups and across all medically defined conditions.

- It is not considered in the wider context of individual management of a programme of health maintenance in a community setting.

- Support services are system oriented with a dependence on administrative operational routines. The medical model of rehabilitation has had a pervasive influence on all community processes which aim to 'restore' individual conditions to 'normalcy.' The assumption that normality can somehow be defined, measured and, through a structured bureaucratic process, then be restored to those who have deviated from the norm, still prevails.

Health planning in New Zealand has a major preoccupation with the *hospital bed* as a basic planning unit. The bed is the benchmark for the system's ability to cope with public health demands and it is the bed which ultimately determines how public health funds are spent. The provision of health resources for staffing, equipment and other medical support services are related to the availability of beds.

The location of the bed is the critical planning issue. It is 'in the hospital', not in the home.

This approach ignores any genuine attempt to define 'Community.' Community services thus become an extension of the hospital system. They operate from the hospital environment and access to such services is by referral from the medical profession. The priority for community services is also to treat and cure illness.

This model for rehabilitation clearly establishes the professional, usually the doctor, as the Manager of the treatment offered and as the Director of the process. Health support services clearly focus on the institutional bed —individual responsibility for maintenance of good health is considered a separate issue from the mainstream Health and Rehabilitation systems.

Prevention

Preventive Health measures can be likened to the Macro ideology. Programmes of mass community immunisation and education about unhealthy habits and practices encourage self-reliance and individual responsibility for maintaining 'Good Health.' These programmes aim to reduce community dependence on the health system, and on health professionals, by attempting to eliminate causes of illness and disease.

The preventive approach to health care has more universal application than the Micro focus of the rehabilitative approach. Some reasons for this are:

- It acknowledges current levels of community wellbeing as the point at which intervention measures should be introduced rather than waiting for the onset of illness in a minority
- Health is seen as a community responsibility which cannot be abdicated to professionally elite experts
- Good health and individual behaviour are linked.
- Medical model rehabilitative processes become a support component for comprehensive systems of community health care.
- The support and maintenance of the individual in independent community living environments becomes the major health priority.

Preventive health measures clearly intend to change individual behaviour both in public and private environments. There is an argument that the best methods of improving behaviour are education or social change to remove underlying causes. Education and public awareness programmes can be spectacularly successful while they are running but their effect is short term. One example was the extensive television campaign mounted in the United Kingdom in 1976 to reduce the number of chip pan fires. After a few weeks of the campaign there was a 30% fall in the fire brigade callout for this sort of fire. Nine months after the campaign however, the rate returned to its original level.

Social change is an attractive solution, however changing social attitudes and behaviour by education is slow and expensive—*design solutions* which create new environments *remain as a low cost* (for new projects), *immediately effective and long term solution* to the issues of health maintenance and injury prevention.

In this context, the Macro approach to Design and to Health Maintenance must be pursued—Design and Injury Prevention issues require a mutually accommodating process for planning and constructing the built environment (particularly the domestic environment), which has universal usage as its primary objective. It is possible to identify particular areas in the home where injury events are more likely to occur. Unsafe behaviour patterns associated with the use of such areas as steps and stairs, showers and kitchens can be established. The challenge for the designer is to ensure that unsafe behaviour is not only unnecessary but that it is also difficult or impossible to perform in these areas. These will be discussed in detail in Chapter IV.

The same case can be made for the public environment where techniques for design for universal usage and injury prevention need to be applied to problem areas like curb cuts at traffic intersections, escalators and elevators.

Marketing Safe and Accessible Design

While safe and accessible design makes good sense it is not part of current, standard architectural design. The current approach typifies the Micro ideology of design for "special needs."

Some reasons for this include :

• Designers don't understand the importance of universal design. Intrinsically safe and accessible design is viewed as additional to, and more costly to implement than, current practice.

• The advantages and benefits of safe and accessible design have not yet been demonstrated. Although common sense suggests it is true, there is a need to document evidence that safe and accessible design will increase personal independence and reduce injury by accident and that it is more functional for all users.

• Designers argue that the introduction of safe and accessible standards is an unnecessary imposition which reduces their creative design freedom.

Designers must be convinced that the design principles identified above will only be successfully implemented under a Macro approach to environmental design and construction. Macro ideology is embraced by the Barrier Free design approach (and its extension to intrinsically safe design). Barrier Free design acknowledges that every member of the community has a fundamental human right of physical access to the built environment and that there are community advantages which will accrue from the inclusion of this approach in standard design practice. Among the presumed advantages are:

• Safe and accessible design does not restrict individual freedom (either of the designer or user) and in fact, increases the independence of elderly and disabled people and young children.

• Safe and accessible design can result in a reduction of the community costs of health and earnings compensation for personal injury and can be implemented with minimal (if any) extra cost compared with conventional construction.

• Creation of intrinsically safe and accessible settings promotes positive change in attitudes and behaviour of the able-bodied majority toward people with disabilities. Such settings also add to the confidence and self-image of people with disabilities, as they become more independent.

Barrier Free environments are currently in common use in many situations where the designer is unaware that anything 'special' has been created. In New Zealand, virtually every supermarket has a continuous level sealed surface from the motor vehicle parking area into the product display section. This "arrangement" has been provided as a matter of necessity so that shoppers, with their fully laden shopping trolleys, can negotiate the journey from inside the supermarket to their vehicle with minimal inconvenience and no threat to personal safety from architectural barriers. Thus the demand for an accessible entrance to the supermarket facility has produced a solution with universal application. The designer has created an environment, without architectural barriers, which doesn't exclude or disadvantage any member of the community. It has been achieved for commercial reasons rather than any obvious concern to provide access for people with disabilities.

In the field of domestic design a market oriented approach has been followed to promote the concept of intrinsically safe environments.

Most designers and builders consider that they build 'safe' homes. The structure meets building control requirements, it will not collapse because of poor construction and basic health needs for light, ventilation and so on are included. However, the fact that more people in New Zealand are environments. The design principles have been introduced in the preceeding sections as the first adjustment. The second adjustment addresses the involvement of the user in the planning process.

User Involvement in the Planning Process.

Locus of Control in the Planning Process. Traditionally, designers have considered the user voice of little importance in the decision making process. User involvement has always been considered superfluous on grounds such as:

- It would add another communication requirement to an already complex communication process.

- User input lacks the technical expertise and experience necessary to work with the professionally trained designer.

- The designer has already been trained to cover any contribution that the user might make.

- User needs are adequately covered by existing building controls

- The client's brief to the designer (particularly in the case of a private home) is sufficient to cover any additional user needs or special requirements.

However most enviromental design does not adequately address the requirements of all users. The most obvious reason for this is that the building industry, by its nature, is *dominated by* reasonably healthy *men*. For example, most architects are male. Most are able-bodied. Most are ambulant. Few are hearing impaired and none are visually impaired. Architects and others in the building industry therefore need guidance. They need to be sensitised to the balance between their personal understandings and objectives for a structure and the behaviours and capabilities of the rest of the population who will use it. Lifchez[3] has highlighted how the current inadequacies of architectural training can be improved in this area by user involvement. Suggestions will be made later, in Chapter III, about how to acheive more formal user involvement in the New Zealand building process.

Concern at this point is to establish that the primary planning procedure necessary to create intrinsically safe and accessible environments must be to involve the end user in design planning and decision making. The concept of Devolution argues for a decentralisation of power and resources so that the user and the decisionmaker can operate together from an equitable base. If design decisions set out to be acceptable to the user it is vital that the user has a major voice from the beginning of the planning process.

Genuine user participation in design planning will produce final decisions with more universal suitability and acceptability. User empowerment will result in a greater sense of individual control, ownership and responsibility for community facilities.

Successful user involvment will depend however on the availability of technically competent, professionally trained consumers. If the process presented in this monograph is to succeed, designers must be reassured about the competence of consumer representation and, such representation must have a guaranteed status in the process. The need to identify and encourage competent user participation in the design process cannot be overemphasised.

Behavioural Outcomes

Human behaviours and the personal factors which influence behaviour will determine the ultimate usage patterns of the built environment.

The purpose of intrinsically safe and accessible design is to create environments that promote longterm independent behaviour and reduce the likelihood of users engaging in behaviour which may lead to personal injury. The intent is clearly to change the behaviour of both users and designers.

Change in designers' behaviour is dependent on their understanding and acceptance of the principles outlined above. The end product of their efforts in the design process is to produce good, universal design solutions. To acheive that end the designer must consult with a range of users (or potential occupants) to *determine the desired behavioural outcomes.*

The issues raisd by the needs of people with disabilities challenge the hidden assumptions that lie behind environmental design decisions. These hidden assumptions concern the physical condition of the population for whom environments are designed. The notional figure of the ninety-five percentile male dominates traditional construction and design requirements.

The ninety-five percentile is the height and reach range that all but five percent of the adult male population fall into. This is a range that will not necessarily suit women, who make up over fifty percent of the population. It does not include children who are not yet fully grown and who comprise about thirty-one percent of the population. It does not include elderly people— about ten percent of the population or disabled people—another ten percent. Allowing for overlap in these figures the group for which the built environment is expressly designed is just under twenty-five percent of the population.

Barrier Free design does not look to the average as the determinant of building dimensions or fitting selections. Rather it requires the designer to look critically at the activities related to any space or fitting and to decide the lowest common denominator for effective usage.

For example, the lowest common denominator for setting the size of a circulation space, or the height of step upstands, is generally the wheelchair user. As a rule, if space and threshold provision is acceptable for a wheelchair user no other user will be disadvantaged.

However the wheelchair is not the only measure of 'man' for design purposes. The same approach applies in other areas—if a glass door can be easily identified by a partially sighted person it will be less likely to accidently confuse the rest of the community. A non-slip surface which is safe for a person using crutches or sticks will be safer for everyone else. At the other end of the scale the tall athletic person may be the common denominator so that doorway clearances allow for the two metre tall policeman, rather than the ninety-five percentile male.

Abandoning the average in this way does not mean that the environment becomes any less convenient for the 'average person' to use. It will result in buildings constructed with a looser "environmental fit" but not buildings which the ninety-five percentile male will find difficult to use.

Adopting this "Barrier Free" approach allows further gains than just convience and accessibility. Improvements in the safety of the environment will result and there are many detailed provisions in national Access Codes which redirect user behaviour into a safer mode. Examples will be given in the next chapter.

Using the domestic environment as a model, injury events associated with kitchens, bathrooms, stairs and so on can be examined to identify undesirable behaviours which result in personal injury. Design solutions which reduce the need to bend and stretch, to climb and descend or to step and balance can be tested as *passive* preventive measures.

Behaviours resulting from common human conditions like visual and mobility impairment, like tiredness and irritability, haste and even drunkeness require analysis in order to create design forms which mitigate against their potential to cause personal injury.

Summary

This introduction establishes the importance of safe and accessible design in planning the built environment. The design concept of intrinsic safety identifies a set of principles which link health maintenance, injury prevention and universal usage. To incorporate the design principles into current planning proceedures requires user involvement in the decision-making process. If this objective is to be acheived from the outset, basic assumptions about user behaviour need to be questioned in order to determine desired behavioural outcomes.

To demonstrate successful translation of the principles and the process into good practical design solutions there must be means of evaluation and this will be the subject of the next chapter.

CHAPTER 2
THE JOURNEY

Evaluating Built Environments

Good design must encourage and facilitate social usage of the built environment. The buildings and the networks that connect them are created for people, all people, to use. Designers have traditionally focussed their trained professional skills on *the structure*—its appearance, its construction methods and materials. This traditional focus now needs to be expanded because of the need to cater for:

• More rapid mobility systems and an ever increasing pace of life which demand greater convenience and ease of use from the built environment.

• Greater usage with natural population growth.

• A much larger usage group of elderly and disabled people whose life expectancy has been dramatically increased by rapid advances in technology and illness treatment. This group will continue to grow at a proportionately greater rate than in the past.

• Environmental design solutions which remove unnecessary architectural barriers as an effective long term balance for the continual imposition of external change related stress.

• The increasing market force economic controls of efficiency and competition which will emphasise the need for facilities to attract customers through good access. The ultimate measure of success in creating built environments which have universal usage as a design requirement now becomes the ease and convenience with which they can be used by someone with a severe visual or mobility handicap.

A Conceptual Framework

Good environmental design recognises and accommmodates the interdependence of three primary components:

1. *Transport Systems*—including the private motor vehicle, bus and rail transportation and in a wider context, air and sea transport systems.

2. *Public or Open Spaces*—Templer4 identifies the development of priority networks which respond to the mobility difficulties experienced by people with disabilities as the appropriate planning response strategy for this component.

3. *Buildings*—both public and private.

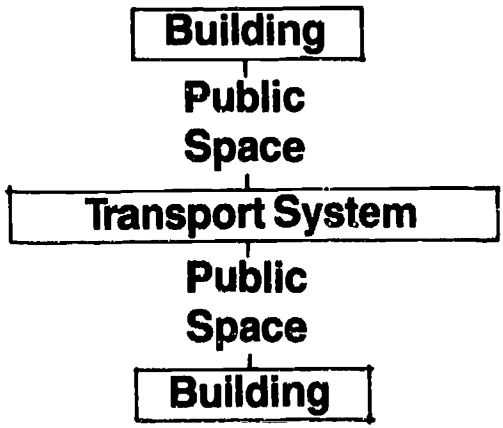

Figure 2. Diagram of 3 Primary Environmental Planning Components

The JOURNEY

The JOURNEY is suggested as a means of evaluating the effectiveness of of environmental design in terms of movement between and within the three primary components--the building, the public space and the transport system.

The JOURNEY is a theoretical path of travel with an identifiable start and end point. In its simplest form the JOURNEY may involve only one metre of travel, at its most complex it can cover movement from one side of the world to the other. In the latter case there is a complicated interaction of a variety of building types, public spaces and modes of transport which can be broken down and evaluated as a series of separate, *intermediate journeys*. The return JOURNEY then encompasses the complete cycle of travel.

Critical points occur in the JOURNEY where components merge and where there are junctions between two surfaces. Such points are to be found at:

• Vehicle set down locations with paved surfaces and appropriate gradients.

• The space between vehicle set down and the building including ground surfaces, curb ramps, pavement slopes, handrails, building entrance thresholds and landing areas.

• Changes in building interior circulation patterns including elevators, doors and doorways, floor coverings, corridors and toilet facilities.

Attention to the design detail of the points of transition (or linkages) between the components is essential. The challenge to the designer is to link these components into combinations of public route networks which eliminate unnecessary architectural barriers at these points.

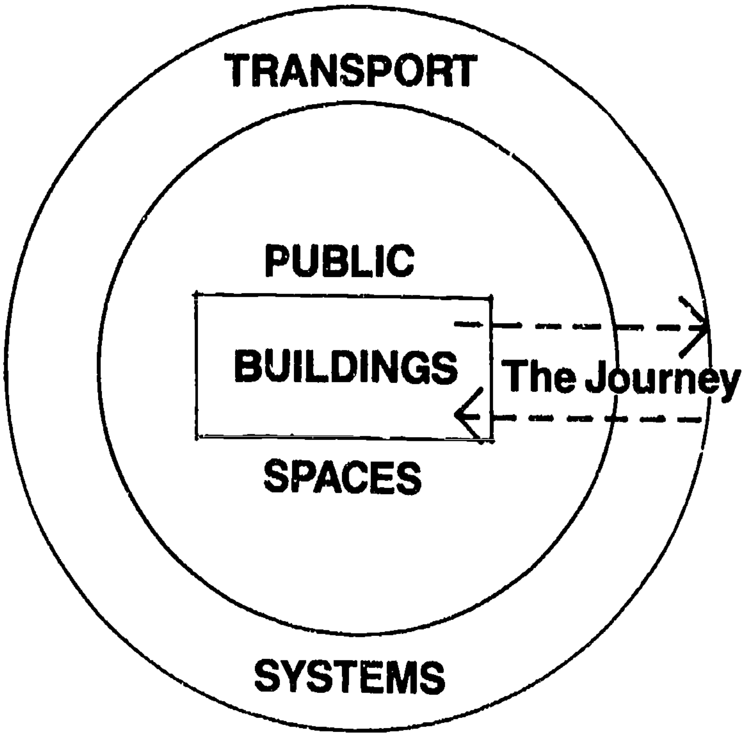

Figure 3. Diagram of the JOURNEY—a theoretical path of travel used to evaluate the effectiveness of bu 't environments

City planners are well aware of the problems of accommodating public and private transport needs with those of pedestrians. Increasing vehicle and population numbers require facilities capable of handling peak-hour densities safely, conveniently and with a minimum of unnecessary delay. In the crush of maximum pedest ian movement obstacles which would be negotiated with ease in the normal course of events become hazards with the potential to cause major injuries.

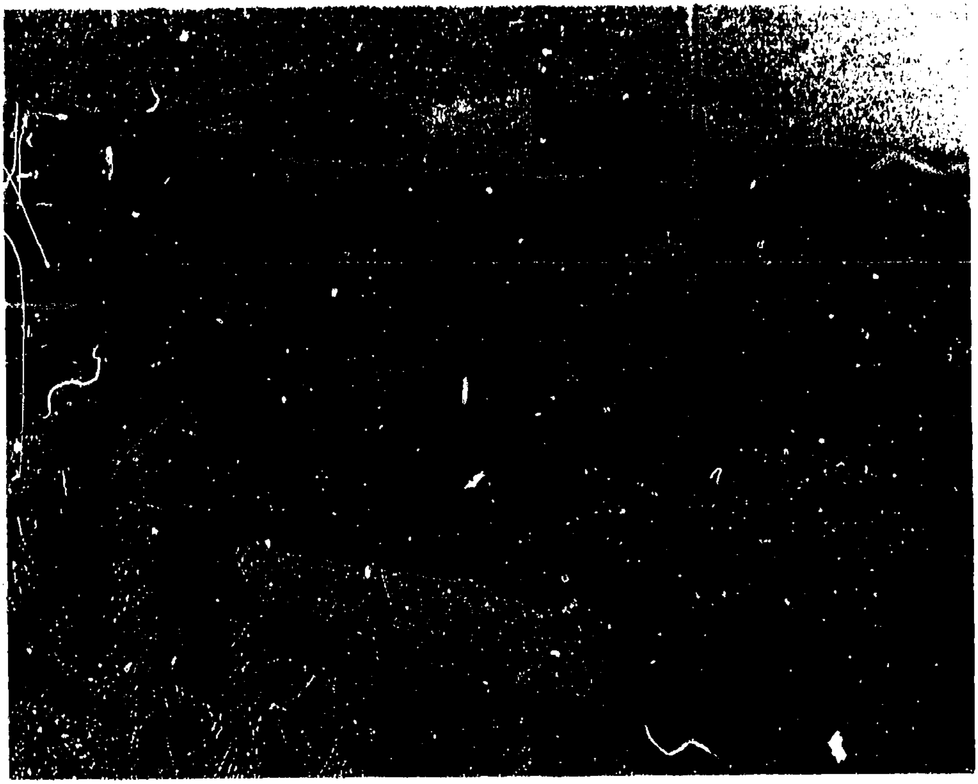

Figure 4. Photograph of extended curb ramp

Attention to design detail at the junction between pedestrian thoroughfares (pavements) and vehicle movement is a good example of how the needs of visual and mobility handicap provide a safe solution for all other users. The pedestrian crossing which is not controlled by traffic lights is a potentially dangerous accident site. Design considerations in this situation include:

• Drivers must have a clear view of pedestrians who are about to use the crossing.

• Visually handicapped pedestrians need precise cues as to where the pavement ends and the roadway begins.

• Wheelchair users need a level transition in order to negotiate the curb.

• All crossing users need an unobstructed view of approaching traffic.

• Vehicle parking provision is usually required on both sides of the pedestrian crossing.

• Stormwater drainage provision is required.

An effective solution which accommodates all of these considerations is to project the existing curb and pavement so that it is continuous with the original pavement onto the road as far as the outside edge of the parked vehicles. Drainage requirements will be met by the gradient specifications for Access Code curb ramps and can be enhanced by piping the original curb line underneath the new projected entry to the pedestrian crossing.

The planning approach used in the curb example is the technique necessary to achieve the objective of independent negotiation of complex JOURNEYS by any potential user.

Barrier Free Design as a Base for Intrinsic Safety

In general, barrier free design and safe design are two sides of the same coin. This is partly because the built environment is not only difficult for people with disabilities to use, but it is often presents dangerous situations for every user. Also design which caters for the capabilities of disabled people is usually safe design.

The entrance step(s) are now usually omitted in the design of new public buildings to allow wheelchair access. Steps are a potential accident site. Their elimination reduces the risk of personal injury and also means easier access to the building for those carrying goods or equipment; young children (toddlers); elderly people; people pushing wheeled conveyances (babies buggies, shopping trundlers, goods trolleys etc.); pregnant women; others with either permanent or temporary disabling conditions.

It is established that 13 people per 1000 have significant difficulty using public buildings because of a disability.[5]

The Significance of the Access Route

The "access route" is a defined JOURNEY starting at the vehicle set down point and concluding at some point (ideally the toilet facility) inside the building. It is described as:

"A continuous route negotiable by a disabled person, unaided, in a wheelchair which is available from the street alignment or car parking area to those areas which are to be made accessible for disabled persons who visit or work in the building. The access route shall include paths, ramps, at least one public entrance, corridors, doorways and lifts within the building."[6]

The important feature of the "access route" is its continuity. Continuity is acheived by ensuring that any architectural barriers which constrain mobility or impede function at critical points are eliminated.

The concept of the "access route" can be extended beyond the building and its immediate environs into the public space environment to form networks of connected JOURNEYS. The sum of these JOURNEYS is called the priority accessible network:

> "The sum of the measures implemented to improve accessibility (the network) must lead to an accessible system that is continuous and comprehensive in its service to all desired destinations."[7]

An example of critical point detailing in a priority accessible network is the junction between the platform and the doorway threshold of a railway train. An extreme instance is the Bullet Train in Japan. Its doorways are completely accessible for wheelchair and visually impaired users, not necessarily for their convenience, but because large numbers of people have to be moved through the confined space with split second timing. In this circumstance there must be no obstacle or potential trip hazard.

The train transport system at airports like Seattle's Seatac Airport in the USA have the same provision, for similar reasons, with the additional need to cater for people carrying baggage.

The detailing of the level transition, in both cases, is an effective design solution using the kind of planning approach for the earlier example of the extended curb ramp and, again, highlights the relationship between Barrier Free design and intrinsic design for safety using the "access route."

The Domestic Environment

The relationship can be extended into the private home. Many of the features associated with Barrier Free domestic design are safer than traditional layouts and fittings. The advantages of level entrance thresholds and the elimination of steps have already been mentioned.

Wet-area showers (with handheld shower hose and mixing valves) present fewer opportunities for accidents involving falls or scalding than conventional showers. Sliding doors have less accident potential than side hung doors. Power sockets positioned higher than usual reduce bending and the potential for back injury.

Using the JOURNEY as a measure, the relationship can be examined more closely.

The housewife returning by car from the supermarket with her purchases and her two young children faces the same unloading difficulties as a wheelchair user. Both have to negotiate the JOURNEY from the inside of the vehicle to the kitchen inside the house. This entails exiting the vehicle and transporting packages, children, stroller or wheelchair from the vehicle to the house entrance and through into the kitchen. It will probably require several trips to complete the exercise. This JOURNEY is often made more complicated by wet weather and darkness or personal factors like fatigue, irritation and distractions like crying children or a ringing telephone.

