HOW UNIVERSAL IS UNIVERSAL DESIGN?
A CASE REGARDING HOUSING IN TAIWAN

by

BIH-CHUAN LIN

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Approved by:

O. John Selfridge

Major Professor
O. J. Selfridge

ABSTRACT

Housing in Taiwan can be categorized into five types, here designated as "A" through "E." The various types respond to influences of climate, economics, culture, and the construction techniques available at a given time. The analysis for this thesis suggests that there is an additional importance influence: the apparent acceptance throughout Taiwan and the housing industry that Taiwanese housing is created for persons of an "average" or "standardized" adult size. For that reason, many of the houses in Taiwan are inaccessible and un-adaptable for needs of many users including some who are elderly, those with physical disabilities, and/or many with temporary/chronic limitations, or those who are not "average."

The United Nations defines an " aging society " as a society with a percentage of its population 65 years-and-over at 7% of the total population. Between 1990 and 2000, Taiwan became an "aging society "by the UN definition. By 2003, the percent elderly has become 9.1; the estimate for 2032 suggests that about 20 percent will be elderly. This fundamental change in Taiwan's population structure is one critical issue in looking at the Taiwan housing supply and highlights the need for improving housing design and access to make life easier, safer, adjustable and equitable across a person's whole life-span.

Universal Design (UD) is "Design for All" that accommodates and considers the entire range of environmental design for humans of all ages, sizes, and abilities.

The author uses the principles of UD as a template for analyzing the Taiwanese housing types and to illustrate problems likely to occur with the changing demographics in Taiwan.

The author found that although the critical application of UD principles to Taiwanese housing brought out legitimate concern, some long-standing cultural influences (such as high-thresholds, and the size of kitchens) and building techniques (such as with plumbing in the existing housing stock) will make renovation UD principles difficult and, for much of Taiwan, perhaps impossible.

The author concludes that future Taiwanese housing could benefit from the application of UD principles, but that Universal Design is not universal for wide-spread renovation to the existing Taiwanese housing stock. Yet in many cases, the thoughtful application of as many as possible UD principles will make housing easier, safer, and more equitable in Taiwan.

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PREFACE

Lead your life
into architecture and environment.
Bring your soul into the nature.
Listen to the heart beat of every life.
(Use) Your hands (to) feel it
(Use) Your eyes (to) appreciate see it
(Use) Your tender lips (to) kiss every life
Finally, (use) your nose (to) breathe the whole nature
slowly into your heart.

將你的生活

融入建築與環境中

帶著你的心靈 走進大自然裏

聆聽 每一個生命 的 心跳聲

用你的手 觸摸它

用你的眼 欣賞 觀察它

用你那溫柔的唇 kiss 每一個生命

最後 將 大自然的一切

藉由 你的嗅覺 輕輕的吸進你心坎

Life is simple
Simple is Universal Design.
Universal Design is humanistic design that designs
For people of all needs, sizes, ages, culture....

Chapter I

Problem Statement

> ***Most environments seem tailored to people with a standard size and a specific range of mental and neurological abilities. Our contemporary cities are like monstrous cookie cutters shaped to exclude people who cannot function within certain limited physical parameters. (Ken Dychtwald quoted in Venolia, 1988)***

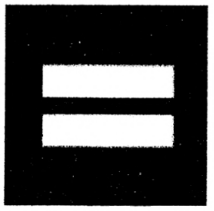
In other words, the physical environment handicaps many and magnifies the disabilities that can, or may, occur during all the various life-cycle states (especially for infants and from aging), from normal healthy conditions (such as pregnancy), from chronic conditions (such as asthma), and from acute or temporary conditions (such as from falls and other so-called "accidents").

This is the case regarding housing in Taiwan today. There is clear evidence that much, actually most, housing in Taiwan is inadequate for those outside some idea of "normal" adult human performance. In addition, the population of the elderly in Taiwan is increasing both in absolute numbers and as a percentage of the total population. All in all, the main challenge for architects, designers, builders, citizens, and public officials in Taiwan is to comprehend the fit between the existing housing stock and the citizens of Taiwan, and respond if the " fit " is found to be inadequate.

One useful frame of reference for analysis, evaluation, and design for all the players involved in housing in Taiwan is that of "Universal Design" (UD). My reading of Taiwanese literature suggests that UD principles are not well understood in Taiwan. A wide-ranging educational effort will be necessary to introduce UD properly in Taiwan as follows: First, the UD concept must be defined in a way that Taiwanese can understand the seven principles of UD (Figure 1.) Then review the general housing situation in Taiwan, including positive results that may come from a better understanding and a wide spread use of UD in Taiwan.

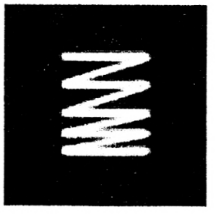
The Universal Design concept is not limited to use by any one group (such as the physically disabled), age cohort (such as the elderly), nor style or type of design. As a broad concept, it includes the spirit, meaning, and intent of producing, evaluating, and utilizing a wide range of products (shoes, toothbrushes, toilets, housing, to transportation, and all means of communication). For brevity in this introductory chapter, figure 1 introduces a short version of the UD principles as developed by the Center for Inclusive Design and Environmental Access (IDEA) with minor editing in support of the translation into Traditional Chinese (See Appendix B)

Figure 1 Universal Design Principles



Principle 1: Equitable Use - The designs can be of equitable use to everyone.

Definition: The design is useful and marketable to people with diverse abilities.



Principle 2: Flexibility in Use - The designs are based on the needs of people so a product must be flexible if it is to serve many users.

Definition: The design accommodates a wide range of individual preferences and abilities.

Principle 3: Simple and Intuitive Use - Every design can be simple to use intuitively.

Definition: Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Principle 4: Perceptible Information -

Definition: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Principle 5: Tolerance for Error - [The designs must allow users to make a mistake without something dangerous or inconvenient occurring.]

Definition: The design minimizes hazards and the adverse consequences of accidental or unintended actions. [In other words, the designs allow action to be achieved with minimum risk, even if a mistake is made.]

Principle 6: Low Physical Effort –

Definition: The design can be used efficiently, comfortably, and with a minimum of fatigue.

Principle 7: Size and Space for Approach and Use -

Definition: Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility. [In other words, all people, including children, people with disabilities, or those who are pregnant, in a barrier-free way can effectively use the designs.]