The design priorty is to exclude any obstacle or barrier which will add stress, increase the potential for an accident or impede the progress of the JOURNEY. Elements of the effective JOURNEY, in this example, include:

1. Covered vehicle access or internal garaging with remote control garage door.

2. Level sealed surface for vehicle parking with sufficient surrounding circulation space (ideally 3.3m per vehicle).

3. A covered, level, sealed route from vehicle to entrance or level internal access between garage and house.

4. Level entrance threshold with doorhandle placed between 900mm and 1200mm above floor level.

5. No abrupt change in floor level between the entrance door and the kitchen.

6. Switches with rocker plates and neon indicator lights.

Door handle and light switch located consistently at the height specified will facilitate their operation by the wheelchair user and by the hip or knee of an ambulant adult if arms are occupied carrying a load. Also, young children are able to operate them more independently. Consistency of placement of all repetitive fittings is a requirement for the visually impaired user.

Resolving Possible Areas of Conflict

Barrier Free design as a base for Intrinsic Safety suggests that any or all provision for people with disabilities is safer for everyone. While the details and dimensions may be negotiable there is no doubt that the challenge of regarding the design of *every* home as design for someone's "special needs" is the technique which will result in improved standards.

Current techniques for 'safe' design focus on active measures which aim to restrict access by risk groups, particularly in child safety. There is obvious conflict here with universal accessibility and the needs of people with disabilities. The height of door handles is a case in point. Placing the handle at a height which young children cannot each will prevent them from entering specific areas and will also exclude many wheelchair users as well as many ambulant people with reach or grasp limitations. However emergency situations such as a fire or an immobilising fall by an adult dictate a design priority for independent access or egress by small children.

Two other examples with similar concerns are·

1. Childproof cupboard door locks. These may be difficult for a person with restricted hand movement or a wheelchair user to manipulate. If such locks require a complicated opening proceedure or a key, they are not a good solution. Medicine cabinets, for example, need to be accessed without delay in the event of sudden illness or accident. A lost key, in these circumstances could prove fatal. Storage for poisons, detergents, drugs and so on should be at eye level and away from any climbing route negotiable by young children. There are many latches now available which are simply manipulated but require logical thought beyond the capability of children.

2. Childproof guards for electric power outlets. These are to protect very young children (crawlers and toddlers) from electrocution. Modern shutter sockets perform this function although they may be difficult for many with limited hand or arm movement. Locating the socket between 450mm and 600mm from the floor helps to solve both problems and reduces the need for adults to bend.

In general, any incompatibility between the requirements for accessibility and child safety should be resolved by a thorough application of the process of user involvement to specific problem areas. The design guidelines presented in Chapter 4 offer solutions for any such problem areas.

CHAPTER 3
THE BUILDING PROCESS IN NEW ZEALAND

Administrative Structure: Who makes the Decisions?

The Building Process in New Zealand is controlled by three main groups. Developers, Professional Design Groups and Elected Public Bodies (through their supervisory staff) make and implement all decisions on the design and construction of the built environment. The main players in this process are Property Development Entrepreneurs, Town Planners, Architects and Building Inspectors. The planning and design process has a system of checks and balances in the form of national legislation, codes of practice and local authority by-laws which guide, protect and constrain all participants.

The contribution of the public and interested user groups will be examined in this chapter. It is contended here that involvement of these groups, especially those whose quality of life is dependent on good access to the built environment, requires more formal recognition and encouragement in the building process. Current proceedures can be enhanced by guaranteed user input in the drafting of laws, codes and regulations; formal education settings for training designers—performance evaluation and monitoring of current design procedures and completed structures.

Opportunities for this to occur will be identified at the appropriate points throughout this chapter.

Participants in the Building Process

Controls on the Building Process are introduced and implemented at a local level.The process begins with an initiative from the developer, who may be an Individual, a Private Company, Government Agency or Community Organisation. When the Developer and the Local-Authority "meet", the building process in New Zealand can be viewed as being in two stages:

a) *Statutory Planning*. During this stage, town planning approvals are sought from the Local-Authority under the District Scheme. Each Territorial Local-Authority is required by the Town and Country Planning Act 1977 to produce its own District Scheme which sets out the guidelines for land use, bulk shape, access to daylight and sunlight, wind, carparking and so on. The District Scheme protects the rights of third parties.

If a proposed development contravenes the District Scheme (and by implication impinges on the rights of third parties) the Local-Authority must call publically for objections from those affected. This statutory planning stage allows the only opportunity for formal consumer (public) participation in the building process.

Objections and appeals against proposed developments, under the District Scheme, fall into *two specific categories:* conditional use and specified departure.

Conditional Use, within the District Scheme, means that the Developer has an application approved for a variation of the Scheme with certain conditions attached. Here the onus is on any objector to substantiate an objection.

Specified Departure from the District Scheme. Puts the onus on the developer to justify an application. The objector must still substantiate any objection but the major responsibility is on the developer. Objections which cannot be satisfactorily resolved at local level are referred to the Planning Tribunal for a legal decision binding on all parties. The process and procedures for hearing objections often becomes one of protracted legal debate which gives the large Development Corporation with access to big budgets a decided advantage over the general public. In instances where extremely large developments are contemplated the resources available to big corporations may also be used to intimidate Local Authorities, with smaller financial resources and less experience, into accepting lower than the required standards. This situation is rare and unless public outcry becomes loud enough, such instances generally pass unnoticed. Usually a satisfactory compromise is reached.

The simplest procedure in this Statutory Planning stage occurs when the proposed development is a *permitted activity as of right* under the District Scheme. In these instances or when all planning approvals have been given the building process moves into the second stage:

b) *Building Regulations*. This stage moves the emphasis away from planning and into *design issues*. If the plans submitted for approval for a proposed development cannot meet the building regulations then it does not get a *permit* to proceed. There are no opportunities, during this stage, for objections or formal user involvement.

The development initiative is originally presented as a sketch plan. The Designer (an Architect, Engineer or Draughtsman) is commissioned to do this by the Developer. Developer and Designer now become partners in a negotiated process with the Local Authority, represented by Town Planners and Building Inspectors.

Developed design plans and documentation are now presented for Local Authority approvals including the *building permit*. Government Agencies are not subjected to the same degree of Local Authority control as are Private Sector Developers.

The Crown (Government Departments) has legal building obligations to the Council (Local Authority) under section 125 of the Town and Country Planning Act. Many Government Agencies operate their own Design Divisions which share a management and control responsibility for all Public Sector development.

The drafting process for documents which guide the building process (laws, by-laws, regulations and codes of practice) provides the most influential opportunity for user participation in the Building Process. Professional interest groups, particularly paid officials of publicly accountable agencies, have always dominated this aspect of proceedings. Private operators, like development companies and architectural practices continually reject the need for mandatory compulsion to provide for public protection. They advocate voluntary (market controlled) provision but are rarely able to participate fully in the drafting process because of their need to be profitably efficient. The history of requirements to provide access for people with disabilities is a good example of the inadequacy of the voluntary approach. In spite of guidelines to assist designers in this area it is only when clear, mandatory procedures are introduced that widespread implementation occurs. If codes and legislation are to lay effective ground-rules for user group protection, it is essential that the user participates in their drafting. At the very least, consumer group comment must be sought and incorporated in the final draft.

Architecture

Architects hold the major cards in the design process. They provide and control the primary design component. They carry the Developer's initiative and the responsibility to see the process through from conception to completed structure. Their professional interests and reputation are protected, in New Zealand, by the Architects Act 1963. The NZ Institute of Architects (NZIA) recommend Architects' fees scales and administer the Architects Education and Registration Board (AERB) procedures which register, university qualified candidates as professional practicing architects. NZIA is ostensibly a voluntary union with fee paying members. All larger public buildings (2 or more storeys) are designed by professionally trained designers but there are many smaller structures and up to 95% of all private housing which are constructed with little, or no, professionally recognised design input.

By international standards New Zealand architecture is small and young. The oldest preserved building since European settlement is 155 years old and the tallest, which took 11 years to build and was completed in 1984, is 3? storeys high. The history of building in New Zealand is of pragmatism and directness. The search for architecture of national identity began "...in the dream of an architecture of pure immediacy and directness such as the shed, the shack and the bach*"[8]

In recent years the rapid expansion of Auckland city and a substantial lift in the earthquake safety requirements in Wellington (causing extensive demolition of the central city) has meant a dramatic increase in architectural workload. However, planning for new projects has stopped abruptly since the sharemarket crash of October 1987.

A milestone in the evolution of New Zealand architecture and building was the construction of the Bank of New Zealand building in Wellington. The project, which took 11 years (from 1974 to 1985) to complete challenged its designers because of its size and engineering structure (it is still the tallest New Zealand building). Construction progress was frustrated by political interference but the whole project thrust low rise (two-storey) New Zealand into the world of high rise construction. It demanded an unprecedented level of technical quality in its materials, detailing and appearance. Questions about public usage, convenience and ease of access were relegated to the last stages of the design process. The black monolithic form of the building is unwelcoming and its grandiose entrance intimidates and discourages public usage. The unnecessarily complicated entrance system with layers of steps, escalators and a conspicuously additional ramp demonstrate minimal appreciation of how the public linkages at ground level might encourage usage.

In spite of its many detractors The BNZ project has been a catalyst and in many ways a source of encouragement for an emerging sense of confidence and flair amongst New Zealand architects. Currently the public buildings of Ian Athfield and Burwell Hunt combine confident imaginative architecture with a sensitive concern for the way all people will use them. (Refer to photographs on following pages).

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*A bach is a small seaside shack

Training

Formal training for the participants in the building process is available in New Zealand at:

- The two Schools of Architecture at Auckland University and Victoria University of Wellington.

- The Engineering Schools at Auckland University and Canterbury University in Christchurch.

- Post-graduate courses in Town Planning at Auckland, Massey and Otago Universities.

- The post-graduate course in Landscape Architecture at Lincoln University College in Christchurch.

- A range of correpsondence and part-time courses offered through some of the above institutions and through other private agencies.

Figure 5. Photograph of elevation of Bank of New Zealand (BNZ) 25 Head Office in Wellington

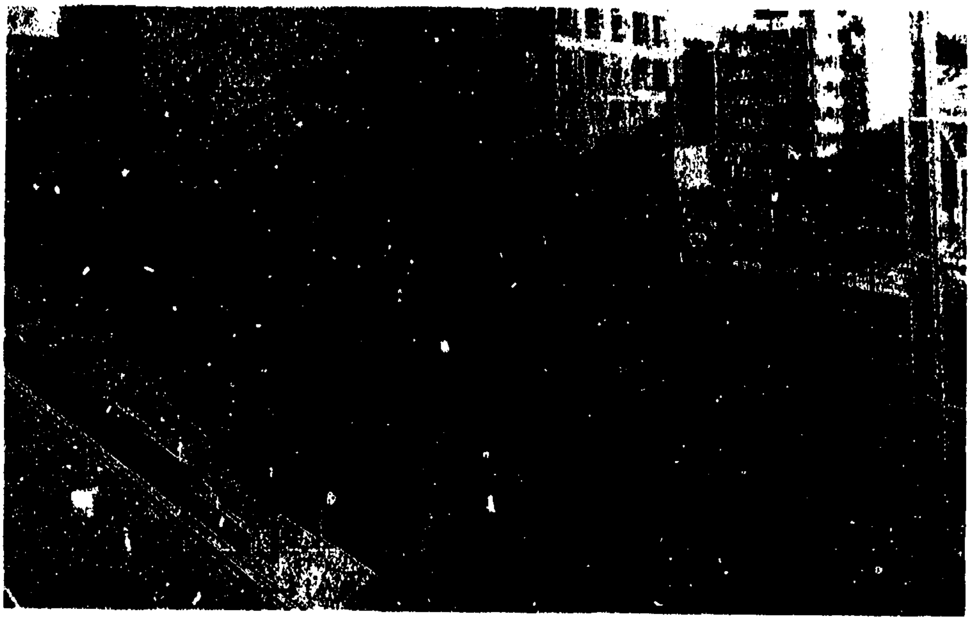

Figure 6. Photograph of complicated entrance to the BNZ Head Office

Figure 7. Photograph of elevation of Telecom House

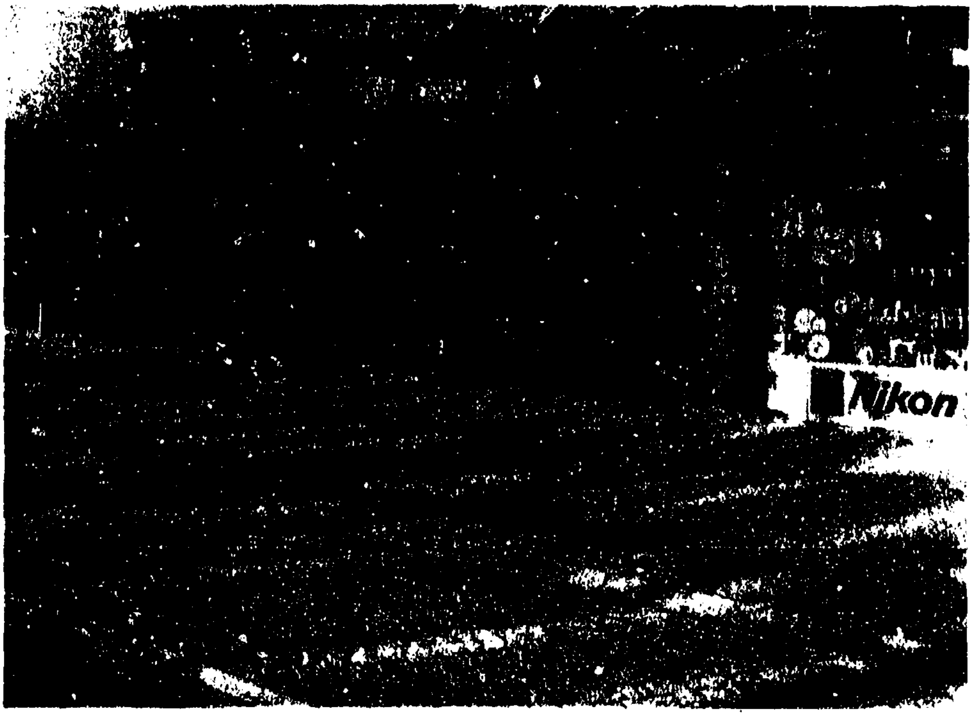

Figure 8. Photograph of entrance to Telecom House

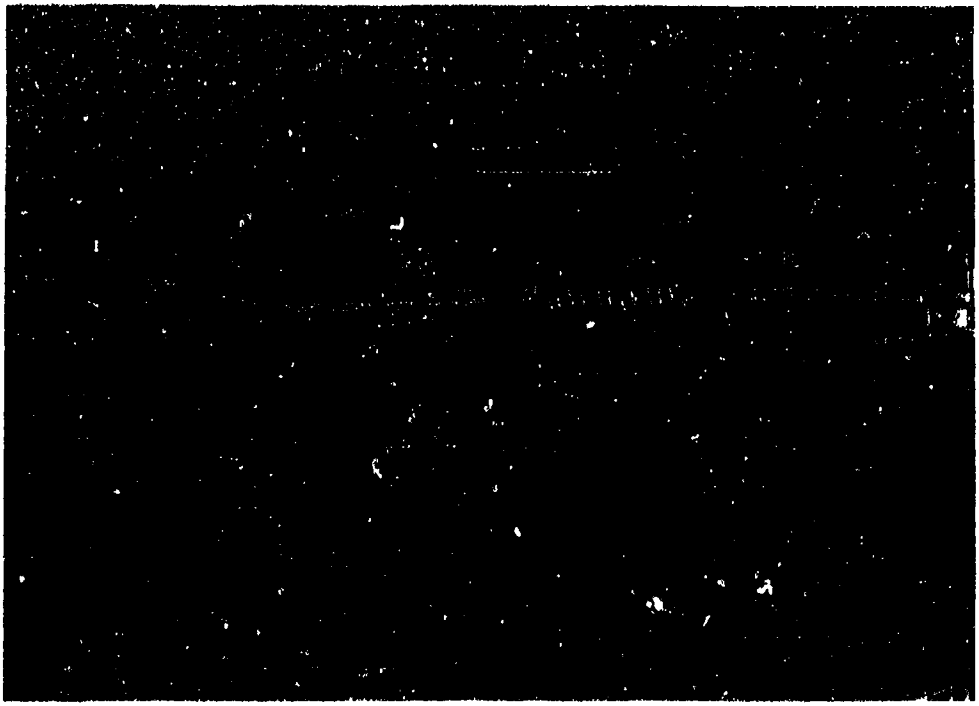

Figure 9. Photograph of elevation of Wellington Aquatic Centre

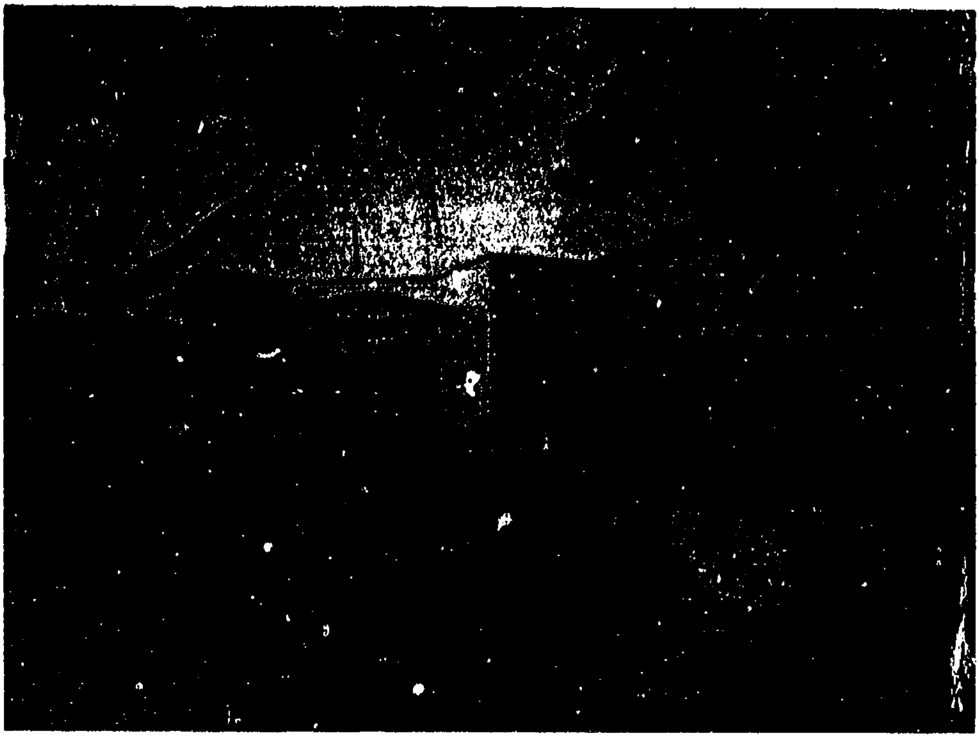

Figure 10. Photograph of entrance to Wellington Aquatic Centre

The training emphasis at most of these institutions is on the built structure—its materials, its appearance and the construction techniques. Legal and professional responsibilities which define and protect areas of sectional interest also have a high priority in formal training, especially for project management concerns. Issues of building function focus on building type and the need to meet specific health and safety standards

Design training for usage of the built environment is accorded low priorty in formal educational settings. Some courses on ergonomics include a focus on design for human factors with criteria for performance, safety, comfort, convenience and aesthetics. There are sometimes optional special interest sessions on Designing for the Disabled. These are rarely, if ever, considered part of any core curriculum despite the legal requirement to provide access for people with disabilities to all public buildings. There are many research projects which use the field of disability as a separate area of study for students with a special interest. The approach continues to follow the Micro ideology identified by Goldsmith so that Barrier Free design is viewed as additional to the 'real' issues of architecture and design. Recognition of accessibility and usage as fundamental requirements for the design of all built environments is not a current training priority.

When accessiblity and usage become priorities for design training the potential for 'qualified' representatives of building user groups to 'teach' students will need to be formally recognised.

Local Authorities

The Local Government Act 1974 establishes New Zealand's 213 Local Territorial Authorities which consist of City, Borough and County Councils. These bodies are elected by local residents every three years. Council revenue is generated through the rating system wherein every property owner makes an annual payment to the Council based on the value of the land and capital improvements made to it. Categories of land use including residential, industrial, commercial, recreational and farm land directly influence the calculation for the rates to be paid for each property.

Currently the Local Government Commission and the Building Industry Commission are investigating ways of amalgamating and simplifying the variety of Local Authority administrative procedures and building control regulations. The findings of these Commissions will result in many of the smaller Local Authorities combining to form larger groupings of regional Government and a National Building Code which will identify broad uniform requirements across all Local Authorities and building types. Some irony exists in the moves to standardise Local Authorities and building regulations. They come at a time when the agenda of Central Government (Parliament) is for devolution of resources and responsibility. Also, the areas of building control which are already under national guidelines (the plumbing and drainage regulations, fire egress, and access provision for disabled people) still provide some of the most conspicuous examples of confusing varience in local interpretation. It is worth noting that these areas of building guideline control all focus on building usage.

The success of the reforms will depend upon the quality of consumer advice sought and incorporated by those responsible for drafting national guidelines; and the efforts of informed local user groups to ensure that the national guidelines are interpreted adequately in their area.

History of Code and Legislation Development

Access Rights. Physical access to the built environment is a BASIC HUMAN RIGHT for every member of the community. People with disabilities, particularly those with mobility impairment, have been the group most severely disadvantaged by an historic denial of that right.

Rehabilitation International in its "Charter for the 80's" proclaims that people with disabilities have the right to use all structures intended for general public use. In New Zealand this issue was first formally addressed in 1967. A public meeting of representatives of central and local government, voluntary and commercial agencies and design professionals agreed to begin work on a set of voluntary code guidelines. About 50 people attended that meeting of whom only one declared a disability.

The first New Zealand Access Code (NZ Standard 4121 Part I) was published in 1971. A supplementary document (Part II) on signage followed in 1975. The two documents were written in recommendatory language, there was no compulsion for architects to use them, however visible results were acheived with the appearance of some wheelchair accessible toilets (especially at airport terminals), the introduction of curb ramps and, from 1975, the increasing use of the International Symbol of Access.

Legislative back-up was needed to mandate the recommendatory approach of the Code. Although some Local Authorities had included the requirements of the Code in their building by-laws, the level of implementation varied considerably from extensive compliance in a few areas to complete ignorance in others. In 1975, a progressive piece of legislation, the Disabled Persons Community Welfare (DPCW) Act, was passed by Parliament. Disability interest was well represented in the drafting of the law which encompassed a range of support and enabling provisions. Section 25 of this Act requires:

> "...for *any new building* or major reconstruction of premises to which the public are to be admitted, the person liable for the cost of construction (whether the Crown, or any Local Authority, or public body or corporation or person) shall ensure that *reasonable and adequate* access, both to and within the building and in the parking and sanitary conveniences, is provided for disabled persons who may be expected to visit or work in the in the building."[9]

The Access Code NZS 4121 is cited later in Section 25 as a means of compliance with the "reasonable and adequate" requirement.

A two year lead-in period was allowed, with the legislation to be enforced from 1 January 1977. The Act is administered by the Department of Social Welfare. The responsibility for enforcement lay with the Local Authorities but there was no legal mandate to enable them to carry out this responsibility. This situation was remedied during 1980 with an amendment to the Local Government Act 1974 Section 641 (3) empowering the Local Authority Council to refuse a building permit for any plans which do not comply with the DPCW Act. Building Inspectors employed by every Council are responsible for the issuing of building permits and they are the key people in the enforcement process.

In spite of a legal structure with clear roles and responsibilities and many encouraging examples of success there were still too many instances of non-compliance. Ignorance (particularly from the disability sector) and procrastination (from Local Authorities and architects) because of an imagined conflict between the mandatory requirements of the 1975 Act and the recommendatory guidelines of the 1971 Access Code reinforced the need for a redraft of the Code. The redraft process was formally initiated in 1980 and NZS4121:1985[10] was launched by the Minister of Social Welfare in December 1985.

The redraft committee pursued a concensus-based discussion process which resulted in clear performance oriented direction. The objective was to *make the Code visible and easy to use* by its primary target audience of architects and building inspectors. The following elements of the new Code were most instrumental in acheiving these objectives:

1. Its *mandatory language* clearly established its direct link with nationwide legislation—only two other New Zealand Standard Code documents have the same status. All relevant legislation is included as the appendix to the other three parts of the Code.

2. Its *editorial style* (diagrams dominating the text) was prescriptive, direct and clear. Its aim was to produce a *working document* which was accurate yet simple enough for the architect and building inspector to find solutions with a minimum of extra research time and interpretation.

3. The major sections (Part 1 and Part 2) *separated the design rules from their application to particular building types and situations*.

Part 1: Contains diagrams showing dimensions and detailing for facilities like toilets, lifts (elevators), showers and so on.

Part 2 Specifies when, where and how many toilets, lifts, showers and so on are required. Important examples from this section were: a lift now required in every new two storey building with a second storey gross floor area of 400 sq m (4000 sq ft) or more, a percentage requirement for accessible units in every new hotel and motel complex.

TOTAL GUEST UNITS	ACCESSIBLE UNITS REQUIRED
0-9	1
10-25	2
Every additional 25	Add 1

Figure 11. Table for the number of accessible units required by law in every new hotel and motel

4. The concept of the *"access route"* required an integrated linkage of all the design elements and their application.

5. The deliberate *omission of private accommodation*. The new code had an immediate impact. Most architects were completely untrained in the requirements for access by disabled people. They suddenly discovered that the performance requirement for "reasonable and adequate" access had far greater design implications than ramps, wide doors and big toilets.

The encompassing concept of the "access route" meant explicit detailing attention to ground surfaces, threshholds, floor coverings, lift design, visibility factors and the way in which they were all combined. To many architects there was nothing extraordinary in this, but property developers resisted the Code on the grounds of extra cost especially for the new lift requirement in two storey buildings. Developers saw a potential extra cost of up to 15% for this requirement. In some of the smaller New Zealand towns development patterns were affected while this lift issue was addressed.

In terms of overall cost to the New Zealand building industry however the lift requirement was insignificant and many developers have now accepted the compromise of a lower performance (and cheaper) lift design for the smaller two storey building. It has also been noted that the smaller building which now requires a lift is a more attractive resale proposition.

Designers have been challenged by the Code. Their response has been generally favourable. However the issues raised by these requirements have been clouded by the restructuring of the New Zealand economy which has virtually stopped property development in smaller cities.

The future promises two immediate opportunities to enhance the level and implementation of access provision to public buildings in New Zealand: a handbook and short commentary on the Code is being prepared by the Standards Association of New Zealand; and the production of the first National Building Code is being investigated by the Building Industry Commission. There is also the pending redraft of the Disabled Persons Community Welfare Act. Disabled consumers will once again be required to participate in the drafting of all these documents.

Injury Prevention

The Accident Compensation Act 1972 governs the operation of the Accident Compensation Corporation (ACC). ACC is a quasi-government organisation, but is independently administered under its own Act. Anyone in New Zealand who is injured or becomes disabled because of an accident after April 1974 is compensated, on a 'no fault' basis, for medical costs and up to 80% of the loss of any taxable weekly earnings. For someone permanently disabled by accident, a lump sum payment is also made with additional assistance provided for transport (vehicle purchase), housing (home alteration) and equipment.

Eligibility for ACC support is quite specific under the legislation—the disabled consumer not covered by the accident criteria has no rights of initiative to seek ACC assistance. Those not eligible have recourse to a consumer initiative to seek financial assistance under the DPCW Act and separate legislation for people with visual and hearing impairments.

For a comprehensive summary of current provision of rehabilitation services and disibility organisations in New Zealand see The World Rehabilitation Fund Monograph #43.[11]

The ACC also has a mandate to promote programmes for Health Maintenance and injury prevention. It is charged under its Act with the initiating and developing of safety standards which could include building controls. There have been many technical documents produced by the Standards Association of New Zealand with the financial support of ACC—the most recent example is the Code on Non-Slip Floor Coverings and Ground Surfaces. Another standard, on playground safety, highlights an increased awareness of the need to change the environment to safely accommodate known types of behaviour even when such behaviours are irrational, as is often the case with young children (and many adults). In recent years a new focus on domestic accidents has meant the introduction of a standard on the Fencing of Domestic Swimming Pools and a revised Glazing standard. The production of a new document on Intrinsic Design for Safety in New Zealand Dwellings is underway with financial assistance from the ACC.

Consumer Involvement and Representation

The formal procedures for user participation in the building process have already been identified in the early part of this chapter. The public interest is protected in part of the building process by town planning appeal and objection procedures. Special interest groups like the Disabled Persons Assembly, the NZ Institute of Architects and the NZ Institute of Building Inspectors on are always invited to participate in the drafting of any law or regulation which will affect the interests of their members.

Once the Statutory Planning approvals for a building project have been given and the design 'proper' begins there are no formally recognised procedures for consumer involvement unless the consumer group or individual is prepared to take legal action. Disability groups have developed the most useful national structure to enable coordinated lobbying at both the national and local levels. The experience, over many years, of having to battle for basic access rights has resulted in a formula for voluntary user participation which has been successful.

Disability Advocacy

The release of the first Access Code in New Zealand in 1971 further encouraged the efforts of the Disability Sector to organise itself. "Watchdog" groups called Coordinating Councils for the Disabled were set up during 1973 and resulted in the establishment of the NZ Council for the Disabled. Each regional coordinating council set up an Access subcommittee. In 1982 these were absorbed, along with the NZ Council and Rehabilitation International NZ, into a new umbrella organisation, The Disabled Persons Assembly (DPA). DPA has a National Executive Committee (51% of whom must be disabled) and 35 Regional Assemblies all elected annually by the membership. Three catagories of membership enable individuals, voluntary agencies and government departments to all be represented.

The Access Committees of the original Coordinating Councils and now of the DPA Regional Assemblies have had varying levels of success with their monitoring role. Many have established a mutually supportive arrangement with the Local Authority Building Inspectors whenever there is debate over the adequacy of access provision in plans submitted for permit approval. In some cases, where there is informed disability interest with the available time and technical expertise, all new plans are reviewed by the Access Committee as soon as they are submitted. These relationships are voluntary and dependent on the initiative of the disability sector and the cooperation of the Building Inspectors. They need to be formalised.

The New Zealand Crippled Children Society, through its national office and its 20 branches has been a long term advocate on behalf of people with disabilities. The Society formally initiated the production of both the 1971 and the 1985 Access Codes. They initiated the Barrier Free Programme and (along with the NZ Paraplegic and Physically Disabled Federation) have played a significant part in the work of the Regional Access Committees.

The Department of Social Welfare has also contributed to the success of disability advocacy. Head Office of the Department administers Section 25 of the DPCW Act and in this role has had to 'adjudicate' on many of the disputes over interpretation of the 'reasonable and adequate' requirement in the Act. Its Regional Offices have also provided supportive membership on the Local Access Committees.

In the current climate of decentralisation the challenge to all the disability advocacy groups will be to review their working relationships with their Local Authorities and Architects to ensure that the successes and progress achieved to date are consolidated.

Domestic Construction

In terms of accessible and intrinsically safe design, private housing is not under the same constraints as the rest of the building industry in New Zealand. Most private housing is constructed and sold as speculative investment by "Design and Build" companies often with little professionally qualified design input. The nature of domestic construction enables, and often demands, extensive user participation in a far more detailed way than is possible with big public building projects. In terms of universal usage of the built environment, there are paradoxes in the relationship between the highly 'professfionalised' public building process and the much 'freer' domestic construction industry. The wheelchair user, for example, can now independently negotiate the front entrance of most public buildings in New Zealand (provided the JOURNEY to the entrance, including vehicle access, is satisfactory). The same possibility however, would be available at only about 0.1% of private dwellings.

Building controls in New Zealand (particularly in the domestic sector) do not consider prevention of personal injury by accident or the maintenance of independence and good health as design issues. Designers in the building industry perceive need and demand for changes in design more from overseas glossy magazines and new product technologies than any sensitive investigation of user requirements.

Because of the effect of domestic injury on the community and the cost to the ACC and the health system (greater than the cost of road injury) the New Zealand Government has a legitimate interest in the problem. The Government responsibility to try to reduce the rate of home accidents is as valid as the responsibility it has already accepted, to try to reduce the rate of road accidents. The options available to the Government and its agencies to reduce home accidents are limited. There are four options for controlling the rate of road accidents:

1. monitoring road users through driver licensing selection and vehicle warrants of fitness.
2. conditioning the behaviour of road users through road code and public education programmes and policing (enforcement) procedures by the Ministry of Transport.
3. improving the design specifications for the vehicles themselves.
4. continually upgrading and maintaining the road user environment by resurfacing roads, restructuring dangerous intersections, regrading bends, installing motorway crash barriers and so on.

The first one of these options is obviously unacceptable in the home environment. Users cannot be selected—everyone has a basic right to choose where they live. Option two, direct behaviour control, cannot be applied in the home either. Public education programmes, to encourage safer behaviour, are expensive , require regular repetition to reinforce their message and are unreliable in effecting long term permanent change. Improving the quality of the user has ethical implications similar to the issue of selection. The cheapest and most reliable option left for Governments and their agencies committed to the longterm reduction of the home injury rate is design improvement of the environment in which those injuries occur—the house itself and its surroundings.

There are already many controls on the safety of building components and the individual appliances and fittings that go into the home but few that relate predictable behaviour in the home to its design and construction.

One UK study suggested that 8% of home accidents were caused directly by bad design.[12] However the same study identified other causes such as mental and physical function, faulty maintenance of buildings and fittings etc., which can all be improved by design aimed at preventing and reducing the likelihood of domestic injury by accident.

Analysis of ACC statistics on home accidents suggests that building design affects at least 50% of such accidents whether it generates hazardous activities (like high level house or roof painting or internal movement from one level to another), leads to mishaps that are unrelated to a specific activity (e.g., unintentional collisions with other people while carrying something) or incorporates dangerous fittings or substances into the home in such a way that they can exacerbate injury in the event of an accident (such as glazing at low levels).

CHAPTER 4
MARKETING INTRINSICALLY SAFE HOME DESIGN

Injury Statistics

During the year ended March 1988, 17% of all Accident Compensation Corporation payouts were for injury events which occurred in the domestic environment. This compared with 38% for work place injuries and 13% for road injury.[13]

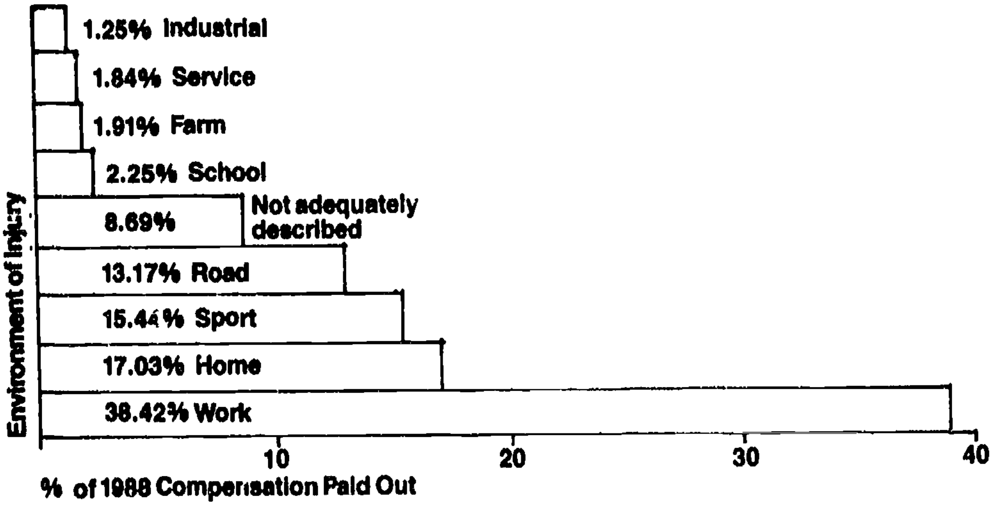

Figure 12. Table for environment of injury from ACC compensation payments in 1988

ACC statistical data reveal a figure of $NZ73,000,000 paid out in compensation for domestic injury during the year ended March 1988. However, ACC statistics are an extremely conservative estimate of the community cost of home injury. The compensation figure does not include the costs incurred for the first week of incapacity after the accident (for which the Corporation is not liable); medical treatment (for which the doctor is normally reimbursed direct); injury (including fatal injuries) to non-earners. This limitation applies to the major care giver in a family and especially to children and elderly people.[14]

Health Department statistics revealed that in 1983, 39% of all hospital admissions, including deaths, resulted from injuries which occur in and around the home.[15] Twenty percent of admissions were for treatment for road injury. If the average stay in hospital is multiplied by the number of admissions for treatment of home injury and that figure is multiplied by the cost of one "bed-day" it is possible to get an estimate of the identifiable health costs. It is extremely difficult to extract accurate data on these areas for one hospital, let alone the whole of the New Zealand Health System. Even if this were possible, the figures would not include the number of people treated as outpatients in emergency rooms.

Also, people who seek private treatment at private hospitals or with general practitioners, physiotherapists and other health professionals do not show in Health Department costs although some may be identified through ACC. Finally, there are no records of people who treat themselves for minor injuries like sprained ankles and cuts.

It is not possible to get accurate information on the overall cost to the New Zealand community of personal injury in the home—the inability to link between databases and the absence of any coordinated approach to the collection and presentation of data are the main obstacles. "Without the linkage exercise with other databases it is difficult to estimate reliably how many injury events occur to non-earners".[16] The author's (conservative) estimate of the community cost of home injury based on identifiable hospital costs, earnings compensation and private treatment is a figure of $NZ150,000,000 for 1988.

Groups Most at Risk

Everyone will benefit from intrinsically safer homes. As well as the potential reduction in health, insurance and compensation costs those groups most 'at risk' of injury in their home will enjoy a better quality of life.

During the life of a house it is certain that it will be used by the complete age range of the population either as owners or visitors. It is also to be expected that during the life of the house someone with a disability will appear as a potential user (as a visitor or a buyer). Homes which do not consider 'at risk' groups in their original design and construction will limit their potential resale market.

Examining ACC claimants who had an accident at home in 1988 shows that 62% were aged 20 to 59. This percentage is greater than the proportion of the total population in the 20 to 59 age bracket. It reflects the fact that most compensation paid is earnings related and this is the principal earner's age bracket. Women are grossly under-represented in this group.

Fatal accidents reported to ACC present a different picture. Here it is the very young and elderly people who are over-represented. Children under the age or four account for 11% of fatal home accidents but are only 7% of the population. People 60 years and over have 33% of all fatal home accidents but represent only 17% of the population. ACC data on home fatalities in these age groups still gives a very conservative picture because of its earnings-related base.

The likelihood of injury at home is much greater and the consequences far more severe for the over 60 age group. The healing process is slower and longer periods of recuperation are required. Minor falls, scalds or cuts can turn an independent older person with a good quality of life into a long-term hospital patient quite often because the design of the living environment lacks any thought about preventive (or rehabilitative) measures.

"For the elderly, good housing is preventive medecine. Housing affects health directly by providing adequate shelter and warmth, and it also affects health indirectly by affecting the occupant's level of morale. Low morale makes a person less resistant to disease and can accelerate a degenerative condition. Level of morale is itself affected by the old person's ability to continue living an independent and useful life. The rooms and layout of the old person's dwelling can make this a possibility or an impossibility, depending on how they are designed."[17]

Demographic projections highlight the proportionate growth of an aging population. Currently about 18% of the New Zealand population is over 60. By the year 2020 it is estimated that this group will comprise about 23% of the total population.

The housing industry is not responding adequately to the needs of this growing market. Retirement villages and infill housing are currently popular corporate investments but the design of these developments does not meet the needs of this client group. Retirement housing tends to be built in clusters, on level sites with low cost, small floor area standard design. The only concessions to the occupier's age are the level (and small) site, low maintenance building materials and a location close to services. While these concessions have a benefical preventive impact they fail to address the design of the dwelling itself. To acheive intrinsically safe housing requires considerable attention to detail so that the adverse elements of design can be id[illegible] nd eliminated. Improved design form in relation to evaluated us[illegible] is the appropriate procedure to follow in meeting this require[illegible]

Hazardous Behaviours and Their Consequences

Some activities in and around the home are more dangerous than others. ACC statistics list the activity being carried out at the time of the injury event, what went wrong, what actually caused the injury and the medical condition that resulted.

In the year ended March 1988, 43% of all compensation paid for home injury sourced *walking and running, lifting and lowering and ascending or descending* (in that order) as the three potentially most dangerous activities.

The original activity leads to a subsequent action which is the immediate cause of the injury event. *Slips, trips and stumbles* along with carrying and stretching are the immediate causitive actions which are responsible for 49% of home injury compensation.

Following the immediate action, there is contact with a harm agent. The data here identifies, *contact with the ground, floor or some object* as the the general harm agents for which 50% of compensation is paid.

Sprains, strains and fractures are the medically diagnosed conditions for which 63% of all payouts are made. *Backs* are by far the most affected part of the body with 24%.

Danger Areas in the Home

ACC data also identify the most common specific harm agents as *path and ground* (11%) and *steps and stairs* (9%). Two other significant categories *are collisions with other people* (7%) and a group of agents which are *not classifiable* (9%).

Data on location of home accidents comes from G.P. treatments and so is based on less severe injuries. Periodically, ACC survey G.P. treated accidents and this information supported by detailed analysis from the UK[18] provide a picture of the areas and fittings involved in most home accidents.

British data suggests that *the bedroom* is the most common location for accidents in the home although it indicates that their severity, in terms of hospital treatment required, is much less than for other areas of the home. Injuries here include falls, poisonings and back injuries. It is to be expected that bedroom accidents feature so highly in the UK because the two storey home building style always places the bedrooms upstairs.

The location of most serious home accidents is the *KITCHEN* where falls, cuts, burns, scalds, back injuries and child poisonings occur frequently. Most household fires start in the kitchen. Predictably, adult women have most of the kitchen accidents and many children are also injured there.

The *living/dining room* is the next most dangerous space. Accidents associated with living rooms also include falls, fires and collisions with glass patio doors. Relatively few living area accidents happen to adults under 64, but there is a high rate among children and elderly people. The position of living areas in the statistics is probably a consequence of the amount of waking time spent there rather than of any high risk associated with this space.

Bathroom and WC's however are high risk areas in relation to the limited amount of time people spend in them. 18% of indoor accidents occur in the bathroom and WC (compared with 20% for the living room). They result in more serious injury (about 25% of falls in the bathroom by elderly people result in fractures with serious consequences) because they are confined spaces with wet slippery surfaces and plenty of hard contact edges. Hot water in confined areas results in many scalds and baths are often the scene of child drownings.

Stairway accidents feature prominantly in UK statistics[19] (again, because of the two storey style of most UK homes). They are less significant in New Zealand. The incidence of stairway injuries is of major concern because steps and stairs often occupy a large part of the floor area of homes (and consume much design time) yet so little time is actually spent using, and on, them.

Steps and stairs are intrinsically dangerous. The ACC 1988 data reveals that steps and stairs are the area of the home with the highest number of compensated accidents that can be directly related to architectural fittings and techniques.

Other general features and fittings that have significant accident prevention implications and require special attention include glass, doors, baths and showers, balconies, heating and water heating.

Design Solutions: Techniques and Guidelines

General Planning. The process described below begins at the initial design planning phase for a *new* home. The detailed case study in the next section can be used as an example for the renewal of existing houses. The four basic planning requirements are:

1. *Plan for User Participation at All Stages.* From the outset the user must participate in decisions about future usage. The designer needs regular personal contact with people who will use the building (owner, tenant and user representative) when it is completed. Technically competent advocates from a user group should be included throughout the process.

2. *Consider the Whole Site.* Initial decisions about the house structure and its positioning on the site will determine how intrinsically safe it will be.

The JOURNEY linkages amongst the exterior domestic environment (public areas, pavement and street), the vehicle access (garage, carport) and the building (the home, with its interior circulation patterns) should be identified before any developed design or construction commences.

Because falls of various types make up such a large proportion of home accidents (49% of more serious accidents) the safest houses are those on one level, on concrete slab foundations, without entry steps. No steps between vehicle set down point (garage or carport) and home entrances will reduce the potential for trips and falls while carrying material to and from the garage (vehicle) and the interior of the house. Level, internal garage access is the ideal provision.

3. *Anticipate a Wide Range of Personal Factors and Behaviours.* These will influence usage patterns of the home and its surroundings. All potential users (ideally everyone) must be 'planned-in' for the life time of the house recognising that the majority of home accidents will be associated with illness among older people, children playing over-vigorously, tiredness and and drunkeness amongst adults.

4. *Use Passive Design for Safety.* Active safety measures like safety plugs for electric sockets to prevent children from electrocuting themselves, or jug holders to prevent toddlers from pulling jugs over may be necessary to improve safety in *an exsisting home*. However these measures require a conscious effort by the user to behave safely. Passive safety measures are the most effective as they do not require any extra user effort to behave safely. Better solutions are electric socket outlets with safety shutters to prevent unintentional insertion of any object. Also, a bench layout with sockets located out of children's reach, shortened jug cords and a kitchen layout which can exclude the toddler from the kitchen space are cheap measures *if designed* into the house *from the start*. Alterations involve extra costs which a family may be unwilling to meet.

Another example illustrating passive design for safety in the provision of kitchen storage is the design of cupboards. Their positioning, height and depth can eliminate user need to engage in the three most dangerous behaviours:

- *Stooping and bending* to use storage that is too low for convenience is the major cause of back injuries.

- *Climbing and reaching* on step stools, chairs or drawers when trying to look into or reach shelving above eye level is the behaviour most likely to result in a fall.

• *Working at a cluttered worktop* which has insufficient storage for utensils, tools and ingredients is an indirect cause of many cuts and burns. Adequate length cupboards and shelving should be supplied at a level (no higher than eye level), where they can easily be reached without bending or stooping. High level storage should not be provided and cupboard tops should be sloped so that it is impossible to use them as shelves.

Steps and Stairs: A Case Study for Intrinsically Safe Design Techniques

Steps are intrinsically dangerous. The significance of steps in the accident statistics makes them a very good example to illustrate techniques the designer will use to meet the four basic planning requirements for creating intrinsically safer houses.