Source: IDEA Center(SUNY Buffalo, 2003)

Chapter II

Review of Literature

UD Definitions & Principles

Universal design is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design (Mace, 1987).

"The intent of the universal design concept is to simplify life for everyone by making products, communications, and the built environment more usable by more people at little or no extra cost. Universal design targets all people of ages, sizes, and abilities (Center for UD).

Universal design seeks to encourage attractive, marketable products that are more usable by everyone. It is design for the built environment and consumer products for a very broadly defined of user (Mace).

...universal design can evaluate environmental design and its value in the public consciousness. By improving the person-to-environment interface, universal design enhances comfort, health, safety, and human performance (Weisman).

Universal design is an approach to the development of products and environments that can be used effectively by all people, to the greatest extent possible, without the need for adaptation or specialized design (Mace, 1987).

Universal design is an approach to design that honors human diversity. It addresses the right for everyone -- from childhood into their oldest years -- to use all spaces, products and information in an independent, inclusive, and equal way. It is a process that invites designers to go beyond compliance with access codes -- to create excellent, people centered design (Ostroff, 1999).

In 1987, Ron Mace coined the term, "Universal Design". Although Mace, an architect and wheelchair user, died in June 1998, the concept continues to develop and grow in importance. Thus, UD began in the field of architecture and expended into other areas, such as a quote use this list produce design, environmental design, and assistance technology.

UD, also known as "design for all' accommodates and considers the range of environmental design for humans of all ages, sizes, and abilities. It is especially concerned with people with what others call "disabilities" and those dependent upon assistance occasionally or at a single point in time in their efforts to otherwise be independent.

In the twenty some years of its development, UD has become a collection of ideas, concepts, and principles of design that is concerned with the design across a broad range of populations including the differences that occur across stages in the whole of life. It is often thought of as "functional" design and is certainly considered as part of a humanistic tradition in design. It is not a stylistic movement as some that people may think, but a movement identifying guiding principles, developing policy, and creating focus on usability and accessibility by everyone to the greatest extent possible.

Its principles are usually codified in seven categories; additional memory aids have been developed to explain and reinforce the principles.

Applying UD principles in architecture is an important process, as a means of assuring housing environments and construction that can integrate both notions

of the life-span of individual residents and the current temporary needs of a person. For example, UD design features often include barrier-free entrances, wider than usual hallways, and audible or tactile devices to extend architectural meanings beyond the merely visible.

UD has come about as a reform movement because of the limitations of ordinary and traditional architectural development. The creators of the movement believe that its principles give rise to more usable, adjustable, accessible and attractive development for all. According to UD principles and demonstrations, here are "10 A's" to depict what and how UD works for human beings:

1. Affordable
2. Accessible
3. Available
4. Appropriate
5. Adaptable
6. Accommodative
7. Autonomous
8. Adjustable
9. Aesthetical/Attractive
10. Adoptable

Principles of Universal Design

There are seven principles of UD based upon concepts of architecture being accessible, adaptable, adjustable, usable, and barrier-free design -- not just for people with disabilities, but also broadly for people of all ages, sizes, cultures and stages of lives. The seven principles of UD must be acknowledged as consisting of criteria, norms, and standards for good design. This is not to ignore

other vital factors of design such as aesthetics, culture, cost, safety, and geographic phenomenon.

Here are the seven principles of UD in their standard form (Version 2.0 4/1/97 © Copyright 1997 NC State University, The Center for Universal Design), along with examples in both English and a translation into traditional Chinese. I have added notes in bracelets [ ] where the English words and explanations are not likely to be understood by Taiwanese in my direct translation.

Principle 1: Equitable Use- the designs can be of equitable use to every one.

Definition:

The design is useful and marketable to people with diverse abilities.

d

Guidelines

1a. Provide the same means of use for all users: identical whenever possible; equivalent when not. [For instance, designs for a main entrance should accommodate all people. By no means, should one design another main entrance just for people with disabilities.]

1b. Avoid segregating or stigmatizing any users. [In other words, the designs must be equitable to fit every user.]

1c. Provisions for privacy, security, and safety should be equally available to all users. [For example, people still have personal space in the public environment and territory, and all people should feel safe.]

1d. Make the design appealing to all users. [In a word, the design must be humanistic and should be interesting to many users, not just one group, such as teenage boys.]

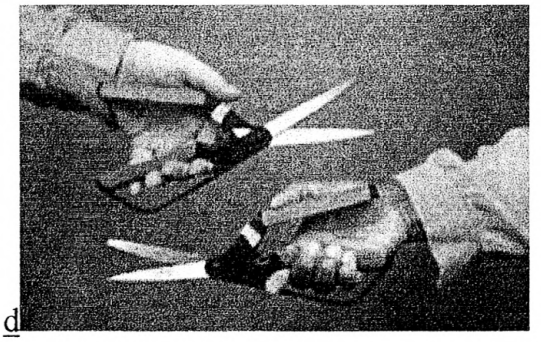
Examples

- Power doors with sensors at entrances that are convenient for all users. [Such as in the supermarket, while people carry grocery bags by both hands, they do not need to open the door, the door will be open automatic with sensors.]
- Integrated, dispersed, and adaptable seating in assembly areas such as sports arenas and theaters

Principle 2: Flexibility in Use- the designs are base on the needs of people to achieve that every one can be flexible in use.

Definition:

The design accommodates a wide range of individual preferences and abilities.



d

Guidelines

2a. Provide choice in methods of use. [Usually there is more than one way to do a task, let users decide how they want to do a task.]

2b. Accommodate right- or left-handed access and use. [In a word, try to let users decide to use their right hand or left hand. Users should be as effective using either hand they choose.]

2c. Facilitate the user's accuracy and precision.

2d. Provide adaptability to the user's pace.

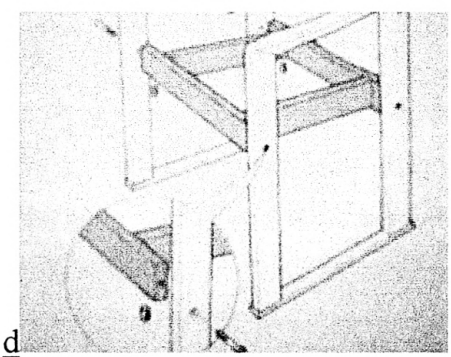
Examples

- Scissors designed for right- or left-handed users. [In another word, the designs must be adjustable for users to comfortable use by both hands.]
- An automated teller machine (ATM) that has visual, tactile, and audible feedback, a tapered card opening, and a palm rest

Principle 3: Simple and Intuitive Use- Every one can be simple in use with intuition.