During the life of a set of steps or stairs people will stumble, trip and fall down them many times. There is a 1 in 6 chance that someone will be seriously injured on a set of steps or stairs during the life of a house.

Although there are many reasons why people fall on steps, an estimated 25% of these falls occur because of the stairs themselves.[20]

User Considerations

Designers need to allow for the physical and mental capabilities of all those who might use the stairs.

Elderly people have difficulty climbing stairs. Frailty, age, decreased mobility, diminished eyesight, slower thinking and reaction times, poor balance and lessened circulation are all factors which can lead to confusion. An overabundance of visual signals at any one time (especially when using stairs) must be avoided. Brittle bones and slow healing processes amongst old people mean that injuries they receive on stairs are very severe. The implications for intrinsically safe design of housing which old people will use (Notably Retirement Village Developments) are clear: Single storey facilities with no exterior or interior steps and stairs should be built.

Children from 12 months to 4 years old regard stairs as a challenging and interesting place to play. From 7 months to over 2 years a child is not agile enough to be left alone on a set of stairs which should be shut off from them. From about 2 years to 4 years old the child will be a skillful user of stairs encouraged by an active curiosity and confident exuberance with little appreciation of the potential dangers. Children climbing on and through balustrades and running up and down stairs risk falling. It must be possible to fence off the top and bottom of stairways. Railings and balustrades must be detailed so that children cannot squeeze through or climb on them.

How Behaviour and Environment Interact

An analysis of why fit adults still have falls on interior stairs shows how behaviour and environment interact to cause accidents. This suggests ways of environmental modification (using passive design for safety) which can minimize this type of accident.

The ten most common types of stair accidents to adults[21] are listed in order below with their associated behaviour and design guidelines.

- *19%* occur when adult women in a hurry, old people with poor eyesight, or people under the influence of alcohol misjudging tread lengths when descending, overstep the nosing and fall, resulting in limb injuries. *Design lighting so that it is cast directly onto the stairs* with no shadows parallel to the nosings. Nosings must contrast in colour with their surroundings.

- *10.9%* occur when women carrying children, groceries or other burdens descending the stairs with their view obstructed or in the dark because they were unable to operate the light switch, overstep the nosing and the fall causing fractures to the lower arm, back of skull or ankle. *Switches* should be easy to operate (with rocker plates) and the length of *tread* should be adequate.

- *9%* occur when adult women catching the heel of high heeled shoes when descending. Results in a forward fall because of an altered or awkward gait as the leg swings. *Stair angles should be in the range 16°-32°.* Outside of this range will induce an awkward gait.

- *6.5%* occur when people descending the stairs in the dark because they can't locate the light switch or the light bulb has burnt out, misjudge the tread length, fail to grasp the handrail and a fall results This often occurs when the person is on an unfamiliar stairway. *Light switches should be two-way with neon location indicators.* Multiple light sources rather than a single fitting mean that bulbs can be more easily replaced.

- *6% to 5%* occur when carpet movement when the descending foot is placed too close to a nosing. *Covering materials must be firmly secured and non-slip.*

- *5.7%* occur when overbalancing and failing to locate the handrail because it is too close to the wall or too large to grip or not there at all. *Handrails,* about 50mm diameter and with 60mm clearance from any wall *must be securely fixed and available on both sides of the stairway.*

• 5% occur when a stair user's line of sight is distracted by an object, a view or an activity either directly ahead or adjacent to the stairway. Foot movement is disrupted and a fall results. *Do not locate mirrors, windows or pictures in positions that will distract the stair user.*

• 4.2% occur when treads are too shallow to accommodate the length of the foot or footwear causing the user to overstep, twist and overbalance-with a consequent fall. *Treads must be over 275mm long.*

• 3.8% occur when the user misjudges the step and falls because the set of stairs has irregular risers or treads. *Treads and risers must be accurate to 6mm. Winders should never be used.*

• 2.9% occur when over or under-stepping the first riser on flights of only two steps results in a fall. *Stairs should be grouped in flights of three or more* otherwise the change in level should be ramped. Cues to the existence of stairs can be provided by handrails, lighting or colour changes.

Even the best designed stair will still have a high accident potential. Obviously to eliminate steps wherever possible is the most effective way to minimise these accidents.

Where stairs are required, better design is essential to eliminate as many primary risks as possible and also to achieve secondary safety by ameliorating the immediate impact of any fall. This means keeping flights of stairs short and consistent, using landings liberally, and making sure there are no harm agents like windows, fires or furniture close to the foot of the flight.

The planning approach and procedures used in this stair section (identifying specific behaviors and their preventive design solutions) should be followed when renovating any major accident location in an existing home environment. There is *no reason* why any new home can not be made intrinsically safe using these procedures.

Successful Programmes and Promotions

Whenever new legislation or regulations are introduced they will be more readily incorporated into current design practice if the target practioner groups are made aware of the need and the rationale behind their introduction. In other words, new design requirements (mandatory or voluntary) must be 'sold' to the designers if they are to acheive the intended changes with as little unecessary delay as possible.

It has been identified earlier in this document that existing legislation and regulation can be ignored by the designer when there is no education or awareness support programme to assist with implementation. In the case of access provision for people with disabilities the most rapid advances were made in New Zealand (following the introduction of the first and second Access Codes and the DPCW Act) when promotion and training sessions were mounted as a complement to the change.

Barrier Free Programme

The Barrier Free programme was initiated and coordinated by the New Zealand Crippled Children Society. It was launched in 1979 with financial and personnel support from the Department of Social Welfare and the Ministry of Works and Development.

The programme adopted a 'commonweal'* philosophy of environmental design for community need. It incorporated the legislation and the Access Code as a planning base and pursued a clear strategy of integrating specialist environmental design needs into a Macro approach for universal usage. The philosophy, related environmental design requirements for people with a wide variety of disabilities to the overall enhancement of community life.

"The purpose of the Barrier Free programme is to remind designers that everyone wants to go to school and get into the classroom, to work and get into the toilet cubicle, to the local pub and buy a glass of beer, to the savings bank and be able to reach the counter, to the cinema to watch a movie, to the motel for a holiday and get into the shower. It is not about hospital design, aids and appliances and extra-ordinary house alterations."[22]

The programme fulfilled a promotional and technical information provision role bridging the gap between the specialist rights and requirements by law and the needs of and benefits for all users of the community environment.

It targeted architects, building inspectors, education institutions and the general public. Promotional and technical publications were produced with emphasis on *quality* presentation of text, diagrams and photography. A series of 20 pamphlets, a movie and a poster series comprised the original resource material for the first nationwide promotion during 1979.

The objective of this phase was to increase awareness about the need for architectural accessibility and to publicise existing standards and resources to architects and community groups. A bold visual layout with much

*'Commonweal' is a word coined to describe a universal planning approach based on specialist provision for minority need.

original cartoon work was planned as a promotional technique. The acheivements and character of the programme can be directly attributed to the thorough planning and sense of humour which was the basis for initiating and implementing the programme.

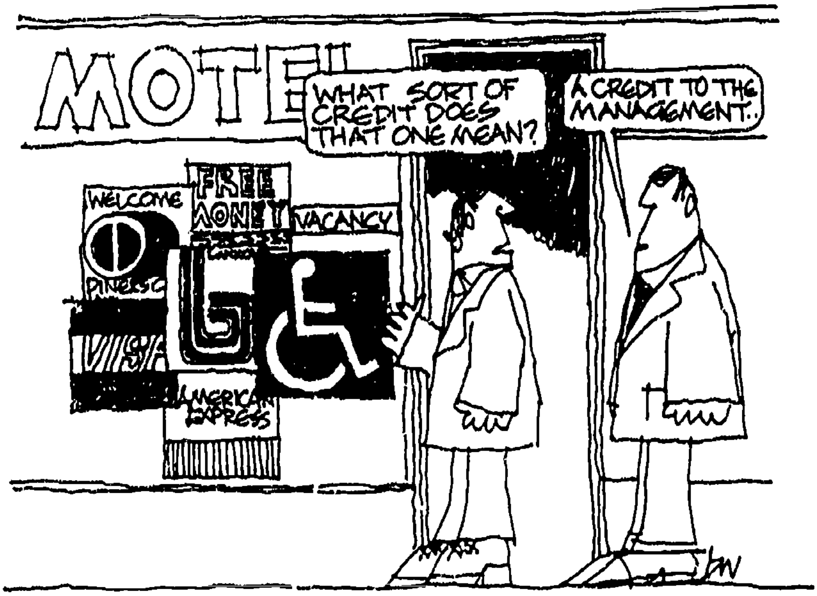

Figure 13. Example of effective humour used in the Barrier Free Programme. Cartoon by Chris Brooke-White.

Five design award competitions run from 1977 to 1985 in association with the NZ Institute of Architects identified buildings, of high architectural merit, which most sensitively incorporated the requirements for access by disabled people.

The second phase of the Barrier Free programme was directed at providing technical information to designers and builders primarily for housing and accommodation. A second series of pamphlets on Barrier Free Housing, another movie, and more posters were produced for the nationwide promotions in 1982 and 1985. Workshops and training sessions during these promotions attracted much local radio and newspaper interest.

Although the Barrier Free programme has drawn heavily on research material and legislative precedent especially from Great Britain, USA and Australia its approach has always been to tailor that information to New Zealand cultural and construction traditions in a practical and detailed way so that the principles of accessible design become simple, comprehensible and easy to implement.

Safe House

The Safe House Design Concept developed out of the second phase of the Barrier Free programme. During 1981 with a grant from the Department of Social Welfare the Barrier Free programme set up a pilot home alterations scheme. In 1982 an Accessible Display Home targeted at the older aged home buyer was successfully presented in a cooperative project between the largest home building company in New Zealand, Fletcher Residential Limited, and the New Zealand Crippled Children Society.

In 1984 the Accident Compensation Corporation approved a five year base funding grant for the Barrier Free programme to develop the area of housing design. A series of pamphlets on Barrier Free Housing Design were produced and the design principles in them were then refined to

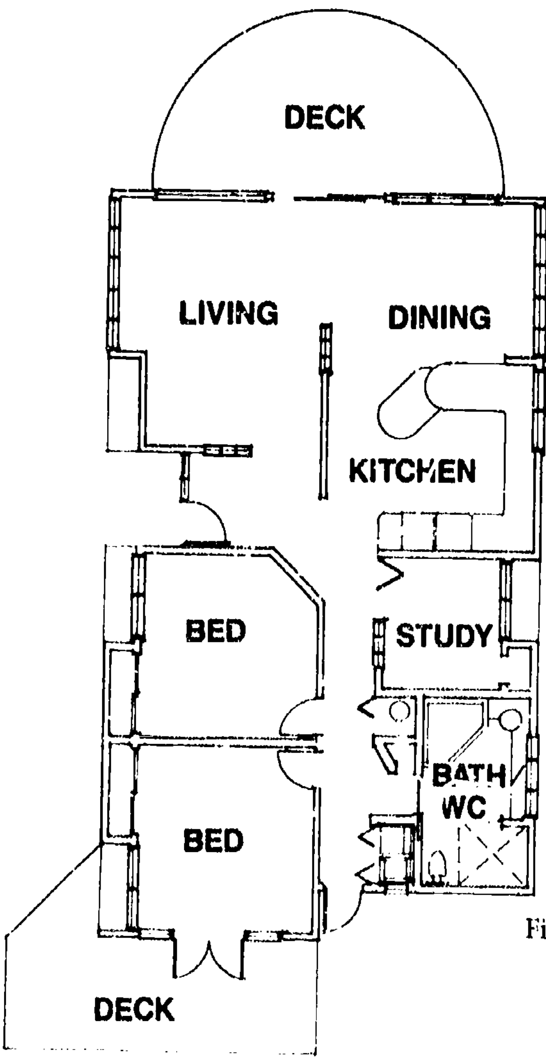

Figure 14. Floor plan of the Safe House '88 Display Home presented by Marshall Homes at the Auckland Home Show, September 1988

highlight their preventive qualities. The rehabilitative features of Barrier Free housing were absorbed under the philosophy of universal usage and repackaged as a set of preventive design guidelines and details for reducing personal injury by accident in the home. The package emphasised intrinsically safe design of the structure through a combination of design techniques to remove architectural barriers and improve fire safety and security.

In 1986 the Safe House Campaign was launched by the Minister of Housing. A seminar series and an annual Display Home at the Auckland Home Show (in 1986, 1987 and 1988) have spawned several new companies now marketing the Safe House principles as part of their design services. The Standards Association of New Zealand have also begun drafting a set of guidelines on Intrinsic Design for Safety in New Zealand Dwellings.

The Cost of Safe and Accessible Design

The question most often asked in the marketing of intrinsically safe design is how much extra does it cost. To begin the answer it is necessary to dispell the often stated belief that creating intrinsically safe and accessible environments is costly. Barrier Free design with its detail of provision for people with disabilities can be implemented for "some additional cost which generally amounts to less than 1% of the total cost of construction".[23]23 The survey which produced this finding was done by the US Department of Housing and Urban Development using a range of nine building types and found that the percentage cost increases ranged from 0.01% to 15%. The requirement for a lift in one particular building accounted for the 15% cost but this was still not enough to produce an average extra cost greater than 1%. The Australian Uniform Building Regulations Coordinating Council has produced almost identical findings. The Swedish Council of Building Research[24] has done similar work on the costs of disabling environments.

From the H.U.D. study an extra cost of 3% was identified for including accessibility in a private home. Marshall Homes, the New Zealand housing construction company most experienced in the field of 'Safe' home building estimate a similar cost for incorporating intrinsic safety into a home. The cost will vary according to the level of provision chosen from the appendicised guidelines.

For new projects, when the design brief specifies intrinsically safe and accessible requirements, the exercise to identify extra costings will usually be more expensive than the design time required to include them.

CHAPTER 5
LOOKING AHEAD

The concept and the planning approach, introduced in this document, for creating intrinsically safe environments presents a range of subject areas which need closer investigation. In this final section four major areas are identified for future research and development with suggested guidelines for action.

Impact of Access Legislation and Codes

It is vital that international communication and exchange of information in this field is improved. The variation in levels of legislative requirements and enforcement procedures, across countries, shows that some nations are extremely well advanced while others have made little progress towards securing and implementing access rights for people with disabilities. The variance between nations requires an instrument for measuring the progress achieved. Such an instrument must be applicable to any nation regardless of the stage they have reached and it must anticipate a cultural bias where this could have either a detrimental or beneficial effect on progress.

If we look at countries which have made good progress we see clear evidence of a regular pattern of necessary stages, each with achievable steps that can be used to measure improvement. In sequence they are:

1. *The formation of an interested lobby group.* This must happen to bring an enthusiasm, establish direction and to articulate need at a stage where no recognition or provision has been considered. This group should be led by people with disabilities, however the political environment in this early phase may mean that an able bodied advocate takes a leading initiative.

2. *The securing of a voluntary set of Code Guidelines.* In any nation the recognised agency for producing national standards must be given this responsibility. The organisation which is affiliated to the ISC (International Standards Organisation) will best perform this task. At this point visible progress will begin. The next task is to make the voluntary guidelines mandatory.

3. *The passing of National Legislation.* National legislation is most effective. It should set minimum requirements to provide access to all new public

buildings and may cite the earlier code as a means of complying with the legislation. The significance of national legislation is that it should provide a base starting point from which any local, regional or state legislation and building regulations are governed and directed—no region should be able to implement provision which is less than the national legislative requirement. The legislation itself should be administered by a sector of the government public service operation with an environmental or public works responsibility although other areas have been used successfully in the past. Efforts to introduce legislation will be supported by the predictable failure, under the voluntary climate, for any substantial progress to be made. Again it is vital that informed, professionally trained people with disabilities participate in the drafting process.

4. *Establish an Education and Awareness Programme.* It is necessary to initiate an education and publicity programme with a technical support base to articulate need, produce practical solutions, and to complement the legislation and assist the professional practitioners and policy implementers. This activity should commence at the same time as legislation is passed. It should be sustained for as long as possible (at least until widespread implementation is acheived) with consistent innovative co-ordination at a national level. This programme must adopt the *Macro* approach to environmental design so that the advantages to the whole community are highlighted as the philosophical base.

5. *Institute Practical Enforcement Procedures.* In most cases enforcement procedures must target the local processes for issuing new plans or permit approvals (including government buildings) and must have national legislative back-up. A monitoring or *'watchdog' disability group* is the other vital component for good enforcement. Such a group requires a nationally co-ordinated and locally active network structure and a secure long term commitment.

6. *Redraft original voluntary code guidelines.* At this stage in the process a new Access Code will be required to fill the gaps in the original document (by now about 15 years old). The new guidelines are vital at this stage to ensure that enforcement procedures are provided with clear direction and implemented as smoothly as possible. This document *must* be clear, direct and well presented so that it is used regularly and easily by the architect, engineer and building inspector.

7. *Identify Evaluation and Measurement Procedures.* The sequence of steps described above is a slow process which can take from 15 to 25 years to work through. Obviously the passing of laws and the publishing of codes are identifiable milestones but the real measure of increase in community accessibility (i.e., more usable facilities) requires an evaluation instrument.

Measuring implementation becomes more difficult in the later stages of the process. As significant advances are made evaluation becomes more difficult but no less important.

A random sampling of permit approvals across a range of building types with a simple building survey follow-up is the best way to proceed at a local level. This should be done at regular intervals up to five years apart.

International comparisons of progress could be measured by an instrument which checks the stages described in the process above across a range of national variations.

Throughout the process there must be a number of professionally competent people with disabilities who form a continuous core of expertise and performance and involve in the planning and direction of the whole area.

Real Community Cost of Domestic Injury.

The authors suspect that much of the data required to identify the above is available. However it is difficult to access and the research process required to extract it is unnecessarily complicated and time consuming because of the disparate, obscure and unrelated databases. There is little interdepartmental linking and no co-ordination for the collection and presentation of information.

A study to estimate or reveal the cost of domestic injury and to bring related but fragmented data together would coordinate the accumulation of departmental, private company and individual payouts for health costs, earnings compensation and welfare support and insurance claims.

G.P. returns, accident and emergency statistics hospital bed usage, ACC payouts, insurance company payouts for personal and property damage (where it is relevant) would provide the basic data required. Additional costs should include estimates of police, ambulance and fire service call out for domestic injury, and should include individual health treatment payouts.

Examination of Domestic Injury Events to More Clearly Identify the Scene and Causes

Although ACC data identifies behaviour, activity, injury scene and resulting medical condition for every injury event, it is still not possible to relate what really happened in the episode directly to the design and construction of specific areas of the home.

Published statistics on domestic accidents provide useful quantative information about where they occur and what activities and fittings they relate to. A more detailed breakdown of these statistics will reveal which areas of conventional design need closer attention to improve intrinsic design for safety.

The shortage of qualitative research relating injury producing behaviour to domestic design means it is too often impossible to locate the initial agent and the harm agent in the layout of the rest of the home.

An examination of coroners' reports would provide detailed descriptions of the morphology of the accident not available from other sources. The study would require a review of coroners' reports over a three year period. This would identify patterns and enable applications of the anecdotal material in the reports to typical domestic situations to see how design may have helped to prevent either the accident or the injury.

As well as accidents causing death, those resulting in serious injury or with the potential to seriously injure require equal investigation. There is no anecdotal detail in a form available for a researcher to do this.

The study to produce this information would need to survey people who have had domestic accidents over a given period. The investigation of each injury event would enable a clear set of conclusions to be drawn.

Post-Occupancy Evaluations

There are a number of New Zealand homes that have been designed and built to minimise potential domestic accidents. There are also many homes, designed for people with disabilities, which now have able bodied occupants. Post—occupancy evaluation of these houses would give an indication of the areas requiring concentrated design attention for prevention of personal injury by accident. The technique used here could also be refined to correlate the findings from the previous section.

The practical outcome of the above sequence of future investigations should be the production of a Design Guide for domestic safety capable of being used and tested. It would provide guidance from the literature and a sound understanding of the aspects of design that contribute to accidents in the home. The problems identified would generate a set of practical design solutions for use by the designer and builder.

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U.S. COMMENTARIES ON FROM BARRIER FREE TO SAFE ENVIRONMENTS: THE NEW ZEALAND EXPERIENCE

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THE NEW YORK EXPERIENCE

It was with great excitement and enthusiasm that I read Wrightson and Pope's monograph. Here is a way of thinking about our built environment which we have hinted at but never fully conceptualized. In developing the accessibility features which have been a part of the New York State Uniform Fire Prevention and Building Code since 1984 we tried to expand the population who would benefit from a barrier free environment. We spoke in vague terms about "universal design" but never developed it into the concept that an accessible environment is an intrinsically safe one.

New York State has one of the most comprehensive building codes in the United States relating to accessibility and adaptability. In new multi-family housing (3 or more apartments), if the building has an elevator, 100% of the apartments have to meet the following design specifications. If there is no elevator, then 25% have to comply. The requirements are the same for substantial renovation of a building, additions or change of occupancy classification. In general terms that means there must be a barrier free route from the street into the building and to all the public areas of the building. That route must extend to each adaptable apartment. All doors within the unit must have at least a 32" clearance.

In the bathroom the walls next to the water closet and tub and/or shower must be reinforced to allow for the later installation of grab bars if the tenant so desires (at the tenant's expense). If there is a cabinet under the sink it must be removable to allow someone with a wheelchair to approach. In the kitchen, the sink and a 30" section of counter top must be adjustable in height from 28" to 36" or set at 34" from the floor to the counter top. Maneuvering space in kitchen and bathroom is required. Access to usable restroom facilities are also mandatory in buildings of general construction such as offices, stores, factories etc. The American National Standards Institute (ANSI) 1986 specifications for making buildings accessible are referenced as the design criteria to be used.

The law is excellent in the scope of its requirements but unfortunately compliance has been spotty at best. Developers tend to think in terms of access as a special amenity for people who are disabled and not in terms of improved safety for everyone. Wrightson and Pope are right in proposing that "the challenge of the Macro approach is to condition public demand to accept a 'changed' design as normal and desirable on both functional and aesthetic grounds". The Macro ideology proposes that the environment be built in such a way as to promote safety and prevent injury for *everyone*. In our training programs for architects, building inspectors, government officials and others we have stressed sensitivity to and understanding of the needs of people with disabilities along with the specifics on the code. Following the model presented here, we have to change our approach to look at a safer, more risk-free environment for everyone.

An example of this is ramps that are installed for access to a building. It has been my experience that once the ramp is there, most people entering the building tend to use the ramp and avoid the steps. The ramp is not only safer but its also the preferred choice.

The federal government has recently passed the Fair Housing Amendments Act of 1988. This requires certain accessibility and adaptability features in all new multiple family dwellings (4 or more units). It applies to 100% of the apartments in elevator buildings and the ground floor apartments in non-elevator buildings. In 1991, access to new housing will be a national requirement. Resistance by architects and developers is already apparent. Using the Macro concept we could begin to encourage compliance. America has become a very litigious society and built-in safety features are strong selling points. Technology to improve user safety is growing. The American Home Builders Association is developing a model of a "Smart House" which incorporates many safety designs such as appliances which turn themselves off when not in use and sensors in the halls and stairs to automatically turn lights on when someone is walking there. One prototype included accessibility features.

In a similar procedure to New Zealand, New York State requires that before construction of a building can begin, a work permit must be issued. In order to obtain this, the plans must be reviewed by the building inspector who determines that all applicable code requirements are being met. This includes access. Throughout the state, enforcement depends on the building inspector. If the required standards are not in the plans, the builder can either amend the plans to correct the deficiency or apply to the Department of State (DOS) for a waiver. The DOS has Regional Boards of Review which hold hearings to review the issues. The Boards can grant waivers if they feel there is sufficient justification. Initially, the major request for a waiver related to accessibility. Since the code has been amended to exclude access to the upper and lower levels of small buildings, the number of petitions concerning access has dropped markedly. This is also partly due to increased understanding by architects of what accessibility means.

Last year the Eastern Paralyzed Veterans Association, the New York State Association of Architects and the New York State Office of Advocate for the Disabled jointly sponsored a competition for architecture students to design a six-story multi-family residence that would be accessible to everyone. The goal was to increase their awareness of the people who would use the building. Schools of architecture tend to teach creative thinking and not code. Here they were required to combine both.

Generally, consumer involvement in the design process in minimal. Via the 34 Independent Living Centers (consumer controlled, non-residential organizations which assist people with disabilities to live independently in the community) in New York State we have begun to increase the involvement of people with disabilities particularly at the Board of Review level. Several centers have now begun to work with developers and architects to insure that accessibility is incorporated as an integral part of the project and not added as an afterthought. This is a slow process which often meets with resistance. Architects have tended to see accessibility as an unnecessary, specialized feature.

The slightly increased cost of construction of adaptable housing is often presented to advocates of barrier free design as a reason against accessibility. We are told that whatever the cost it cannot be justified by the few people in wheelchairs who would use the premises. Advocates have to change their approach and stress that improved safety features benefit *everyone* and not just wheelchair users.

New York City, which is exempted from the state building code, passed legislation in 1987 which mandated accessibility provisions similar to those in the state code. They have set up an on-going committee of city officials, consumers, architects, and representatives from the construction industry to improve the industry's understanding of what is required and to resolve conflicts which may arise. It does not review situations on a case by case basis but looks at the broader issues. The committee was organized by the Mayor's Office for the Handicapped which was instrumental in getting the accessibility code enacted. They have also an intensive training program for the building inspectors. Resentment by architects and builders is high. They have not developed their thinking to encompass the Macro approach.

The challenge is definitely to change people's thinking. If we can get developers and others involved in construction to broaden their thinking to a safer, more universal design concept, then we will achieve success.

Wrightson and Pope refer to the interdependence of the transport system, public or open spaces and buildings. One cannot begin a JOURNEY without a means of transportation. In the United States there has been a strong movement by advocates for accessible public transportation. In New York City a multi-modal accessible transportation system is being developed. All buses purchased over the last several years have wheelchair accessible lifts. As of now, over 75% are accessible. The United States Circuit Court of Appeals has just ruled that all buses purchased with federal funds must be accessible. This will greatly increase access to affordable, low cost transportation for people with disabilities.

Access to certain key subway stations is being included in renovation plans. The two stations in Manhattan which have completed renovations, link with three new stations in Queens to provide the first accessible inter-borough subway connection. Elevators with proper security facilitate use of the system. A limited door-to-door paratransit service is in the final planning stage. It will serve people too severely disabled to use public transit. Similar accessibility plans are underway in other cities in New York State and throughout the country. Without accessible transportation people with disabilities cannot be intergrated into society. The bus lifts, if utilized fully could benefit people with baby strollers, the elderly and many others. Ideally, if a low floor, ramp equipped vehicle can be designed that is strong enough to withstand pot-holed streets, that would be the safest vehicle for everyone.

Curb ramps are now required at every new or reconstructed curb at corners or crosswalks. Whenever a street is repaved a curb ramp is included. This has been a slow process and much needs to be done. Certainly curb ramps are safer and easier for most people. Standardization of design type and texturing would assist people who are blind to recognize the curb ramp.

The New Zealand Experience has challenged me to expand my approach to the issue of accessibility. We must educate society to the fact that what is essential for those of us who use wheelchairs is actually safer and thus beneficial to society as a whole.

Julia Schechter
New York, April 1989

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PRIORITIES, VALUES AND ATTITUDES OF SOCIETY

Wrightson & Pope have put together a monograph which is impressive for its comprehensive approach and timely presentation. Without doubt the message is clear. We need to develop barrier free and safe environments. And indeed we need to work for appropriate and effective design solutions in our built environment to satisfy not just the needs of people with disabilities and elderly persons, but the needs of all.

This monograph helps bring some clarity to the task at hand by laying before us the issues, the problems, and a range of solutions and reasonable directions to be taken. There are many paths of action. These include developing design standards and guidelines, increasing the public awareness, forming advocacy groups, creating educational programs for designers and users, establishing codes and legislation, instituting regulatory enforcement procedures, analyzing causes of accidents, maintaining a statistical data base on accident events, making post-occupancy evaluations and maintaining international contact for communication and exchange of information. All of the above have been well identified, referenced and detailed in this very valuable document, which should serve as a vehicle for international application and benefit.

But, if we are truly to achieve the goal of safe environments, I believe more thought and understanding needs to be given to the role that values and attitudes of people, and of society as a whole, play in effecting change. Perhaps, if we desire a rapid improvement in the way we view the importance of environment to our health and well being, then we need to deal with the issue of values and attitudes first, before we can hope to achieve any dynamic and meaningful change.

Such change involves the way we look at our environment, understand our environment, and value our environment. People are creatures of habit tending to follow custom and fashion. Public and individual perceptions are being formed by advertising and media hype to create fantasy and image. A sense of efficacy and self-esteem, more likely than not, is based on the concern of what a neighbor may think, or how one is perceived by others, and so on. There seems to be a massive insecurity amongst us, a fear of change, and a fear of life, because in a manner, life is change. Most people don't want to risk their future. They want to maintain their sense of security by staying with what they already have, rather than to expose themselves to possible error, financial loss or embarrassment.

Perhaps it is a false sense of security that people hold on to and value the most. By not making a change or trying new approaches or new ideas they reduce their chance of failure, but as well, they unfortunately reduce their chance for success and for a potentially better quality of life. Take the example of the elderly person almost recovered from a hip fracture, who is provided a "walker" by the nursing staff on her release home. She uses the aid for one day, and hides it in the closet so her friends will not see she is dependent upon an assistive device. But alas, she later slips in her hallway, and goes back to the hospital for a long period of treatment at greater cost to herself and the community.

Or consider the example of the middle aged couple with an elderly father who is in good health, but is experiencing some mobility problems. By installing a stair lift to the second floor bedroom level, they could maintain him at home. But "the lift looks institutional, it may be time for us to put Dad into a rest home." But alas, they end up taking away Dad's independence and spending more either in out-of-pocket expenses or in taxes, than would have been expended in creating an enabling home environment.

Perhaps I'm mistaken. Maybe it is the local builder who is afraid of change and potential financial loss and finds himself unwilling to put into a new house he is constructing, a universally designed bathroom or kitchen because it is different than what the public is familiar with, and he is unsure that it will be accepted in the marketplace.

But this issue of values and attitudes goes beyond. It involves our governments, our bankers, our investors, who frequently seem focused on cost, rather than on total return. The short term benefit is on how much money can be saved and how much can be made. Few developers look at the benefit beyond the immediate monetary return. And by this I mean, the intrinsic benefit to the user of a new product, or of a new building environment. It should include how it enhances and improves the users quality of life, the users health and safety and access, and in addition, the community's long-term well being. The long term benefit to the building investors is in the reduced cost of maintenance and insurance premiums, in cost of operation and the benefit of user appreciation and enhanced owner reputation.

When the public and private sector perceive, that by applying the notion of universal design to their living and working spaces, that by investing in barrier free and safe environments, they will reduce their overall costs and tax burden; they will reduce their illnesses and disabilities; they will improve their quality of life, then, and only then, will they begin to accept the change we are advocating. One could say, there is no free ride. Society pays for everything, in one way or another. So if we neglect the provision of barrier free and safe environments, we generally end up paying for rehabilitation, or more costly care later.

This monograph is a commendable effort. It is filled with sound research, with both discouraging and encouraging reports, with facts and figures and some compelling evidence on the need for change. There are solid recommendations and practical guidelines to support this effort in creating enabling environments.

The variety of problems existing in New Zealand to creating barrier free and safe environments are not untypical of those existing in other countries. These problems, as referred to above all seem to have a common denominator: cost. The numerator involves politics, power, vested interest, apathy, values and attitudes. Such problems exist in the USA in a similar way, and elsewhere, as well.

I note that barrier-free design for public buildings in New Zealand came about through the doings of an activist group. Barrier free and safe environments don't seem to start naturally. Many years ago in Berkley, California, it was an activist group that started an independent living movement and the development of published guidelines on barrier-free design. They pushed to effect changes to the public laws, to building codes and regulations, to educate and to disseminate information, to conduct seminars and to encourage the formation of regional independent living centers. Much progress has been made and more is needed.

It is suggested that part of the process of creating safe environments involves the education of the designer and requires user involvement. Although I agree with this approach, a further step could do much to reinforce this effort and to maintain its thrust for future generations. My concern is that we as a developed and affluent society are missing something in our basic education. I believe that we must start the education and awareness process for safe environments in the primary grades. I feel strongly that we must provide our children early on, with an understanding of the significance of the built and natural environment, its importance to their wellness and the wellness of their fellow human beings. Our children need to understand their future role in managing and developing the environment to serve their needs and the needs of the world community as well.

If we don't start, we will continue to experience such stories as the following: The other day, a real estate developer friend and I were talking about barrier free office buildings. He told me about a new building he is developing (in the USA) and a prospective long-term tenant who wanted to maximize his usable floor space. The prospective tenant requested that the handicapped toilet stall in the men's and women's rooms be deleted from the plan since he didn't have any disabled people working for him. He figured that this change would reduce the size of the toilet room and the remaining space could be recaptured into usable floor area.

The building code in the town does not require handicapped toilets on each floor. Since these toilet units were being provided on other floors the developer could legally delete these handicapped units. A further request of the prospective tenant was to eliminate the handicapped parking areas in the space reserved for his staff's use. This would enable him to recapture an additional parking space.

When my friend heard these requests he said to the prospective tenant, "Someday you may have handicapped people working for you." The response was, "When that day comes, I'll pay to make the building changes."

So with this example, the emphasis is again on the bottom line, on business efficiency, on cost, on return on investment. Perhaps in reading between the lines of the meaning of the prospective tenant's statement "when that day comes..." is probably... "I'm not going to be hiring any handicapped people!"

And in much the same way, this is how we have been treating our planet. We have not paid heed to what we are doing today. We are not looking at the legacy we leave to future generations. Many of our fellow human beings seem indifferent to the poisoning of our environment, to the air we breath, or the water we drink, or the food we eat. We focus on living for the moment, for the good life, for the quick return, without the understanding that we have to change our priorities, our values and attitudes. We have to make a difference. There are no other options. We must begin the task of improving our built and natural environment. We must accommodate all our fellow human beings, regardless of age or disability. The monograph by Wrightson and Pope helps us with this important and necessary task.

Paul Grayson
Winchester, Mass. April 1989

APPENDIX

CONTENTS

INTRODUCTION

This Appendix is a set of guidelines drafted by the authors for the Standards Association of New Zealand. The guidelines will form the basis of a document on Intrinsic Design for Safety in New Zealand Dwellings to be distributed for public comment.

A preventive approach based on 'maintaining good health' is followed. This identifies the design and construction of the home and its external environment as the starting point for addressing domestic safety issues. Traditionally the approach to safety has followed a rehabilitative model which focusses on a medical condition as its starting point.

ACKNOWLEDGEMENTS

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RELATED DOCUMENTS

Reference is made in this document to the following:

NEW ZEALAND STANDARDS
NZS 1900: Fire Resisting Construction and Means of Egress. Chapter 5:1988
NZS 3114:1987 Specification for Concrete Surface finishes.
NZS 3604:1984 Light Timber Frame Buildingsnot requiring specific design.
NZS 4121:1985 Designfor Access and Use of Buildings and Facilities by Disabled Persons.
NZS 4223:1985 Glazing in Buildings.
NZS 5841: The Reduction of Slip Hazards Part 1:1988
NZS 6703:1984 Interior Lighting Design.
NZS 7421:1985 Specification for the Installation of Solid Fuel Burning Domestic Appliances.

BRITISH STANDARDS
BS 3705:1972 Recommendations for provision of space for domestic kitchen equipment.
BS 4125 Safety requirements for child safety barriers for domestic use.
BS 5395 Stairs Ladders and Walkways Part1:1977. Code of practice for design of straight stairs.
BS 6539 Fireguards for use with solid fuel appliances.

OTHER PUBLICATIONS:

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BRITISH STANDARDS INSTITUTION
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SECTION 1 SCOPE AND GENERAL CONSIDERATIONS.

1.1 SCOPE

1.1.1 This document provides guidelines for the design of dwellings, that will assist in the prevention of unintentional personal injury. It describes factors to be taken into account in design that will reduce the likelihood of an incident or injury occurring in association with any building element or fitting, either alone or in association with other elements.

1.1.2 It is assumed that residents, or visitors to dwellings, are at some time going to indulge in inappropriate or dangerous behaviour that could lead to unintentional personal injury. This is only to be expected. This is the normal human condition and should be anticipated. Many incidents, or personal injury arising from those incidents, can be forestalled.

1.1.3 From time to time reference may be made to the special requirements of some groups, especially very young, elderly or disabled people. Although a dwelling may not be intended for occupation by those groups it is a reasonable assumption that in the life of a dwelling someone from one or another of those groups will live in or visit that house.

1.1.4 Some of the recommendations in this document deal with areas where standardisation of itself will help to prevent the unintentional personal injury. This is particularly true where an unconscious or reflex action is involved, or where an activity is carried out in the dark. Examples might include reaching for light switches, or taps, or the height of safety rails or grab rails. Standardisation of these fittings is desirable and can be acheived without restricting design freedom.

1.1.5 Some provisions of this document relate to security against intruders when personal injury could conceivably result from that intrusion. Considerable emphasis is given to prevention and suppression of fire, as a cause of personal injury. However this document does not apply to protection of property against damage or protection of property from theft.

1.1.6 The document does not cover the design of individual products, although reference is made to other Standards Association publications which may cover the design or specification of fittings.

1.1.7 In general this publication does not deal with construction, detailing or installation of the elements or fittings referred to. At all times it is assumed that building is conducted to a good trade standard, by registered tradesmen where appropriate, and that fittings are installed to the manufacturers requirements, the relevant New Zealand standard and the requirements of relevant government departments and local authorities.

1.2 APPLICATION

1.2.1 This document applies to all new dwellings, including apartments and travel accommodation. It is of particular importance for dwellings for the elderly. Some of the items discussed have relevance to public buildings.

1.2.2 The principles discussed, and some of the recommendations made here have relevance to alterations to existing dwellings. Obviously thought must be given to their suitability in any particular case.

1.3 REFERENCES

1.3.1 The full titles of reference documents cited in this publication are given in the earlier section on "Related Documents".

1.3.2 Where any Standard named in this publication has been declared or endorsed in terms of the Standards Act 1965, then:
(a) Reference to the named Standard shall be taken to include any current amendments declared or endorsed in terms of the Standards Act 1965: or
(b) Reference to the named Standard shall be read as reference to any Standard currently declared or endorsed in terms of the Standards Act 1965 as superseding the named Standard, including any current amendments to the superseding Standard declared or endorsed in terms of the Standards Act 1965.

1.4 DEFINITIONS

1.4.1 For the purposes of this document the definitions given in the following list apply. Building terms used have the definitions given to them in the *Glossary of Building Terms.*

ACCIDENT means unexpected mishap causing personal injury.

DISABILITY GLARE means excessive brightness of parts of the visual field in relation to the general surroundings that impairs the ability to see detail.

DISCOMFORT GLARE means excessive brightness of parts of the visual field in relation to the general surroundings that causes discomfort without directly impairing the ability to see detail, but which can affect safety through distraction and fatigue.

HARM AGENT means the building element or fitting which actually causes the injury.

INITIAL AGENT means the building element or fitting which triggers off the chain of events leading to the injury.

INTRINSIC DESIGN FOR SAFETY means design that identifies potential accident and injury sites and removes or mitigates the hazard by amending the design.

PITCH means the inclination of any part of a building, such as a rafter or stair, to the horizontal.

PITCH LINE means a line drawn through the nosings of a stair, from which measurements such as angle, headroom and handrail height are taken.

RAMP means any slope with a rise greater than 1 in 20.

WET AREA SHOWER means a shower area not enclosed by a cubicle where the sloped flooring of the shower area is continuous with the flooring of the bathroom and there is neither upstand nor step down defining the shower area.

SECTION 2 SITE LAYOUT

2.1 GENERAL

2.1.1 Many new houses in New Zealand are not designed for a specific site and are sold as a packaged design or as a prefabricated unit transported to the site. The recommendations of this section should be considered by designers when evaluating the suitability of such a house for any individual site, as well as designing a house for a specific site.

2.2 ORIENTATION

2.2.1 A design which does not take orientation to the sun into account may lead to behaviour in a space which is unexpected or inappropriate to it. For example if a kitchen is the only space in a house which receives afternoon sun, it may be used as a children's play area at the same time as food is being prepared. This may lead to distractions for the cook, or trip hazards because of the presence of the child, as well as discomfort glare and solar over heating.

2.2.2 Entries to the dwelling should not be exposed to the prevailing wind and the possibility of driven rain. This reduces the attractiveness of a level entry and will cause a user to hurry up or down any outside steps at a time when they are slippery or visibility is impaired.

2.2.3 The house should be orientated so its entries are clearly visible from the street or open to observation by neighbours to discourage intruders.

2.3 CHILDREN'S OUTDOOR PLAY SPACES

2.3.1 Every site should have identified on it an outdoor area suitable for children's play. The space should be: sunny, sheltered from the wind, reasonably level, well drained, capable of being supervised from indoors (both from the kitchen and by somebody using the telephone, separated from water hazards, separated from vehicle manouevering areas and capable of being fenced if required.

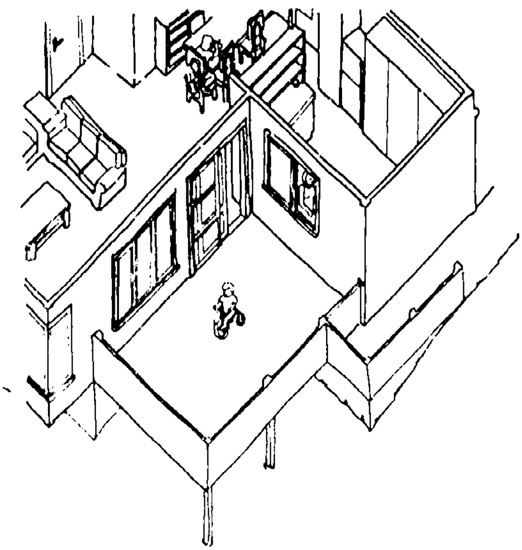


Figure A1. Layout of suitable child's play space. NOTE: Main workstation, supervised play area (well fenced and clear of vehicles), fence detailing to prevent climbing, self-closing gate.

2.3.2 Sooner or later most detached houses will have a small child visiting or living in them for an extended time. Poor planning at the initial design stage may make it impossible for a satisfactory play space to be created.

2.4 VEHICLE ACCESS

2.4.1 Garaging or parking spaces should be identified on every site. These areas must be separated from areas identified as children's play spaces and be able to be fenced off from them.

2.4.2 Vehicle manouevering routes should be identified. It should be possible to drive a vehicle on and off the site, rather than the vehicle having to be reversed on or off it.

2.4.3 Vehicle crossings of footpaths and curbs should allow a good view of pedestrians on footpaths and vehicle and bicycle traffic on roads. The entry to a driveway should not be located immediately beside a side boundary. This could mean that the occupier of the house will lose control of the amount of visibility that he or she will have when exiting from that driveway should the neighbour build or plant on the boundary.

2.4.4 Vehicle crossings of curbs and footpaths should allow a vehicle to approach the road or footpath with reasonable caution. There should be a level area at least three metres, and preferably five metres, long at the end of a sloping driveway to allow a vehicle to pause safely before crossing a footpath.

2.4.5 Vehicle accessways should be at least 2.8M wide for access by emergency service vehicles.

2.4.6 Garaging or parking should take the vehicle as close as possible to an entry to the dwelling. Internal access from the garage to the house is preferable.

2.4.7 The space between the parking area or garaging and the entrance to the house must be adequately lit. *See 2.6 Exterior lighting.*

2.4.8 Power sockets in garage and workshop areas should be provided with earth leakage circuit breakers. These provide additional protection to people using electrical appliances in that space and outdoors, especially in wet conditions.

2.5 PATHS AND PAVING

2.5.1 In general exterior steps should be avoided if a ramped slope of a rise of 1 in 14 is achievable. Exterior path slopes should not exceed a slope of 1 in 12. Well formed steps are safer than steep ramps. It is often possible to eliminate exterior steps through landscaping, even to houses with suspended timber floors.

2.5.2 Path slopes of greater than 1 in 20 should have a textured slip resistant finish, such as concrete with a soft broom finish. (NZS 3114:1987 surface U5 is such a finish. See also Table 1.)

2.5.3 Exterior steps and slopes of a rise steeper than 1 in 20 should be provided with a secure handrail 840-900mm from the slope or the pitch line of the steps.

2.5.4 Exterior steps with a rise of over 1200mm should be constructed so that a child-proof gate can be fitted if required.

2.5.5 Where required, exterior steps should be grouped in flights of three or more. Single steps are difficult to see and must not be used.

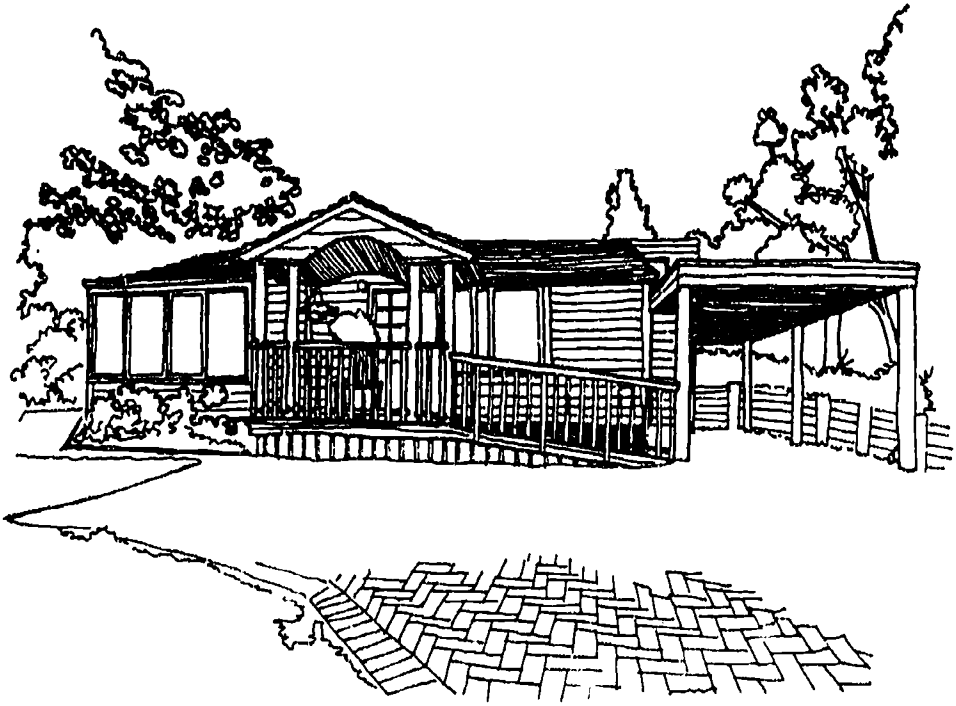


Figure A2. Ramped approach to house on suspended timber floor.