Definition:

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.



d

Guidelines

3a. Eliminate unnecessary complexity.

3b. Be consistent with user expectations and intuition. [In a word, operations can be easy to understand with intuition, while they are in operation.]

3c. Accommodate a wide range of literacy and language skills. [Assisting users can be easy and not require technical language knowledge.]

3d. Arrange information consistent with its importance. In another word, the information and its significance must be considered together.

3e. Provide effective prompting and feedback during and after task completion.

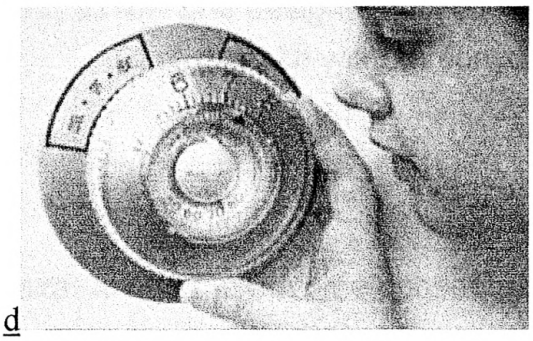
Examples

- An instruction manual with drawings and no text. [For instance, in the airport, while people carried baggage to get to the gate, and did not use a moving sidewalk to reduce fatigue traveler; because the sign only used words in a language they did not understand.]
- A moving sidewalk or escalator in a public space

Principle 4: Perceptible Information

Definition:

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.



d

Guidelines

4a. Use different modes [pictorial, verbal, tactile] for redundant presentation of essential information.

4b. Provide adequate contrast between essential information and its surroundings. [In a word, to make use of the contrast to emphasize essential information, to easy to understand for users while they operating the device or machine.]

4c. Maximize "legibility" of essential information.

4d. Differentiate elements in ways that can be described [i.e., make it easy to give instructions or directions.]

4e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations. [In another words, deliver information to users by using diverse ways and devices (sign, picture, sound, touch), even though for people with specific sensory limitations.]

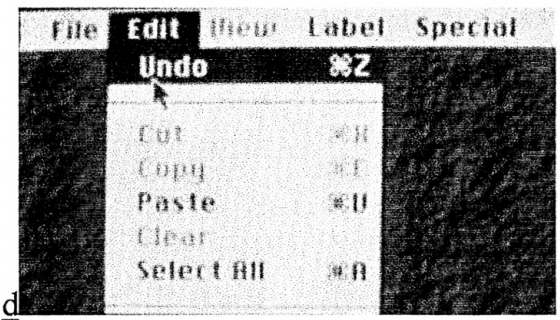
Examples

- Tactile, visual, and audible cues and instructions on a thermostat
- Redundant cueing (e.g., voice communications and signage) in airports, train stations, and subway cars. [To assist people to get to their destination clear and correct using different methods—sight, sound, touch.]

Principle 5: Tolerance for Error- [the designs must allow users to make a mistake without something dangerous occurring.]

Definition:

The design minimizes hazards and the adverse consequences of accidental or unintended actions. [In a word, the designs allow action to be achieved with minimum risk, even if a mistake is made.]



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Guidelines

5a. Arrange elements to minimize hazards and errors: most used elements, should be most accessible; hazardous elements eliminated, isolated, or shielded.

5b. Provide warnings of hazards and errors. [In other words, if something dangerous occurred or a mistake has been made in an operation, there will be a sound or some additional warning to alert users to safety problem.]

5c. Provide fail-safe features. [In a word, the products must provide an operation of procedures and installation of instruction in the using for users to prevent a breakdown or the creation of a dangerous situation even if a mistake has been made.]

5d. Discourage unconscious action in tasks that require vigilance.

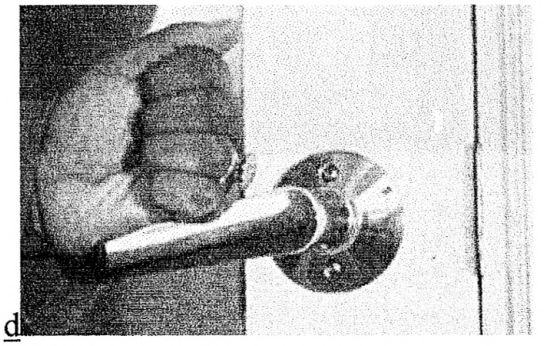
Examples

- An "undo" feature in computer software that allows the user to correct mistakes without penalty
- A double-cut car key easily inserted into a recessed keyhole in either of two ways

Principle 6: Low Physical Effort

Definition:

The design can be used efficiently and comfortably and with a minimum of fatigue.



d

Guidelines

6a. Allow user to maintain a neutral body position.

6b. Use reasonable operating forces.

6c. Minimize repetitive actions. [The designs can be operated without repeating the same actions by users.]

6d. Minimize sustained physical effort. [To limit long sustained physical effort to users, while they involved in the operation.]

Examples

- Lever or loop handles on doors and faucets
- Touch lamps operated without a switch

Principle 7: Size and Space for Approach and Use

Definition:

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility. [In a word, the designs can be effective used by all people, even though the kids, people with disabilities or pregnant, in a barrier-free way.]

d

Guidelines

7a. Provide a clear line of sight to important elements for any seated or standing user.

7b. Make reach to all components comfortable for any seated or standing user.

7c. Accommodate variations in hand and grip size. [In other words, the operation is not limited by a user's hand and grip size to be successful.]

7d. Provide adequate space for the use of assistive devices or personal assistance. [In a word, the special design must be large enough to accommodate the needs of all users including someone with a walker or someone being helped by a nurse.]

Examples

- Wide gates at subway stations that accommodate all users

- Controls on the front and clear floor space around appliances, mailboxes, garbage dumpsters, and other building elements

These Principles of Universal Design address only universally usable design, while the practice of design involves more than consideration for usability. Designers must also incorporate other considerations such as economic, engineering, cultural, gender, and environmental concerns in their design processes.

The principles offer designers guidance to better integrate features that meet the needs of as many users as possible. All Guidelines may not be relevant to all designs.