2.5.6 Exterior steps should have a variation of riser height of no greater than 5mm.

2.5.7 Sloping exterior surfaces must be distinguished from level surfaces by a change of colour or surfacing, and be slip resistant. A vertical element such as a lighting post or handrail is a valuable cue to the existence of a change in slope. (Refer to Table A1 on following page).

2.5.8 Exterior surfaces should be textured, free draining and stable. Sheet material such as textured concrete, asphalt, perforated rubber or plastic matting and outdoor carpet are preferable to gravel or other loose granular materials. in areas where snow, ice or frost may occur surface slip resistance will degrade significantly.

2.6 EXTERIOR LIGHTING

2.6.1 Exterior circulation routes should be lit, especially exterior steps. Lighting of paths and steps should deliver a minimum of 30 lux at ground level. (NZS 6703:1984 Code of Practice for Interior Lighting Design refers.)

2.6.2 Exterior lighting for steps should direct lighting on the treads, preferably from below handrail level. Dispersed light sources are to be preferred. Intense light sources should be avoided for other than exclusively security lighting, as they will cause disability glare, cast deep shadows onto step treads and cause night blindness.

2.6.3 Lighting between the house and parking and garaging should be controlled by two way switching.

2.6.4 Switching should be weatherproofed and switches, lights and wiring must be protected from mechanical damage.

Table A1
Slip Resistance of Exterior Paving and Tread Finishes
(This table refers to section 2.5.7)

Material	Slip Resistance Dry & Unpolished	Wet	Remarks
Clay Tiles (Carborundum Finish)	Very Good	Very Good	May be suitable for external stairs.
Clay Tiles (Textured)	Very Good	Very Good	May be suitable for external stairs.
Clay Tiles	Good	Poor to Fair	Slip resistance when wet and polished is very poor.
Mastic Asphalt	Good	Good	
Concrete	Good	Poor to Fair	If a textured finish or a non-slip aggregate is used, slip resistance value when wet may be increased to good.
Terrazo and other stone-based surfaces	Good	Poor to Fair	Non-slip nosing necessary on stairs. Slip resistance when poslished or polish is transferred by shoes from adjacent surfaces ver poor.

Very Good—Surface suitable for areas where special care is needed
Good—Surface satsfactory for normal use.
Poor to Fair—Surface below acceptable safety limits.
Very Poor—Surface unsafe

Source: BS 5395 Stairs, Ladders and Walkways. Part 1:1977 Code of Practice for Design of Straight Stairs.

2.6.5 Nosings of exterior steps should have a reflective coating. Traditionally this has been white paint for concrete steps. A range of durable self adhesive, slip resistant tapes is available for timber steps. Rough sawn or band sawn timber surfaces are not a durable slip resistant surface.

2.7 FENCING OF SWIMMING POOLS

2.7.1 All private outdoor swimming and spa pools, or pools deeper than 400mm which can be used for swimming or paddling must be fenced.

2.7.2 The fence must be at least 1.2 metres higher than the surrounding ground level or any permanent fixture adjacent to the fence, except that mesh fences capable of being climbed must be at least 1.8 metres above the ground or adjacent permanent fixture.

2.7.3 Clearance between the bottom of the fence and the ground, or clearance between palings must be no more than 80mm. Mesh fences must be attached to a bottom rail or pipe to maintain that maximum opening and prevent children from crawling underneath.

2.7.4 The fence must be durable, and designed to prevent children from climbing over or crawling under the fence from outside. Any mesh or trellis must have a maximum opening dimension of 80mm. Fence framing must be on the side of the fence facing the pool.

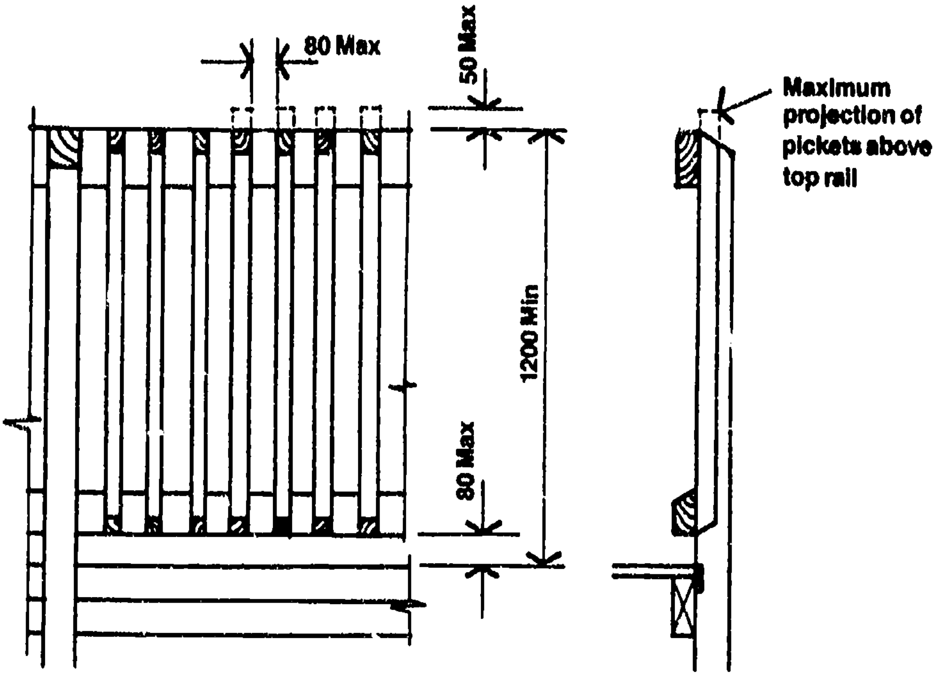


Figure A3. Fencing detail to discourage climbing.

2.7.5 Gates must be of at least the same height as the pool fence. They must not open inward towards the pool area, and must be self closing and self latching. Latches must be on either the inside of the gate facing the pool area or, if mounted on the outside of the gate, must be at a height of at least 1.5 metres from the ground.

2.7.6 Exterior doors of house opening into the pool area must open away from the pool, be self closing and self latching, and have control heights no lower than 1200mm from the finished floor level.

2.7.7 Indoor spa pools must have self-closing self latching doors set at 1200mm from finished floor level.

2.8 EXTERIOR DECKING AND BALCONIES

2.8.1 Exterior decking and balconies over 1200mm above the exterior ground level must be protected by a handrail and balustrade at least 900mm high, detailed to prevent climbing. Where the hazard is extreme the balustrade should be at least 1200mm high and conform to the requirements of section 2.7.

SECTION 3 STRUCTURE

3.1 FOUNDATION SYSTEM

3.1.1 In general slab-on-ground construction is preferable to a suspended timber floor because entry steps may be easily avoided and it is possible to make fire egress safer. There is nothing intrinsically safer about a dwelling on a concrete slab. The firmer and harder concrete floor is a greater potential harm agent than the more yielding timber floor. However the entry steps conventionally associated with a suspended floor are a significant initial agent for accidents in the home and on balance slab-on-ground is preferable.

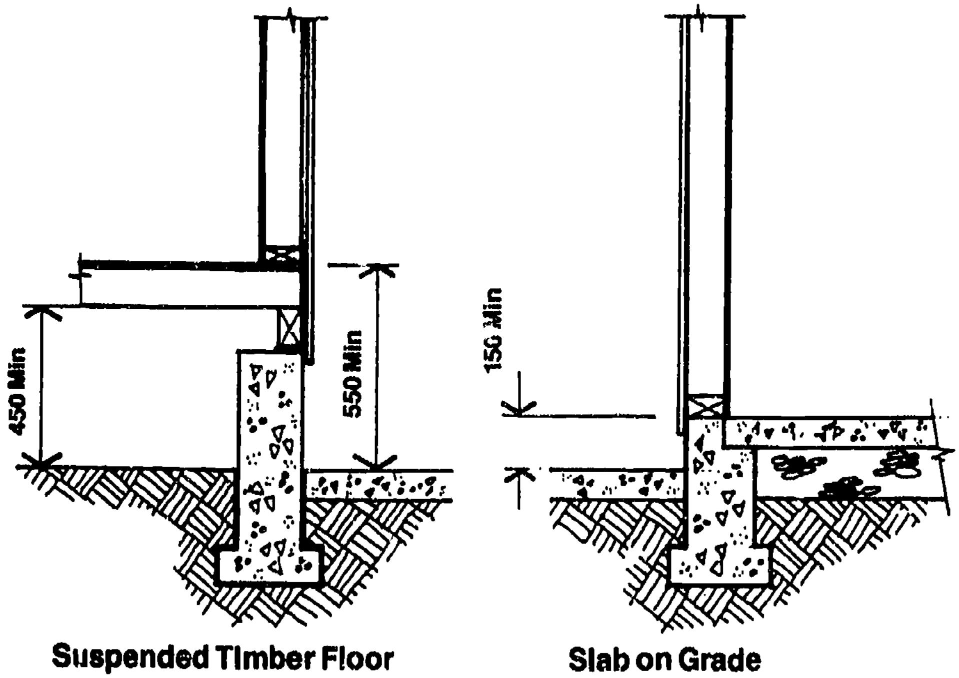


Figure A4. The difference in floor levels between a building with a suspended timber floor and a building with a slab on ground floor.

3.2 NUMBER OF STOREYS

3.2.1 Where the site area permits, dwellings should be single storeyed and avoid changes in floor level. Dwellings intended for elderly people must be built on one level only. Multi-storeyed dwellings are intrinsically more dangerous than single storeyed dwellings because stairs are a potent initial agent for accidents. Where a change of level is essential or preferred for aesthetic reasons careful attention must be paid to the detailing, lighting and decoration of the stairs. Elderly people are more prone to falls, and more at risk of serious injury when they do fall. Accordingly dwellings for elderly people must be designed to avoid the need for steps and stairs. Other hazards associated with multi-storeyed dwellings are as follows:

a. Maintenance, including painting, window cleaning and cleaning of gutters, is more hazardous than in single level dwellings.

b. Fire egress is more difficult from upper storeys.

c. The risk to children from falls is greater from multi-storeyed dwellings.

3.3 FRAMING

3.3.1 Multi storeyed dwellings must be either platform framed or must include alternative fire and smoke stopping at first floor level. Balloon framing, especially if dwangs are not used, can provide a smoke path from the ground floor to upper level bedrooms.

3.4 EXTERIOR MATERIALS

3.4.1 Materials should be selected with regard to their future maintenance. The need for high level routine maintenance should be minimised. Dwellings for elderly or disabled people should be constructed out of materials that require a minimum of maintenance. The idea of a maintenance free dwelling is a myth. Even a brick and concrete tile building, with aluminium joinery and copper guttering will require some exterior maintenance. This maintenance might include the painting or touching up of roof and walls, fascias and barge boards, cleaning of walls, windows or overhead glazing, cleaning of gutters or rainheads, replacement of components or glass, replacement of window hardware, repair or reorientation of a television aerial or rescuing a cat from the roof. Planning should anticipate the need for risk free access to every part of the house, especially for routine maintenance.

3.5 PAINTING

3.5.1 It should be possible to reach the eaves of a single storeyed house from a secure ladder from all points of the perimeter of the house. The ladder will require a firm, level base, preferably paved, one quarter as far out from the base of the wall as the wall is high.

3.5.2 Where multi-storeyed dwellings, or dwellings on sloping sites will have to be refinished or maintained the walls should be fitted with sockets for scaffold brackets before the interior is lined so that repainting is convenient and guttering can be cleaned and maintained. Sockets should be accessible progressively from the lowest level for fitting the scaffolding without exposing the user to the risk of falling.

3.5.3 Roofs with a pitch of over 20 degrees should have a long lasting or low maintenance finish, such as a factory applied paint finish or concrete tiles roof.

3.5.4 Areas of roofs that are not accessible by roof ladder, such as some parts of a hipped roof or roofs that are dissected by dormer windows or other parts of the structure, must be provided with to secure anchorage for safety ropes.

3.6 CLEANING

3.6.1 It should be possible to clean all high level windows from inside the house without leaning far out of the window, or from decking and balconies. This is particularly important where windows are exposed to salt spray and there is a need for frequent cleaning.

3.6.2 Cleaning of overhead glazing can be reduced by using translucent rather than transparent rooflights will require less cleaning. Designers must plan means of cleaning overhead glazing without risk of falling or breakage of the glazing. This can be acheived by:

a. Planning exterior glazing so that it can be cleaned from the eave without the need to climb onto the roof.

b. Using a pivoting roof window that permits cleaning from the inside.

c. Designing the roof so that the rooflight can be safely cleaned from a window above it.

d. Designing in hazard-free access to the roof and fixing points for safety ropes or harness.

3.6.3 Access to the roof must be available without the need for a user or a ladder to come close to overhead electrical mains.

SECTION 4 FLOOR LAYOUT PLANNING

4.1 GENERAL

4.1.1 Planning should take into account not only the prospective owners or residents, but also the possible visitors to the dwelling, and the certainty that a dwelling will pass into other hands during its service life. Many of the children drowned in domestic swimming pools are visitors to the house with the pool. Similarly many children are poisone while visiting family, friends or relatives, who, without children of their own at home, are less aware of the need for safe storage of medicines or household cleaners.

4.1.2 Adequate space must be allowed for all household activities, including circulation. Activity areas must be defined at the design stage so that clashes of incompatible activities (such as cooking and circulation) can be avoided.

4.1.3 Spaces wh' :h may be particularly hazardous to children, such as a garage or workshop, and all exterior doors, should have door handles set at 1200mm from the floor. A door handle set at this height is too high for a child under three years of age to operate.

4.1.4 The interior layout of the house should identify a children's play area that is separate from the kitchen, but which can be supervised from the principal work areas. (See fig 1.)

4.1.5 Likely harm agents, such as heaters, steps, etc, should not be placed at the end of circulation channels such as stairs or corridors.

4.1.6 External corners in interior walls, and projecting walls and fittings should be avoided where possible. Abrasive surfaces should be avoided. All sharp edges should be eased.

4.1.7 The number of doors should be minimised as they act both as the initial agents for accidents and as the harm agents for injuries. The implications of door swings should be considered by desi ;ners. Door swings should never clash. Doors

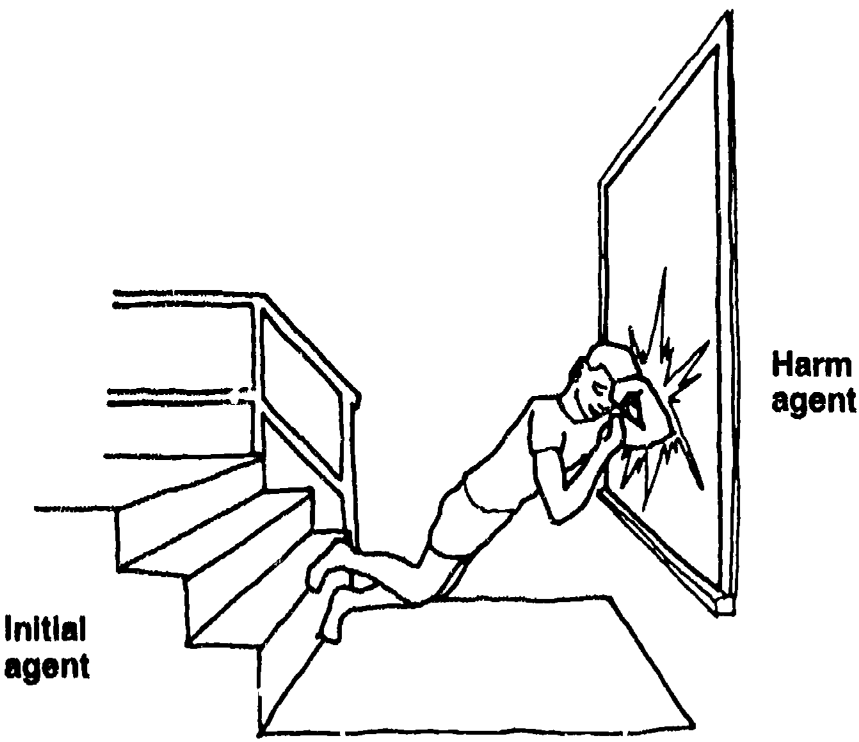


Figure A5. Relationship between the initial agent and the harm agent.

should not open into hallways, stairways or circulation channels. Entries and circulation channels should take prevailing winds into account as severe draughts, and the slamming of interior doors, are hazards for children.

4.1.8 Annealed glass door and side panels must not be located at the ends of corridors and other clear circulation channels. Children are easily tempted to run down clear corridors and may find it difficult to stop.

4.2 FLOOR LEVELS

4.2.1 Changes in floor level should be minimised. There must be no changes in level in housing designed for elderly people. Falls on stairs are a major cause of severe injuries. The recommendations made below and in section 9, Steps and Stairs, are designed to reduce the likelihood of a fall on a set of stairs, or reduce the likeihood of injury should a fall occur. Even well built stairs will remain a potential accident hazard.

4.2.2 Where a change in level is unavoidable, enough space must be allowed in the floor plan at the conceptual planning stage to fit a comfortable stairway, with adequate headroom (See 9.1.3).

4.2.3 The plan layout of a building should be arranged in such a way that stair travel is kept to a minimum, if a change in level is unavoidable.

4.2.4 Plan layouts that require steps or stairs between the kitchen and the dining space, or the bedrooms and a toilet, must be avoided.

4.2.5 There should be no need for a resident to descend stairs between spaces where a person may have to carry a bulky load which will obscure vision of a stair. These routes include both the indoor and outdoor spaces between:
a. The garage or parking space and the kitchen.
b. The laundry and the clothesline.

4.2.6 Floor planning should incorporate enough easily accessible storage for the usual tools, utensils and appliances, such as vacuum cleaners, ironing boards and the like, as well as seasonal storage such as clothing, blankets and recreational equipment. The Housing Improvement Regulations 1948 require that a dwelling unit should have a storage area at least 1 square metre in plan and 2m high, unless a laundry of 3 square metres or over is provided. One guideline used overseas is that 10% of the floor area of the dwelling should be devoted to storage. Adequate storage is necessary to prevent trips and other hazards being introduced into work areas and circulation routes.

SECTION 5 FIRE SAFETY

5.1 FIRE PREVENTION

5.1.1 Dwellings should have linings and finishes which will not support combustion and which have low spread of smoke and flame indices. The fire properties of common building materials are given in MP 9:1987. Fire Properties of Building Materials and Elements of Structure.

5.1.2 Adequate built-in heating must be planned into every dwelling. Poorly placed portable heaters are a common source of fires, especially radiant heaters in living rooms or small bedrooms. Where budgets do not allow built-in heaters to be provided, wiring for these heaters should still be provided for installation at a later date.

5.1.3 Heaters for small rooms must be located at high level, well clear of joinery, doors, windows and associated curtaining.

5.1.4 Solid fuel heaters must be installed strictly in accordance with Local Authority requirements, BRANZ Building Information Bulletin 248 (1986): Solid Fuel Appliances: Their Use In Existing Fireplaces, and NZS 7421:1985, Specification for the Installation of Solid Fuel Burning Domestic Appliances.

5.1.4 Both free standing and built-in wood stoves must be securely fixed to the floor. These appliances will otherwise become a serious fire hazard in the event of earthquake.

5.1.5 Kitchen stoves and hobs must be sited away from windows or curtains.

5.1.6 The stove or hob must be sited so a fire on a cooktop cannot obstruct an egressway.

5.1.7 Cupboards must not be located above a stove or hob.

5.1.8 The wall behind a stove or hob must be fireproof and finishes must not aid the spread of smoke or flame.

5.1.9 Soft furnishings, including carpet, should be selected with regard to fire safety. Woollen furnishings tend to be less combustible than most synthetics and reduce the chance of a fire taking hold from a carelessly placed cigarette.

5.2 FIRE EGRESS

5.2.1 Every room in the home must have two escape routes. One of the egress routes from the bedrooms must not pass through the living room or the kitchen as these are the most common night-time fire areas.

5.2.2 Windows used for fire egress should have a minimum dimension of 560mm in one direction (horizontal or vertical) and a minimum clear opening area of 0.6 square metres. The window should be capable of opening to 90 degrees to the wall. The top of the windowsill should not be more than 900mm from the floor, and not more than 900mm from exterior decking or 1800mm from the ground.

5.2.3 Security stays fitted to egress windows should be of a type that can be removed when the sash is closed.

5.2.4 Secondary egress from dwellings for elderly or disabled people should be through exterior doors to bedrooms, such as ranchsliders with a level entry, rather than egress windows.

5.3 FIRE DETECTION AND FIGHTING

5.3.1 All parts of the house should be able to be reached by a garden hose permanently attached to a standpipe hosetap.

5.3.2 Designers should identify a suitable position for a fire extinguisher in or near the kitchen, between the stove and a fire exit. The most suitable type of extinguisher is the dry powder type.

5.3.3 Designers should identify suitable sites for smoke detectors that will give full coverage of the house. Detectors should be located as follows:

a. Detectors must be able to be reached by the smoke.

b. One detector must be located between bedrooms and living areas, and close to bedrooms.

c. Extended plan houses where the distance between living rooms and sleeping rooms is greater than 10m, two storeyed houses, and houses where the bedrooms are separated by living areas will require more than one detector.

d. Detectors should be able to be easily and safely maintained without the danger of falling.

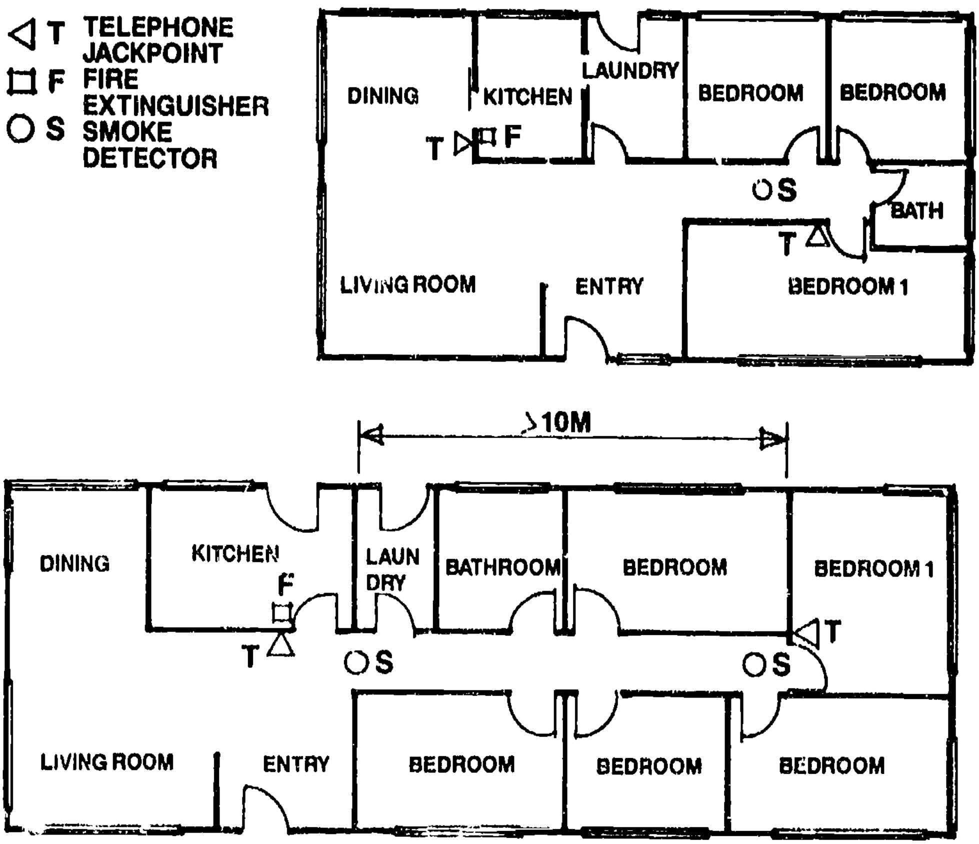


Figure A6. Layout of smoke detectors, fire extinguisher and telephone jackpoints.

5.3.4 Locate a telephone extension at the entry between the kitchen stove and an egress way. Do not locate a telephone extension near the stove or any other potential source of fire. Destruction of one extension can cut off the whole telephone installation and delay the calling of the Fire Service. Note that cordless telephones cannot be relied upon as a means of calling for assistance in a case of fire.

5.3.5 Isolating switches for ovens should be located beside the stove rather than behind it so the stove can be switched off in case of fire, without the user having to reach over the cooktop and run the risk of burns.

5.3.6 Designers should consider the provision of domestic sprinkler systems in dwellings. Design or construction should not eliminate the possibility of installing these systems at a later date.

SECTION 6 KITCHEN DESIGN

6.1 KITCHEN LAYOUT

6.1.1 Work areas in kitchens must not lie on circulation routes.

6.1.2 Kitchens must be able to be fenced off from young children, if required.

6.1.3 The kitchen must be positioned to allow supervision of both indoor and outdoor play areas.

6.1.4 The distance that hot food must be carried between the serving area in the kitchen and the dining area should be minimised.

6.1.5 There must be no change in floor level between the kitchen and the dining room.

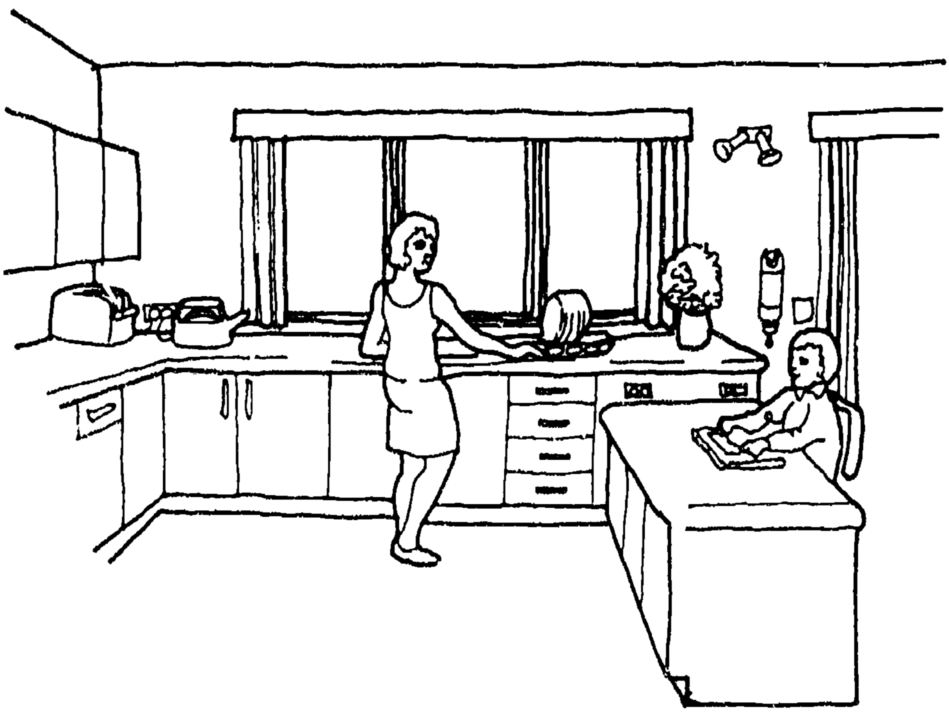


Figure A7. On balance the "U" shaped or cul-de-sac kitchen is intrinsically safer that other shapes. There is no conflict of activities, children can be excluded, but can still be supervised, and there is no conflict with the requirements of fire egress. The breakfast bar in this diagram isolates the kitchen, allows a child to participate in kitchen activities and company without being underfoot and reduces the distance that some dishes have to be carried.

6.2 KITCHEN SPACE REQUIREMENTS

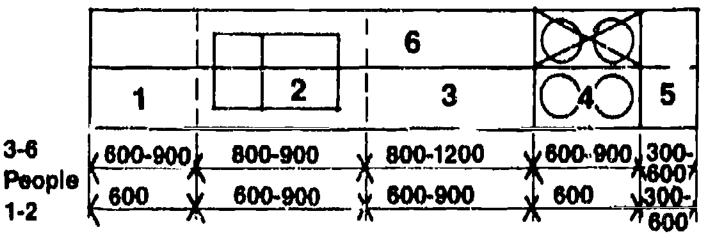
6.2.1 The kitchen should have a minimum floor dimension of 1400mm between benches, or between benches and fittings.

Table A2
Space Requirements for Benchtops

Work Centre	Minimum	Target	Comment
Oven	300mm	450mm	Heat resistant surface onse side at least.
Hob	300mm one side, 600mm the other	450mm one side, 600mm the other	Must be at the same level as the hobs and have heat resistant surfaces on both sides, smooth enough to slide a pot.
Food Processor	450mm each side	525mm each side	
Sink	900mm one side, drainer the other	900mm one side, 750mm the other	
Refrigerator	300mm one side	450mm one side	
Under Bench Storage (two shelves)	1800mm	3000mm	Dimension does not include dishwasher or cupboard with waste disposal but does include underbench cupboard.
Wall Hung Cupboards (two shelves)	1800mm	3000mm	Maximum height of top shelf 1650mm from floor.

Work centres may overlap to reduce the total length of worktop required.

Source: Dr. R. Sinnot. Safety and Security in Building Design.



1. Sink top for clean dishes.
2. Sink bowl unit.
3. Main worktop.
4. Cooktop.
5. Heat resistant setdown space.
6. Over-bench cupboards.

Figure A8. Space requirements around kitchen worktops.

6.2.3 A microwave oven should be designed into the kitchen layout, whether or not it is required immediately. Its space and heat resistant set down requirements are the same as for a conventional oven.

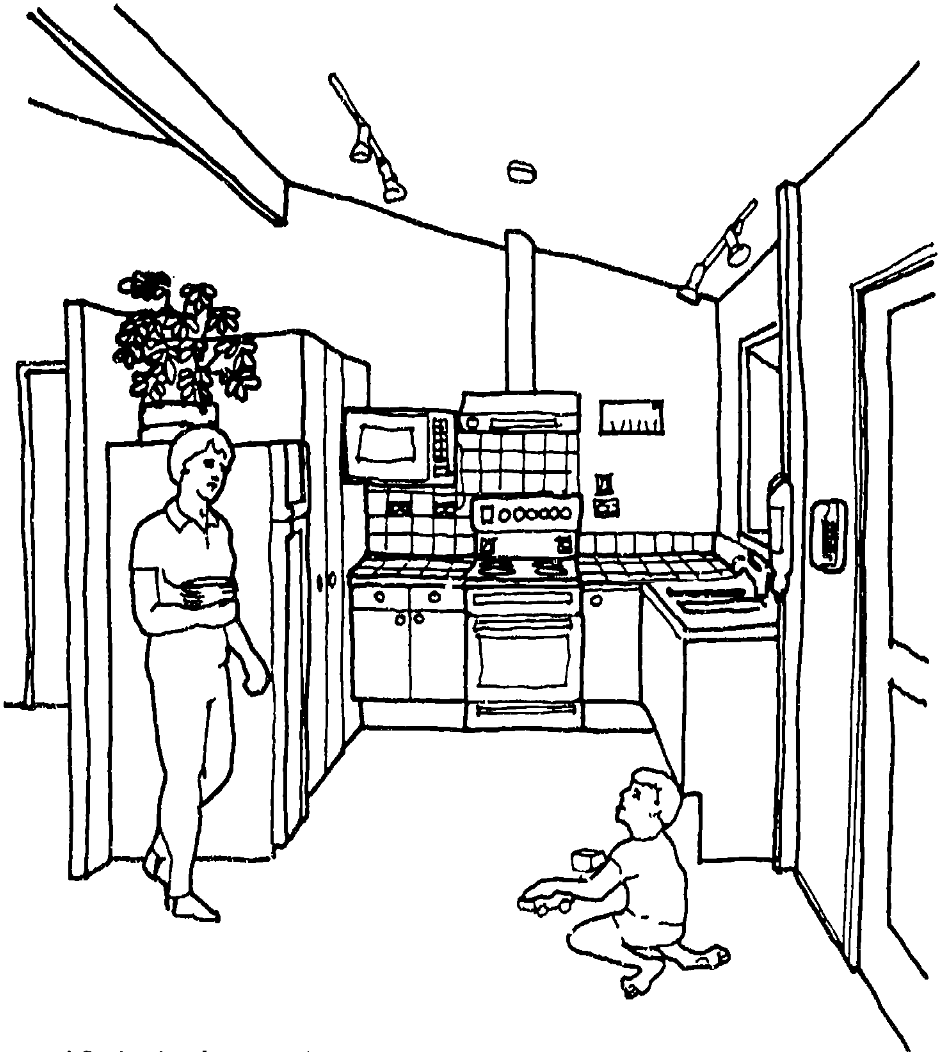


Figure A9. Cooker layout. NOTE: Set-down space beside cooker (level with cooker and other work surfaces), fire-proo[illegible] rear to cooker, cooker positioned clear of circulation routes, fire extinguisher and telephone at entry to kitchen cul-de-sac.

6.3 FITTING HEIGHTS

6.3.1 Work surfaces adjacent to the stove or hob must be at the same height as the cook top. Work surfaces immediately opposite a stove or hob must be at the same height as the cooktop. This reduces the possibility of a hot pot or pan being caught on the edge of a bench and being tipped. If a conventional floor mounted stove is fitted, this fixes the worktop height at 910mm. Benchtop hobs allow the height of the worktop to be set to suit the ergonomic requirements of the user (usually 50mm below the height of the elbow joint, measured from the floor, when the user is wearing typical footwear).

6.3.2 Worktops should be continuous in height. Variations in worktop height increase the risk of a user of a kitchen misjudging a bench height and spilling the contents of a hot pot. Variable height work surfaces can be provided through pull-out work surfaces and mobile trolleys

6.3.3 Wall ovens should be set with the middle shelf at bench top height. This reduces the likelihood of back injury or accidental burns and scalds.

6.3.4 High level storage should be avoided. The highest shelf should be no higher than 1650mm from the floor. In dwellings for elderly people the maximum shelf height should be 1350mm. A kitchen user should be able to reach a cupboard comfortably without having to stand on a chair or steps. High level storage leads to dangerous falls.

6.3.5 Shallow kitchen sinks will reduce fatigue by reducing bending. The bottom of a kitchen sink is usually placed lower than optimum for most kitchen users so that benchtops can be kept at a comfortable height. A shallow sink bench will allow the worktop to be set at a more convenient height.

6.4 COOKING APPLIANCES

6.4.1 Wall ovens and bench top hobs are preferable to conventional ovens as they reduce bending and the risk of back injury. If the use of this split level cooker arrangement would reduce bench and storage space below the minimums shown in Table A2 a floor mounted stove and extra bench space would be preferable.

6.4.2 Floor mounted stoves should be fixed to the wall behind. This will prevent the stove tipping over if a child climbs onto the oven door

6.4.3 Bench mounted cooktops with staggered burners or elements are preferable, unless the extra length that these fittings require will reduce bench spaces to below the minimums shown in Table 2.

6.4.4 Gas appliances should not be specified for dwellings for elderly people. There is a possible relationship between gas waste products and some respiratory conditions in well-sealed buildings. Old people are more absent minded and the risk of escape of gas is higher with this group than for the general population.

6.5 KITCHEN STORAGE

6.5.1 Kitchen storage should be adequate for loose equipment such as kitchen tidies, stools etc as well as food, utensils and appliances.

6.5.2 High level cupboards should have sliding or bifold doors, or be designed as open shelving. Head height side hung doors should not be used.

6.5.3 At least one kitchen cupboard, preferably the under sink cupboard must be fitted with a child resistant catch. Kitchen cleaners are often poisonous or corrosive and should be secured. Locked cupboards are not suitable because users forget to lock them when children are only occasionally in the house. High cupboards are not secure, as children will climb to reach them.

6.5.4 Utensil drawers should be fitted with child resistant catches.

6.5.5 The use of pull out cupboards, corner baskets and mixer lifts will enhance kitchen safety by minimising bending.

SECTION 7 BATHROOM DESIGN

7.1 GENERAL

7.1.1 The bath should be separated from other fittings to avoid creating a climbing path for children to wash hand basins, windows or bathroom cupboards.

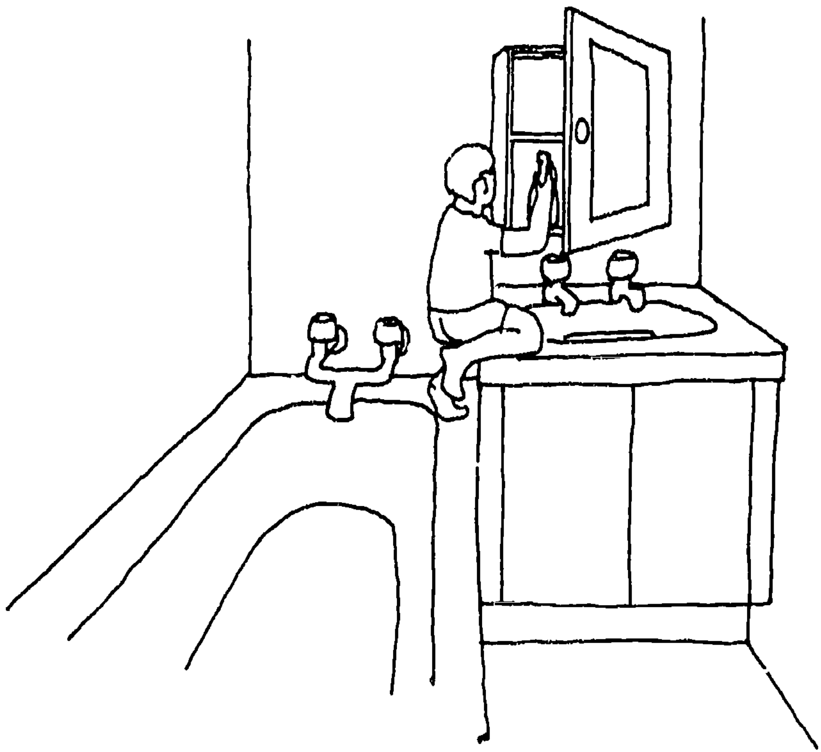


Figure A10. The bath should not provide a climbing path to a cupboard, window or basin.

7.1.2 Ease of cleaning should be considered in bathroom design. Some bathroom cleaning tasks are physically demanding, and poor cleaning can increase slip hazards in the bathroom.

7.2 WET AREA FLOORING

7.2.1 Colours should be chosen to show dust, dirt or mould build up as these make the surface more slippery when wet. Green or beige are less suitable than contrasting colours.

7.2.2 Bathrooms should have floor drains to reduce water build-up on the floor.

7.2.3 Flooring must be slip resistant. (Refer to Table A3)

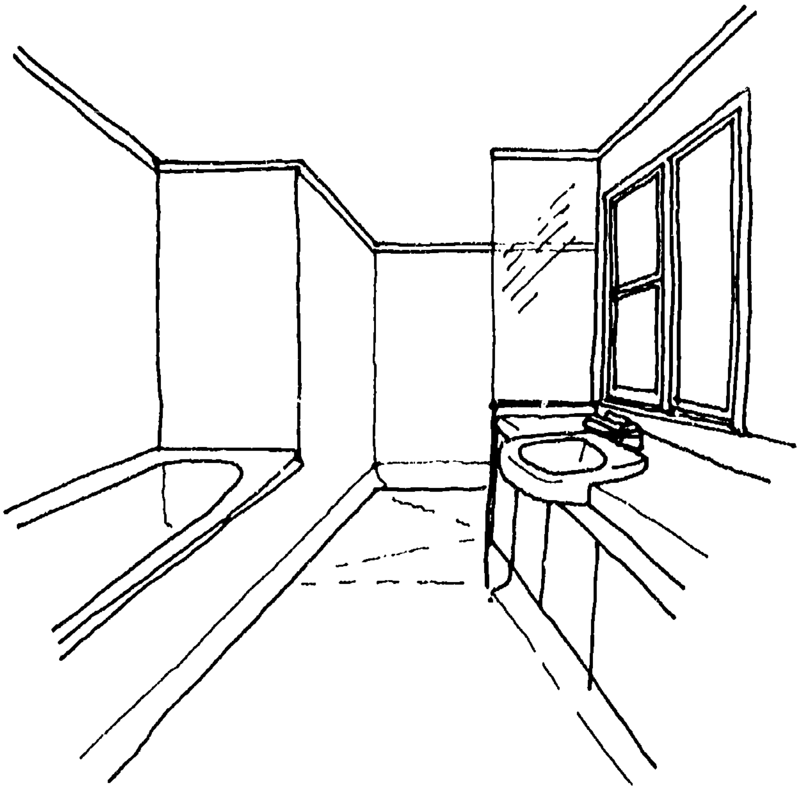


Figure A11. Bathroom layout to aid cleaning. NOTE: Cover vinyl, wet-area-shower can be easily squeegee cleaned.

7.3 BATHS

7.3.1 Showers over baths should be avoided wherever possible because of the risks associated with stepping into them, and the slipperiness of the bath surface.

7.3.2 Bath bottoms must be level and textured for slip resistance.

7.3.3 Baths must be fitted with grab rails. If rails are not fitted by the builder on dwangs the area around the bath and shower should be reinforced with a 300mm wide band of 12.5mm thick construction plywood so that support is available for fixing rails at a later date. Handrails must resist a deadweight pull of 150kg.

7.3.4 A bath faucet should be used in preference to two taps. This will reduce the chance of scalding from an unrelieved stream of hot water.

7.3.5 The hot tap in a bath must be located furthest from the bath edge. This reduces the chance of scalding as the hot tap will be more difficult for the child to reach.

7.3.6 Bath screens should be avoided as they increase the physical difficulty of cleaning the bath.

Table A3
Slip Resistance of Interior Floor Finishes
(This table refers to section 7.2.3)

Material	Slip Resistance Dry & Unpolished	Wet	Remarks
Clay Tiles (Carborundum Finish)	Very Good	Very Good	May be suitable for wet areas.
Clay Tiles (Textured)	Very Good	Very Good	May be suitable for wet areas.
Clay Tiles	Good	Poor to Fair	Slip resistance when wet and polished is very poor.
Carpet	Very Good	Good	Rots with continual wet usage.
Terrazo, Marble and Other Stone	Good	Poort to Fair	Non-slip nosing necessary on stairs. Slip resistance when polished or polish is transferred by shoes from adjacent surfaces very poor.
Cork Tiles	Very Good	Good	
PVC	Very Good	Poor to Fiar	Edges of sheets may cause tripping if not securely fitted to base.
PVC with Non-slip Granules and Textured Surface	Very Good	Very Good	
PVC with PVC with Non-slip Granules	Very Good	Good	
PVC with Textured Surface	Very Good	Good	
Vinyl Asbestos Tiles	Good	Fair	
Linoleum	Good	Poor to Fair	
Rubber (sheets or tiles)	Very Good	Very Poor	Not suitable near entrance doors.

Very Good—Surface suitable for areas where special care is needed
Good—Surface satsfactory for normal use.
Poor to Fair—Surface below acceptable safety limits.
Very Poor—Surface unsafe

Source: BS 5395, Part 1.

7.4 SHOWERS

7.4.1 Showers should be wet area showers rather than cubicles with separate shower bases. Wet area showers have the following advantages:
a. There is no threshold to step over, removing a trip and slip hazard.
b. The number of projections in the bathroom is reduced, reducing the number of potential harm agents in the event of a fall.

c. The absence of obstructions makes it easier to assist children, elderly or infirm people in the shower.
d. A seat is easily fitted.
e. Should an emergency occur it is easier to escape from an open shower area than a cubicle.
f. The other recommendations made in this document for the safer design of showers are easily incorporated into wet area showers.

7.4.2 Shower flooring must be slip resistant.

7.4.3 Showers must be fitted with handrails.

7.4.4 Showers should incorporate hand-held shower roses.

7.4.5 Showers should be fitted with shower mixers, with set anti-scald devices. Thermostatic or thermoscopic mixers are preferable.

7.4.6 The shower mixer must be positioned so that the water temperature can be adjusted without the user getting wet.

7.4.7 All glazing around showers must be safety glass or plastic.

7.4.8 Showers should be fitted with space for soap, shampoo, etc to avoid the need to stretch or bend on a slippery surface.

7.5 BATHROOM DOORS

7.5.1 Bathroom or WC door locks must be unlockable from outside the bathroom.

7.5.2 Bathroom or WC door locks must be openable from the outside if it is necessary to assist someone who has fallen in the bathroom. This can be acheived in several ways
a. Fit removeable hinges.
b. Use a sliding door. Generally a sliding door can be opened without injuring someone who has fallen against it.
c. Use a door that opens outward, where this is possible without risk. No door should open into a thoroughfare.

7.6 BATHROOM STORAGE

7.6.1 Bathroom cabinets must be fitted with child resistant catches. Child resistant catches are preferable to locks as their operation is automatic.

7.7 BATHROOM HEATING AND VENTILATING

7.7.1 A bathroom heater, conforming to the Electrical Wiring Regulations 1976, must be fitted.

7.7.2 All bathroom windows must be fitted with effective security stays.

SECTION 8 LAUNDRY DESIGN

8.1 GENERAL

8.1.1 Flooring must be slip-resistant.

8.1.2 Laundry cupboards must be fitted with child-resistant catches.

8.1.3 The laundry should be designed so that there is a shelf at 910mm high that is large enough and strong enough to take a laundry absket or a full nappy bucket. This may be a fold-down shelf over a laundry tub.

SECTION 9 ENTRIES, DOORS AND WINDOWS.

9.1 GENERAL

9.1.1 Sliding doors are to be preferred for doors in frequent use, and doors to play or nursery areas, and when the door opens into a confined space. These doors do not project towards a resident when half open, they cannot be opened into the face of another person approaching the door, and they reduce the danger of damage to a child's fingers from being trapped in the door. Sliding doors must not be used where the doors open out onto a swimming pool or spa pool.