(Version 2.0 4/1/97

(The authors
Compiled by advocates of universal design, listed in alphabetical order: Bettye Rose Connell, Mike Jones, Ron Mace, Jim Mueller, Abir Mullick, Elaine Ostroff, Jon Sanford, Ed Steinfeld, Molly Story, & Gregg Vanderheiden)

Universal Design Implications & Exemplar

Implications of Universal Design

Universal Design is the design of products and spaces that anticipates future needs in the lifespan of a home and its residents (Peterson, 2002). Typical UD solutions include the following recommendations.

- Site: There are no stairs to climb from the time one-steps out of a car, taxi, or bus, or as one arrives "on foot" along a public way, to the apartment and townhouse. Large and easy to read signs are there to provide help to both residents and visitors find their way.
- Kitchen: All of the stovetops in the kitchen are of the flat-surface variety, safe (do not burn to the touch) and easy to clean. Both stovetops and sink come with height adjustable features and have knee space underneath the counter to accommodate the various needs (stature, mobility, strength) of the person cooking and cleaning. Appliances in the kitchen include a wall oven, which has a side-hinged door with a pullout counter for loading and unloading pans to and from the oven and/or microwave. Efficient use of space is evident with the addition of toe drawers, not only making good use of space but also providing extra storage.

- Bathroom: All of the bathroom lavatories are equipped with knee spaces, with an adjacent barrier-free turning radius of at least 5 feet for wheelchairs. The shower, bathtub and toilet are all surrounded with reinforced walls; in anticipation of future grab bars if they are not yet installed. A built-in folding seat is provided for the bathroom with a shower. Non-slip and textured tiles are selected for the bath floor to prevent falls.
- Bedroom: In case of a temporary or long-term wheelchair need, bedrooms should have at least an open 5' turning radius, depending on the placement of the furniture. All of the doors are 36" wide and are fitted with easy-to-operate lever-style handles.
- Closet and storage: Lighting is placed in all of the closets and storage rooms. An adjustable shelving system is available to easily accommodate different people with different needs.

Sources for these descriptions include the Fair Housing Act Design Manual (1998) and the May issue of Home and Design, featuring "Ingenuity and Freedom" (Whiteley, 2002).

Exemplar of Universal Design

Although various fields of design have responded to the principles of UD with products and services, this thesis is about housing, more specifically about housing in Taiwan. Thus, the text and illustrations will focus on housing and housing-related products. This is no way suggest that UD activities are limited to housing, or that there are not UD exemplars in industry, health care, commercial and institutional developments, transportation or other activities where UD principles have been needed or found to be appropriate.

Selected characteristics of the Taiwanese population and of housing

The following sections describe selected characteristics of the Taiwanese population and of housing in Taiwan.

Population of Taiwan

The estimated residential population for 2003 in Taiwan Area totals 22,301,000 persons. The average annual growth rate of the population was 0.9% over the past decade. Moreover, the average annual growth rate had

continuously declined in the period from the 1996 census to the 2000 census as show in table2-1.

Table 2-2 illustrates the Taiwan population by age group for 1990 and 2000. The United Nations calls an "aging society" that society with a percentage of its population 65 years-and-overs at 7% of the total population. Between 1990 and 2000, Taiwan became an "aging society" by UN definition. Figure 2-1 shows that the shape of Taiwan's population structure is changing from the classic "pyramid" to that of a "column". This occurs as the sign of younger age cohorts decrease and members of older age cohorts survive longer.

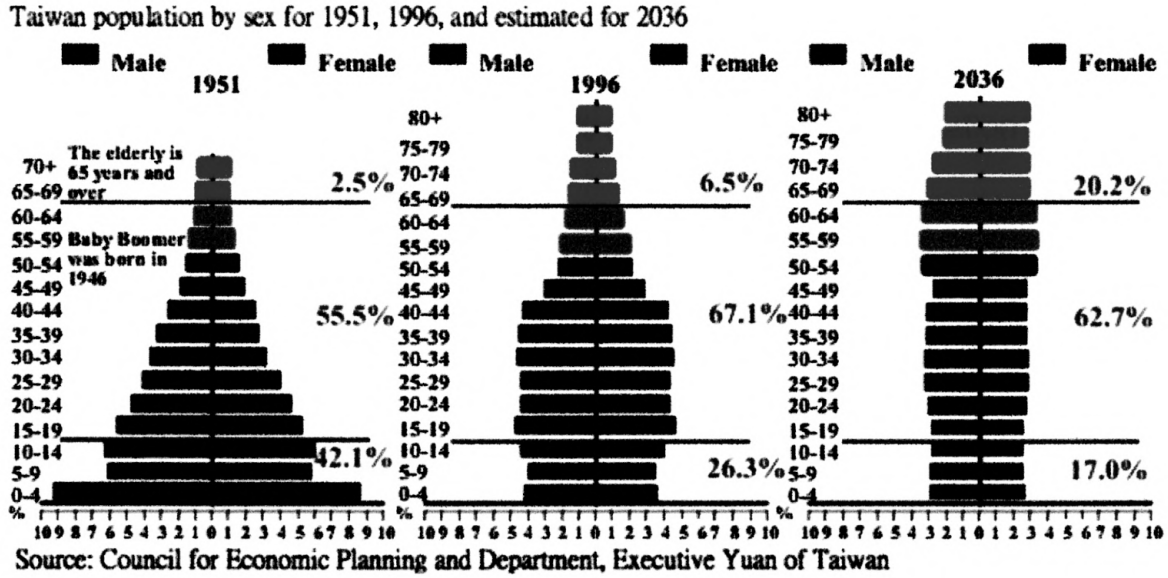
Table 2-1 Average annual population growth rates for selected historical censuses

Average annual population growth rates for selected historical censuses

	Grand total person	Average annual growth rate %
Census 1966	13,505,463	3.7
Census 1970	14,769,725	2.3
Census 1975	16,279,356	2.0
Census 1980	18,029,798	2.1
Census 1990	20,393,628	1.2
Census 2000	22,300,929	0.9

Resource: The Ministry of Interior Department

Figure 2-1 Taiwan population by sex for 1951, 1996, and estimated for 2036



An estimate of the aging population by the Ministry of Interior Department suggests that the total aging population will increase each year between 2000 and 2010 on average 47,000 persons. The aging population will rise to 9.8% of the total. From 2010 to 2025, the 65-and-over population will increase each year to 124,000 people to become 16.5% of the total population in 2025. That percentage will expect to jump to 20% of the total population by the year 2032. These estimates suggest that over the next 20 years, the older population category will increase by more than 13%. Perhaps the most important trend in aging population statistic affecting the demand for universal design is that of the aging of the so-called Baby Boom generation, the dramatic population increase in Taiwan

and elsewhere that began in 1946. Today, 2004, many members of that generation are now in their 50s.

The 2000 census reports that 19.4% of the residential population is found in the 45-64 age cohorts (See table 2-2). Moreover, there are 808,203 persons in 55-59 year group and 761,156 persons in 60-64 year group. (See appendix C table 1) The population impact of the Baby Boom generation are briefly discussed here and can be seen in Appendix C Table 1. The first of the Baby Boomers were 34 in 1980. Between 1980 and 1990, that Baby Boomer age-cohort increased 58 percent, a similar increase occurred as the group (who were 44 in 1990) increased by 2000 by nearly 60 percent.

Table 2-2 Taiwan population by age groups and dependency ratios for 1990 and 2000

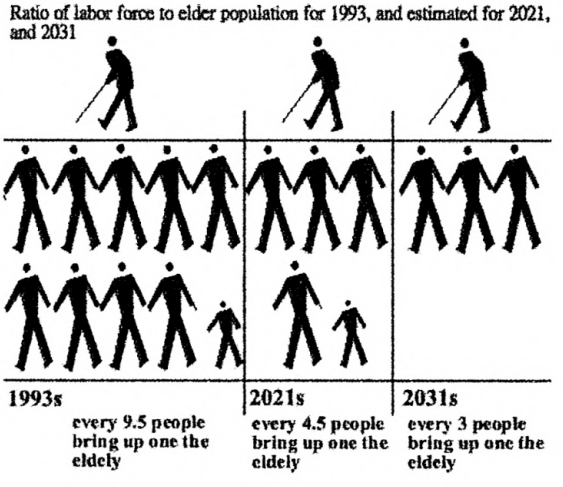
Taiwan population by age groups and dependency ratios for 1990 and 2000

	Grand Total	Less than 15 years	15-64 years				65 years and over	Dependency Ratio	
			Total	15-24 years	25-44 years	45-64 years		Child	Elder population
All the end of 1990 — 000 persons	20,394	5,490	13,664	3,821	6,674	3,169	1,239	-	-
All the end of 1990 — %	100.0	26.9	67.0	18.7	32.7	15.6	6.1	40.2	9.1
All the end of 2000 — 000 persons	22,000	4,665	15,448	3,851	7,340	4,258	1,887	-	-
All the end of 2000 — %	100.0	21.2	70.2	17.5	33.4	19.4	8.6	30.2	12.2

Note: 1. Child dependency ratio: 0-14 years population/15-64 years population. 2. Elder dependency ratio: 65 years and over/15-64 years population.

Source: Council for Economic Planning and Department, Executive Yuan of Taiwan

Figure 2-2 Ratio of labor to elder population for 1993, and estimated for 2021, and 2031



Source: Council for Economic Planning and Department, Executive Yuan of Taiwan

Table2-3 Comparison of percent 65-and-over of population by selected countries

Comparison of percent 65-and-over of population by selected countries

Country / Years	Sweden	United Kingdom	France	Germany	United States	Japan	Singapore	Taiwan
1900	8.4	5.2	8.2	---	4.1	---	---	---
1960	11.8	11.7	11.6	10.8	9.2	5.7	---	2.5
1973	14.5	13.6	13.2	13.9	1. 10.5	7.9	2. 5.7	3.2
1984	16.9	14.8	12.9	14.7	3. 11.7	10.0	4. 7.2	4.8
2000	17.2	15.3	14.7	16.7	12.0	15.1	11.1	8.4

1. - 1975 2. - 1970 3. - 1985 4. - 1980

Source: 1. Council for Economic Planning and Development, Executive Yuan of Taiwan

2. Singapore Census

3. Johnson, P., etc, (ed.), Workers vs. Pensioners: Intergenerational Justice in an Aging World, Manchester U. Press, 1989, p. 26-27.

This table illustrates that, by the UN definition, Sweden and France had each become an "aging society" early in 1900s, and the percent of the population 65-and-over has slowly increased to about double in the 100 years from 1990 to 2000. In contrast, Japan became an "aging society" by 1973, and its population 65-and-over almost doubled in the 27 years from 1973 to 2000.

Table2-4 Comparison of the total years of the aging population's ratio from 7%-14% and over in different country:

Name of Country	Ratio of aging population 7%	Ratio of aging population 14% and over	Total years of the aging ratio from 7%-14% and over
Taiwan	1994	2021	27years
Singapore	1980	15% 2010	30years
Japan	1970	1994	24years
United States	1945	2015	70years
United Kingdom	1930	14. 8% 1984	54years
Germany	1930	14. 7% 1984	54years
Sweden	1890	14. 5% 1973	83years
France	1865	14. 7% 2000	135years

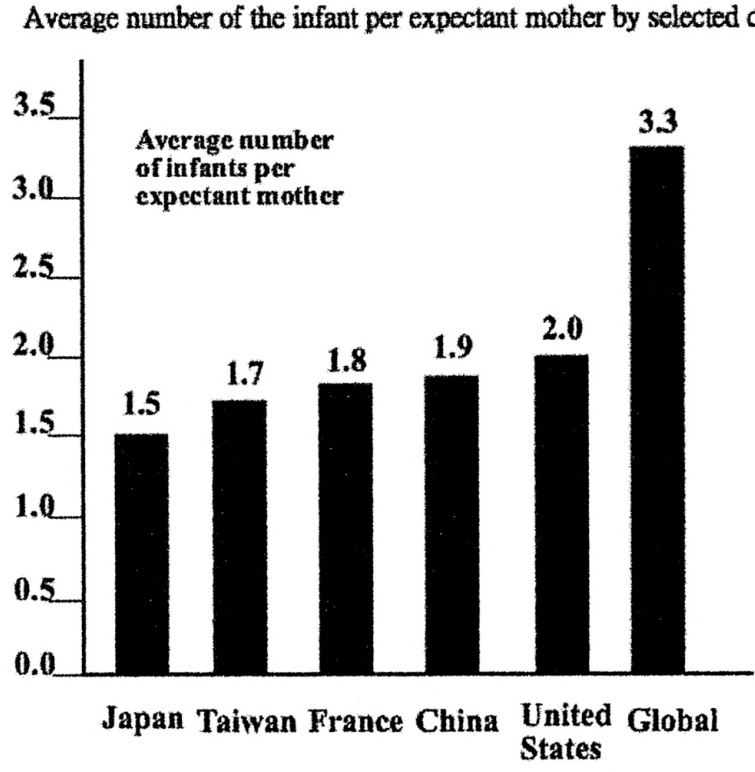
Source: 1. Population Census, the Ministry of Interior Department of Taiwan
2. Singapore and Japanese Census
3. Johnson, P., etc, (ed.), Workers vs. Pensioners: Intergenerational Justice in an Aging World, Manchester U. Press, 1989, p. 26-27.