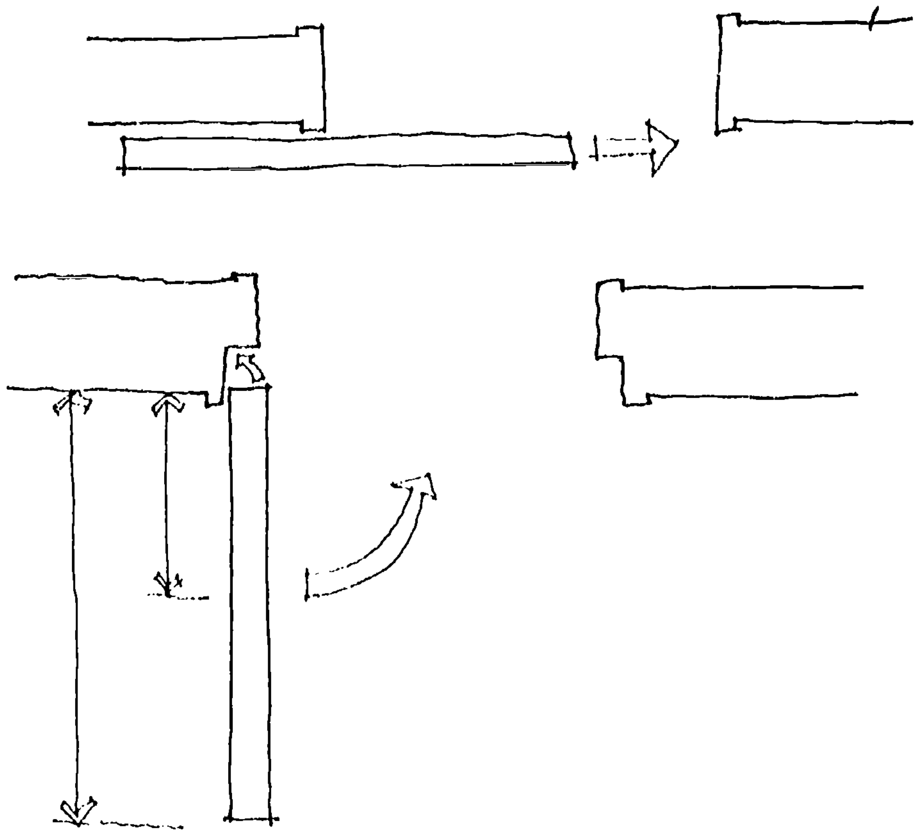


Figure A12. Side hung doors can cause serious crush injuries, compared with a sliding door.

9.2.2 Side hung doors are preferable for bedrooms. These doors usually provide a better air seal, and therefore noise and smoke stop, than a sliding door.

9.2 GLAZING

9.2.1 Buildings must comply with the requirements of NZS 4223:1985, Glazing in Buildings. This standard identifies where marking of clear glass is required to prevent glass becoming the initial agent for an accident. It also establishes where safety glass is required to prevent glazing becoming a potential harm agent.

9.2.2 When transparent glass is used in doors and side panels it is recommended that it be marked for visibility.

9.2.3 Safety glass should be considered for all glass below 1500mm from the floor. Safety glass (toughened or laminated according to the requirements of NZS 4223:1985) or approved plastic glazing is required in all doors and side lights with significant areas of glass. Areas where safety glass need not be used (according to the above Standard) include :

a. Framed glass doors and side panels when:
The clear width of the glass is less than 500mm, or
The lowest part of the glass is over 200mm above floor level, or
The clear opening height of the glass does not exceed 1000mm, or
The door or side panel is provided with a suitable horizontal rail or bar at least 40 mm wide, with its upper edge 700mm or more, and its lower edge 1000mm or less, above finished floor level.

b. Low level glass of significant area (given in Table 12 of the above standard) where:
Thelowest part of the glass is notwithin 200mm of the floor, or
The glass is not over 500mm in width and does not protect a change in levelof greater than 1000mm.

9.2.4 All glazed shower doors, screens and bath enclosures must be glazed with safety glass or shatter-proof plastic.

9.2.5 All unframed or partly framed glass doors and sidelights should be toughened glass.

9.2.6 All overhead glazing must be laminated.

9.2.7 The use of laminated rather than annealed glass in glazed panels beside entry doors will improve security.

9.3 ENTRIES

9.3.1 Entry doors should be sheltered from prevailing wind.

9.3.2 Entry doors should be exposed to observation from neighbours or the street.

9.3.3 Entries should be designed to avoid entry steps or thresholds.

9.4 ENTRY DOORS

9.4.1 Entry doors should be designed so that it is possible for a resident to see who is at the door without being seen, and without opening the door.

9.4.2 Timber exterior doors should be solid core. Solid core doors are more secure against forced entry and offer better fire resistance than hollow-core doors.

9.4.3 Aluminium sliding doors should be fitted with an anti-lift device, so that the door cannot be lifted from its track from the outside.

9.5 WINDOWS

9.5.1 Windows should not open directly over or across paths or other accessways.

9.5.2 Windows required to be open for continuous ventilation, such as bathroom, W.C. or laundry windows, should be fitted with security stays.

9.5.3 Security stays on windows used for fire egress must be able to be released when the window is closed.

9.5.4 Upper level windows that allow a clear opening of over 1000mm square, where the sill is under 1200mm from the floor, should be fitted with removeable security stays for child safety. Because of the relatively small number of multi storey dwellings in New Zealand the number of injuries resulting from children falling from windows is small, but this has been a major problem in other countries, particularly in Britain and the United States.

9.6 HARDWARE

9.6.1 Door and window hardware should be fitted at the heights shown in Table A4 below. These are generally based on the requirements of able bodied, elderly women and will enable most of the community to reach the hardware without risk.

Table A4
Heights of Hardware From the Floor

Description	Dimensions Mode	Height in Millimeters
Door Handles	Maximum	1200
	Prefered	1000
Door Bolts	Maximum	1570
Window Fasteners (no obstructions)	Maximum	1570
Window (behind 360mm obstruction such as deep shelf)	Maximum	1420
Window (behind 600mm obstruction such as kitchen bench)	Maximum	1330

Source: S. Pleasant: Ergonomics—Standards and Guideiines for Designers.

9.6.2 Deadlocks must be able to be latch operated while residents are at home for fire egress.

9.6.3 Door hardware must be securely fixed, with both hinges and striker plates screwed through the jamb into the framing timbers.

9.6.4 Hinge bolts should be fitted to outward opening doors, especially french doors. Hinge bolts will strengthen the hinge side of inward opening doors against forced entry.

SECTION 10 STEPS AND STAIRS

10.1 GENERAL

10.1.1 Dwellings designed for elderly people should be built on one level, with no entry step.

10.1.2 Spiral stairs, or winders in stairs should not be used.

10.1.3 Headroom on stairs should be at least two metres from the pitch line.

10.1.4 Other activity areas must not be allowed to intrude onto stairs or landings. If the design calls for a mixed use of steps, stairs or landings, and there are no design alternatives, there must be no conflict of use with the stairs. Landings used for (say) play areas for older children or sitting areas should be large enough for that purpose without intruding on the circulation space, and fitted with built in furniture or toy storage so that loose material is not left on the stairs.

10.1.5 A person using the stair must not be distracted by his or her surroundings while descending the stairs. If a person using the stairs catches a glimpse of (say) a mirror, a television set, or a good view, particularly if it has been partially obscured at the top of a flight of stairs, the attention of the stair user will be diverted from the stair to the surroundings.

10.1.6 Doors should not open onto stairs or outward onto landings.

10.1.7 Potential harm agents must not be located at the foot of a flight of stairs. Such harm agents could include a solid fuel stove, or a window not glazed with safety glass.

10.1.8 Flights of stairs should be kept short by using landings. Where possible flights should have a rise of not more than 2000mm.

10.2 VISIBILITY

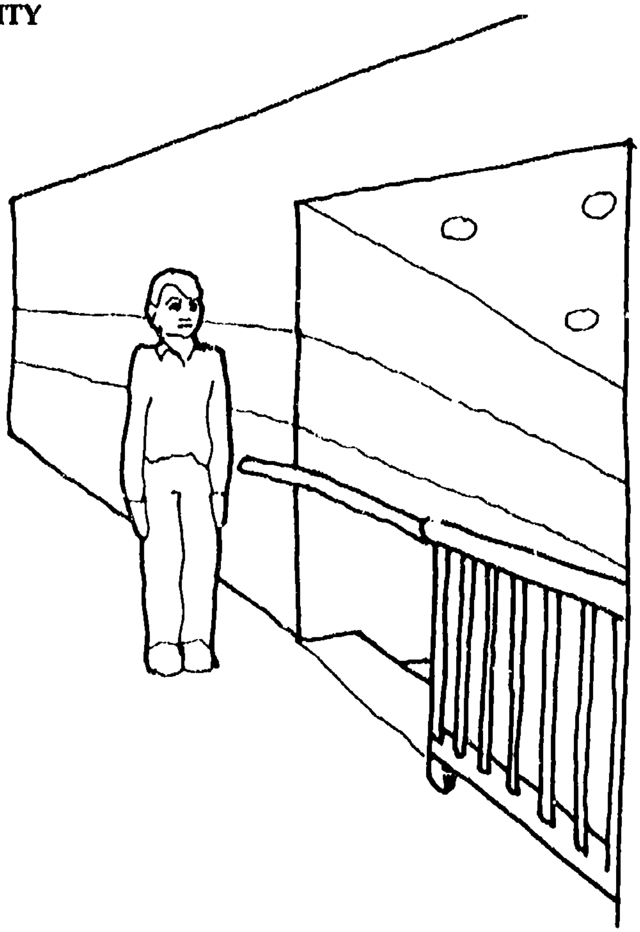


Figure A13. Visual cues to the existence of a stair. (Refer to section 10.2.2 above.) NOTE: Change in lighting, contrast in floor colouring, handrail, graphics.

10.2.1 Steps must be grouped. There should be no fewer than three steps in each group. Single steps, including steps at entries, are hazardous.

10.2.2 Visual cues should be provided to the existence of the stair. Such visual cues include changes in colour or lighting intensity, changes in wall or floor finishes, or the handrail.

10.3 LIGHTING

10.3.1 Lighting level on the stair tread should be at least 150 lux.

10.3.2 Light levels should be evenly distributed. Avoid concentrated light sources which could cause disability glare. Such light sources could include skylights or windows as well as luminaires in the users view, or the reflection from polished wood or stone treads.

10.3.3 Light sources below handrail level will light the stairs without the risk of dazzling the stair user.

10.3.4 Stairs must be lit by at least two lamps, so that lighting will be available when one bulb fails.

10.3.5 Bulbs in stairways must be easily accessible for replacement without the risk of falling.

10.3.6 Light sources should not throw a shadow parallel to the nosing, which could create confusion as to where the nosing actually is.

10.4 LIGHT SWITCHING

10.4.1 All stairs must have two way switching at the top and bottom of the stairs, so that it is not necessary to use the stairs in the dark.

10.4.2 Switches should be large enough, and mounted at a height where they can be operated with an elbow if the stair user has his or her hands full.

10.4.3 Light switches at the top of the stairs should have neon locators fitted.

10.5 PITCH

10.5.1 The target stair pitch is 30 degrees. This pitch is comfortable for all users and will minimise the likelihood of falling on the stair.

10.5.2 The optimum stair pitch for safety is 32 degrees. The maximum stair pitch is 42 degrees. Stairs should not be shallower in pitch than 16 degrees. Stairs steeper than 42 degrees become hazardous to descend.

10.6 RISERS

10.6.1 Riser heights should be in the range 150mm - 180mm.

10.6.2 Variations in riser height must not be greater than 5mm.

10.6.3 Open risers should not be used. Open risers are less safe than closed risers because:
a. It is possible for a small child to climb between the treads.

b. Elderly people in particular may become confused by the visual clutter that the view through open risers produces when climbing the stair, and have difficulty identifying the stair nosing.

10.7 TREADS

10.7.1 Stair and step treads should be at least 300mm wide. 330mm is preferred, to take the full length of most men's shoes. Treads must not be shorter than 275mm.

10.7.2 Stair treads must be level. Forward slopes for drainage on exterior steps should not exceed 1 in 100.

10.7.3 Treads must have a secure, non slip surface:
a. Exterior concrete steps should have a U5 (soft broom) finish. Any painted nosing should have coarse sand sprinkled in the last coat of paint before it dries.
b. Tiled treads and nosings should be textured.
c. Carpet or vinyl staircoveringsmu stbe securely fixed.
d. Nosings must be securely fixed.
e. Deep pile carpet or deep underlays must not be used.

10.7.4 Nosings should be rounded and project no more than 25mm from the riser.

10.7.5 Nosings must be slip resistant and should contrast in colour and texture form the tread. Heavily patterned carpets should not be used on stairs as the nosing could become difficult to identify.

10.8 STAIR WIDTH

10.8.1 The distance between stringers (ie. actual tread length) should be 900mm.

10.9 HANDRAILS

10.9.1 Handrails must be easy to grip without hurting one's knuckles on the wall surface. A 35-45mm handrail at least 55mm from the wall will be suitable. Handrail dimensions are specified on page 11 of NZS 4121:1985, *Design for Access and Use of Buildings and Facilities by Disabled Persons.*

10.9.2 Handrails should be able to resist a 150 Kg deadweight pull.

10.9.3 Handrails must be set approximately 900mm above the pitch line.

10.9.4 Handrails must extend the full length of the stair and at least 300mm beyond the top and bottom riser. This covers the effective top and bottom tread of the stair.

10.10 BALUSTRADES

10.10.1 Balustrades are essential where a stair or landing is not enclosed by walls.

10.10.2 Balustrades must be at least 900mm high. If the hazard is extreme the balustrade should be 1200mm high.

10.10.3 Balusters must be no more than 100mm apart. A maximum spacing of 60mm is preferable to prevent the possibility of children squeezing between the balusters.

10.10.4 The bottom rail must be detailed so that a 100mm ball could not pass through the openings in the balustrade.

10.11 STAIR GATES

10.11.1 It must be possible to fit a stair gate at the top and bottom of the stair if required.

10.11.2 Any stair gate must be the same height as the handrail or balustrade.

10.11.3 A stair gate must be securely hinged and operate easily.

SECTION 11 ELECTRICAL SAFETY

11.1 GENERAL

11.1.1 This section assumes that all installations are in accordance with the Electrical Wiring Regulations 1976 and that all wiring and installation of permanently wired appliances is carried out by a registered electrician. The danger of electrocution or electrical fires is increased if the installation is not carried out by a competent person. There is a clear statistical relationship between the rate of domestic accidents and amateur installation and repair of fittings and appliances.

11.1.2 Electrical installations must anticipate future requirements despite any appearance of redundancy in the short term. The number of electrical appliances in common use is still increasing rapidly. Underprovision of sockets and provision of circuits of minimum capacity will lead in future to residents adopting unsafe practices such as running extension cords from room to room or using fuses or circuit breakers of higher rating than the cable.

11.1.3 Electrical mains should be run underground where possible.

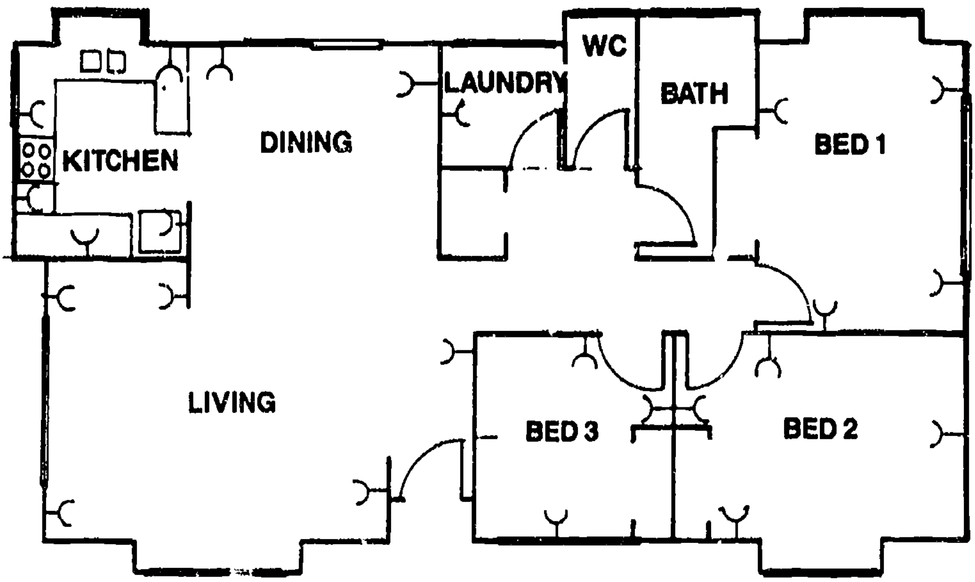


Figure A14. Optimum layout of electrical sockets. NOTE: No electrical appliance lead should cross a circulation route.

11.2 METER AND DISTRIBUTION BOARD

11.2.1 The meter must be located outside the house in a position from which it can be easily read. Main switches and circuit breakers should be located inside where they can be easily found in the dark at a height of not more than 1.45 metres from the ground.

11.3 POWER SOCKETS

11.3.1 Adequate provision must be made for power sockets by anticipating the likely appliances to be used in a space and their likely location.

11.3.2 Power sockets should be located on either side of doorways. Trailing cords must not have to cross circulation routes.

11.3.2 Power sockets must be set at 450mm-600mm from the floor. The preferred height for sockets for general use is 1metre from the floor but this may not be acceptable on aesthetic grounds.

11.3.3 All sockets must be switched.

11.3.4 One socket in each circuit should have an earth leakage circuit breaker fitted to it. Earth leakage sockets must be used in circuits serving garage or workshop areas.

11.3.5 All sockets should have safety shutters fitted. Safety shutters prevent children from poking metal objects into the phase aperture.

11.3.6 Socket plates should be shaped to prevent children slipping metal instruments down behind partially withdrawn plugs.

11.3.7 Double socket outlets should be horizontal. It is difficult to fit two moulded plugs into a vertical double socket.

11.3.8 The following appliances should be planned for in the kitchen, whether the first resident of the dwelling owns them or not: Refrigerator, Freezer, Waste disposal, Rangehood, Microwave oven, Extract fan, Wall clock, Toaster, Electric jug, Food processor, Dishwasher, Radio, Electric Frypan, Coffeepot and possibly electronic ignition for gas appliances.

11.3.9 It should not be necessary to use the electric sockets on the stove, or to use multi-boxes, extension cords or long flexible cords in the kitchen.

11.3.10 Kitchen plug sockets must be located at the back of benches, or on a return wall if a return wall exists. Sockets should be set 250mm above worktops.

11.4 LIGHTING

11.4.1 Lighting must be adequate for the activities carried out in each space. (Refer to Table A5).

11.4.2 Lighting plans must be sufficiently flexible that illuminances can be increased up to 100% above the design illuminances given in table 1 if required. The requirement for additional light for fine work begins at 21 years of age in normally able-bodied adults, and deterioration continues throughout life. The need for extra light must be able to be met without extra fittings and without exceeding the rating of those fittings.

11.4.3 Light switch layouts must follow the main night time circulation routes, such as from the entries to the living areas and the bedrooms to the bathrooms and toilet. The designer should "walk through" the plan, choosing the positions of light switches so that it is not necessary to cross any major space in the dark.

11.4.4 All stairs must have two way switching at the top and bottom.

11.4.5 Light switches at the top of the stairs should have neon locators fitted.

11.4.6 Lights on stairs must be able to be operated with an elbow. Many stair accidents have resulted from people with their hands full being unable to reach or work a light switch, and trying to use the stairs in the dark.

Table A5
Recommended Standard Service Illuminances
(This table refers to section 11.4.1)

Area	Standard Service Illuminance Lux	Position of Measurement	Colour Appearance of Lamps
Homes			
Living rooms:			
general	50	Working Plane	Intermediate or Warm
casual reading	150	Task	Intermediate or Warm
sewing and darning	300	Task	Intermediate or Warm
Studies:			
desk and prolonged reading	300	Desk	Intermediate or Warm
Bedrooms:			
general	50	Floor	Intermediate or Warm
bedhead	150	Bed	Intermediate or Warm
Kitchens:			
working areas	300	Working surface	Intermediate or Warm
Bathrooms	1100	Floor	Intermediate or Warm
Halls and Landings	150	Floor	Intermediate or Warm
Stairs	100	Treads	Intermediate or Warm
Workshops	300	Bench	Intermediate or Warm
Garages	50	Floor	Intermediate or Warm
Old People's Homes	Illuminances should be increased 50–100% above recommendations for homes. Particular attention must be paid to avoiding glare and to revealing steps and obstructions. Two-way switches should be installed in throughways, stairs and similar areas.		

Notes:

In all home areas, attention should be given to the lighting of room surfaces. Luminaires should be selected and positioned to give occupants a compromise between attractive "sparkle" and unwanted glare. Dimming is useful for changing atmosphere.

Additional mirror lighting required in bedrooms.

Additional mirror lighting required in bathrooms. Enclosed luminaires should be used.

High luminance areas should be screened from view when ascending or descending stairs.

Note that incandescent lamps give a light which is classed as intermediate or warm.

Source: NZS 6703:1984 Code of Practice for Interior Lighting Design (Table B1, Page 53)

11.4.7 Each bed space should have a switch within easy reach of the bed.

11.4.8 Light switches must be set at the same height as the door handles: both should be set at about 900mm, within the safe reach of children, and the convenient reach of adults. Any child who is old enough to walk freely through a house must be able to turn on lights independently, and to exit a room freely in the event of an emergency such as a fire.

11.4.9 Lighting at entries should shine from the house so that the face of any visitor can be readily identified.

11.4.10 Circuits and switches should be available for exterior lighting whether or not that lighting is installed at the time that the dwelling is constructed.

11.4.11 All light bulbs, especially those on stairways, in sloping ceilings, and outdoors, must be able to be replaced without risk of falling.

11.5 ELECTRIC HEATING

1.5.1 Capacity should be provided in the switchboard for electric heating in every room, whether or not that heating is installed.

11.5.2 A high level heater must be installed in the bathroom conforming to the Electrical Wiring Regulations. Bathroom heaters should be mounted at least 2000mm from the floor and their switches positioned so that they cannot be reached from a wet area.

11.5.3 Bedrooms should be wired for electric heating, whether or not such heaters are actually installed. If the furniture layout in the bedroom does not permit a low level fan convection or panel heater in the room then provision should be made for high level radiant heating.

11.5.4 High level radiant heating must be positioned well clear of curtains and in such a position that heat is not radiated onto a door or joinery.

11.5.5 Built-in heating should be planned into the kitchen. There is often waste heat available in the kitchen, but not usually while food is being prepared. A portable heater in the kitchen will create a trip hazard.

SECTION 12 HOT WATER

12.1 WATER TEMPERATURE

2.1.1 Hot water systems should be fitted with tempering valves or thermostatic mixing valves to bring the delivered water temperature down to 55 degrees C. Water at 55 degrees C is still hot enough to kill germs or to melt fat. However it is cool enough that it will take about 30 seconds to burn a child's skin to its full depth, giving time to escape or call for help. It is still possible for a child to trap himself or herself in a bath or shower cubicle, however, and care must still be taken with bathroom detailing to reduce the likelihood of that sort of accident.

12.2 TAP TYPES AND POSITION

12.2.1 Taps must be positioned so that the cold tap is the closest to the user, to reduce the risk of accidental scalds. Where no preference exists the hot water tap should be placed on the left of the cold water tap. After NZS 4121:1985

12.3 HOT WATER CYLINDER

12.3.1 The hot water cylinder should be secured against earthquake movement by strapping the cylinder back to the wall framing.

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