Singapore, Japan, and Taiwan became "aging societies" later than other countries, but in contrast to the Western countries listed they have taken (or will take) fewer years to reach the doubling of the UN definition (from 7 to 14 percent of the population 65-and-over).

The Taiwanese Ministry of the Interior Department's Department, population statistics show that in 1993, there were 9.5 people, -less-than-65 for every person 65-and-over. Their estimate for 2021 suggests there will be every 4.5 people for each 65-and-over person. By 2031, their estimate is that the ratio will be 3:1. (See Figure 2-2)

A related population issue is that of birthrates. As shown in table 2-5, the birthrate in Japan is the lowest of these selected countries. However, the birthrate of Taiwan ranked second.

Table 2-5 Average number of the infant per expectant mother by selected country



Source: Population statistics of the Ministry of Interior Department of Taiwan

Housing Stock/Housing Types

The development of the Taiwanese housing stock and housing types reflects economic development. For example in the year 2000, the percentage of those employed in the service sector is almost 8 times that of agriculture. This is a radical shift from what was the agriculture/industry/services employment split in the early 1950s. At that time, the agricultural sector amounted to 64 percent of all employment. Big cities and metropolitan areas gained housing as a reflection of this shift in economic development. Housing architecture shifted as well. "Typical" housing types shifted from low-density to high-density; the housing types changed from the traditional rural house (type A) to apartments and high-rise building. The new units are smaller than traditional house and, by many accounts; the living quality is inferior to the earlier town house < tou-tian-cuo >.

(See figure 2-3&2-4, and table 2-6&2-7)

The popular or typical housing units from 1940s to 1990s can be divided into seven types. Type A is the Traditional rural house. Type B is the Semi-detached house. Type C is the Terraced house< a two or three story house is so-called tou-tian-cuo >. Type D is the Five-and-fewer story apartment buildings without elevators. Type E1 is a unit found in buildings of 6 to 12 stories. Type E2 is a unit

found in buildings that are over 12 stories high. Type F is the residual category "others". (See figure 2-3&2-4, and table 2-6&2-7)

Figure 2-3 and Table 2-6 illustrate the shifts in the types of housing between 1980 and 1990. This shift continued the changes that began as the result of economic development and political changes in Taiwan since the 1940s. For example, there were no apartment structures (types D, E, and F) prior to 1960. The longer-term changes are illustrated in Figure 2-4 and Table 2-7 showing the total housing units built by type and by decade since the 1940s compared with the totals in existence prior to 1945.

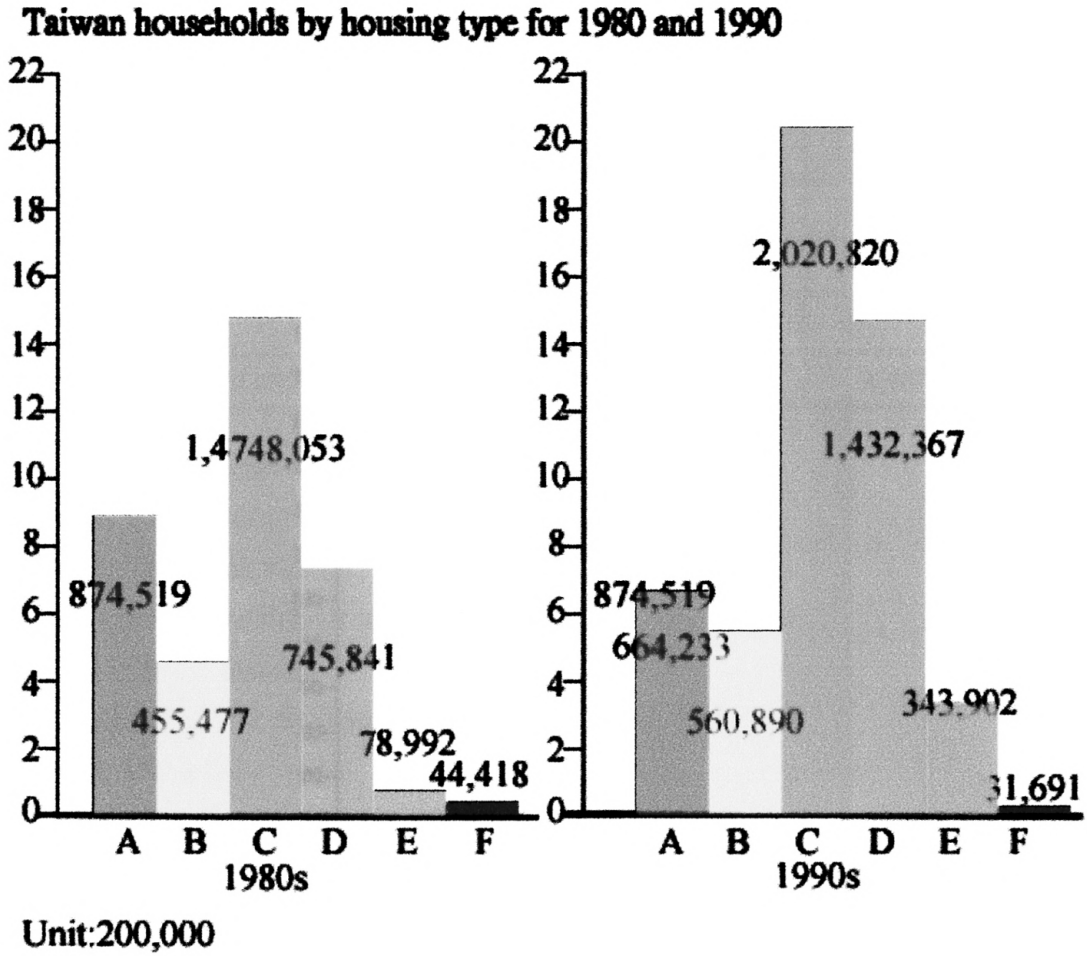
Table 2-6 Taiwan households by housing type and percent for 1980 and 1990

Taiwan housholds by housing type and percent for 1980 and 1990

	1990s		1980s	
Household / Housing Types	Household	%	Household	%
A	664,233	13.14	874,519	23.78
B	560,890	11.10	455,477	12.39
C	2,020,820	39.99	1,478,053	40.19
D	1,432,367	28.34	745,841	20.28
E	343,902	6.80	78,992	2.15
F	31,691	0.63	44,418	1.21
Total	5,053,903	100	3,677,300	100

Source: Population statistics of the Ministry of Interior Department of Taiwan

Figure 2-3 Taiwan households by housing type for 1980 and 1990

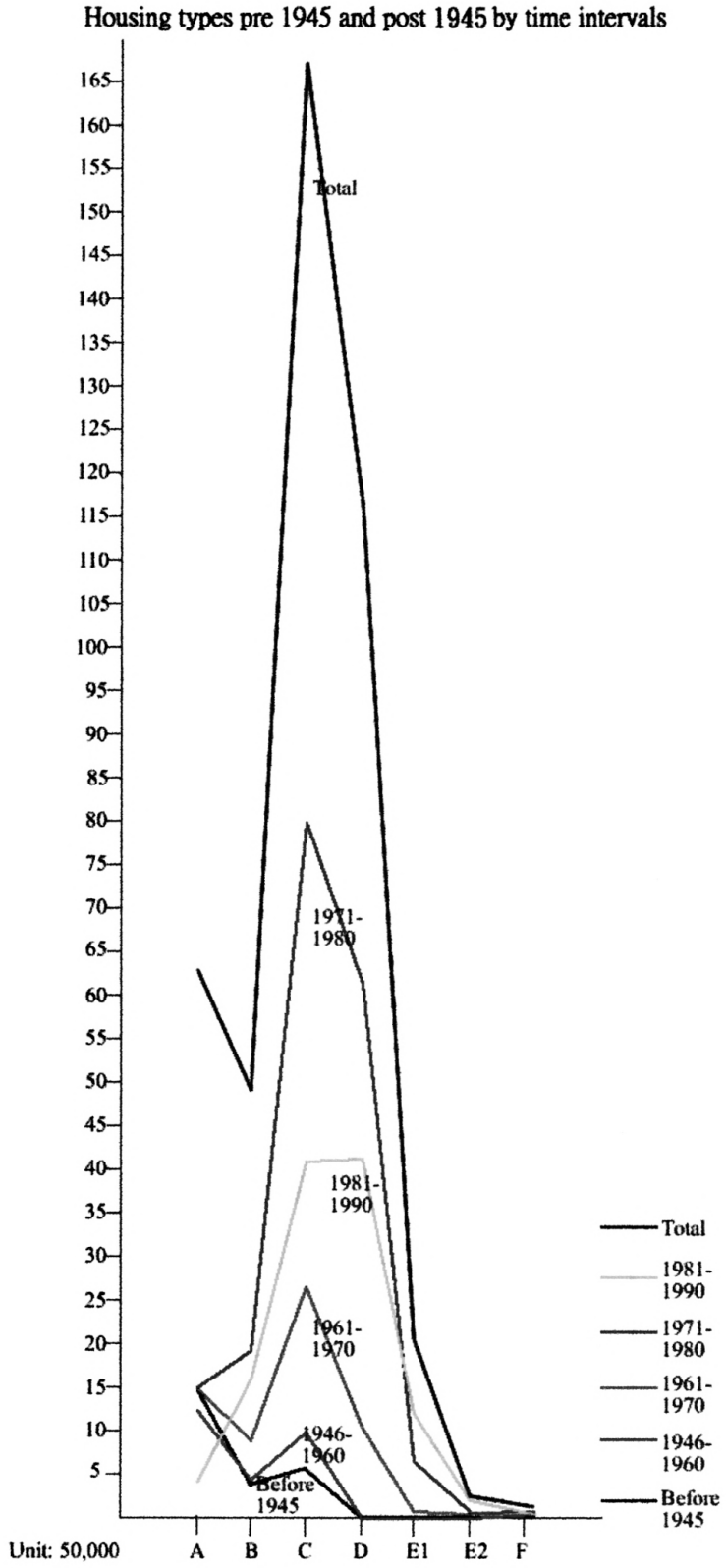


Source: Population statistics of the Ministry of Interior Department of Taiwan

Type A: Traditional rural house
Type B: Semi-detached house/ Duplex house
Type C: Terraced house
Type D: Five-and-fewer story apartment buildings without elevators
Type E: Apartment buildings greater than five stories
Type F: Others

Source: Population statistics of the Ministry of Interior Department of Taiwan

Figure 2-4 Housing types pre 1945 and post 1945 by time intervals



Source: Population statistics of the Ministry of Interior Department of Taiwan

Table 2-7 Housing types pre 1945 and post 1945 by time intervals

Housing types pre 1945 and post1945 by time intervals

	Before 1945s	1946-1960s	1961-1970s	1971-1980s	1981-1990s	Total
A	142,413	121,602	147,068	147,717	46,620	632,420
B	31,508	37,648	83,863	187,871	158,344	499,234
C	57,692	99,864	267,985	796,694	451,066	1,673,301
D	0	0	103,089	613,958	452,521	1,169,568
E1	0	0	7,231	69,143	129,422	205,796
E2	0	0	156	4,462	26,779	31,397
F	2,902	4,570	6,289	7,048	4,659	25,468

Type A: Traditional rural house

Type B: Semi-detached house

Type C: Terraced house

Type D: Five-and-fewer story apartment

Type E1: 6-12 stories

Type E2: Over 12 stories

Type F: Others

Source: Population statistics of the Ministry of Interior Department of Taiwan

Table 2-8 Selected household and housing characteristics for 1980, 1990, and 2000

Selected household and housing characteristics for 1980, 1990, and 2000

	Average floor area per person square meter/person	Average number of rooms per person room/person	Average size of household person/household	Household ownership rate %	population density person/km2	Average number of persons per housing unit person/housing unit	Average floor area per housing unit square meter/ housing unit
1980	15.3	0.7	4.8	79.1	498.0	5.6	85.9
1990	24.1	0.9	4.0	78.5	563.6	4.6	111.1
2000	31.6	1.2	3.4	82.5	616.3	3.9	122.1

Source: Council of Labor Affairs, Executive Yuan of Taiwan

Economic characteristics of housing

In terms of percentage, relatively few people 55 and over are low-income. Moreover, those on the leading age of the Baby Boom generation often have substantial income and are inclined to spend it. Perhaps the most important trend in aging affecting the demand for universal design is the aging of the Baby Boom generation, that began in 1946 and that many are just now in their 50s.

Hosing Development and Problems after Restoration of Taiwan:

Housing conditions and problems are presented here with their linkages to social and economic development.

I. 1945-1960s Economic "Rehabilitation Period"
   - Postwar Baby Boom: The housing area was insufficient, especially during the period from 1953 to 1959s. The frequent "natural disasters" even made problems of shortage of housing stock and insufficient housing area worse.

II. 1960-1975s Economic "Development Period"
   - At the early stage of industrial development, people migrated from countries to cities rapidly. As a result, it became overcrowd in cities. (Residential buildings, land and housing prices are increasing with time.)

III. 1975s-1990s Economic "Transformation Period"
   - Transformation to Industrialized Economy:
     The price of real estate jumped,

↓

(1) low environmental quality

(2) Higher housing consumption in cities (expensive rent and housing price)

Ex.: Monthly pay: NT$20,000, rent: NT$15,000

After the price of real estate shoot up madly, people could afford to buy a house of about 30 pings in Taipei only if he/she had an annual income of NT$13,000,000 – 23,000,000.

In the 1970s and 1980s, housing prices increased greatly. By the late 1970s prices had increased from a previous nine times earlier prices to as much as eighteen times prices from the early 1970s. A greater increase occurred in the 1980s where by the late 1980s prices were as much as twenty three times as high—and that from an earlier in the decade high of thirteen times increase. In addition, the reasonable value established by the United Nations was then a three to seven times increase.

IV. 1990s-now "Nationalization Period"

- Increase of migrants (immigration to cities or foreign countries)

Low growth of population in 1990s → an inverted triangle of population structure.

Housing Development Period

V. 1975s-1990s

1975s→ "High tide of immigration"

1970s→ 1980s

↓

□ Development of residential buildings

↓

□ Promotion of real estate market (active development of the real estate market)

VI. 1980s-1990s

1980s and 1990s → The price of real estates in Taipei City rose to preposterous heights.

1986s → a. The people engaged in the service industry were now more than those employed in industry.

41.5% > 41.47%

b. New Taiwan Dollars kept appreciating.

1988s → The population of Taipei City registered negative growth.

Economic Development of Taiwan:

* Per capita income: 1965 – 203 USD
  1980 – 2155 USD
  1990 – 7332 USD

Vacancy Rate: 1996 – 0.22% less
1980 – 13.12% ↓
1990 – 13.16% more

The phenomenon of shortage of housing units disappeared.

* But, 1980s and 1990s were big years
  Example: the housing price of Taipei City
  - 1979: Price increased by 38%.
  - 1980: Price increased by 47%.
  - 1989: Price increased by 96%.
  - 1990: Price began to drop.

Table 2-9 Employment by sector and age group for 1990 and 2000 in Taiwan

Employment by sector and age group for 1990 and 2000 in Taiwan

Unit: %		Grand total	Agriculture	Industry	Services
1990	Grand total	100.0	19.1	27.8	54.0
	15-24 years	100.0	6.6	28.5	64.9
	25-44 years	100.0	13.5	31.6	54.9
	45-64 years	100.0	36.2	19.5	44.4
	65 years and over	100.0	61.3	9.2	29.5
2000	Grand total	100.0	8.5	28.1	63.4
	15-24 years	100.0	1.8	25.7	72.5
	25-44 years	100.0	4.4	31.0	64.6
	45-64 years	100.0	16.2	25.3	58.5
	65 years and over	100.0	59.9	7.3	32.8

Source: Council of Labor Affairs, Executive Yuan of Taiwan

Table 2-10 Housing purchasability for 1981 through 1992

Housing purchasability for 1981 through 1992

Items / Years	Average purchased price per houshold 1,000 Taiwanese dollar (A)	Average income per hosehold 1,000 Taiwanese dollar (B)	Purchasable ability = (A)/(B) Times
1981	1,331	266	5.00
1982	1,506	275	5.48
1983	1,566	296	5.29
1984	1,763	314	5.61
1985	1,932	320	6.04
1986	2,181	342	6.38
1987	2,221	366	6.07
1988	2,645	410	6.45
1989	3,323	465	7.15
1990	3,423	520	6.58
1991	4,180	587	7.12
1992	4,338	640	6.78

Source: Council of Labor Affairs, Executive Yuan

Housing Market

A summary of the Taiwanese housing market:

1985-1994 – The real estate market fluctuates greatly.

1987-1989 – The market value of real estate increased rapidly and it became stable or went a little up in the subsequent years.

1989 – The price of real estates in Taiwan is at its high peak.

Later, the price of real estate turned down, and the market has declined slowly. Meanwhile, the supply of newly-built housing units increased gradually. As a result, the vacant houses increased continuously and further produced a negative influence upon the market of newly-built houses and pre-sales houses. The devaluation of housing prices and an imbalance of housing unit supply and demand has partially occurred because of the control of floor area ratio implemented by the central government, which led to excessive construction of housing units by construction companies.

Japanese Era:

Japanese Era – 1920 - The population migrated from countries to cities.

1960 – The economic structure of Taiwan changed gradually from an agricultural society to a society of industry, commerce and service trades, especially during the period from 1986 to 1991.

Statistics of Housing Units:

	Year 2000	Year 1990
Population: 22,000,000 people		-----
Existed Number of Housing Units: 6,990,416		> 5,088,232 units
Average Housing Number per Household: 1.1		> 1
Housing Ownership Rate: 82.2%		
Average Number of Persons Per Housing Unit: 3.3 persons		
Average Number of Rooms per Housing Unit: 4 rooms (including living/dining rooms)		
Average Number of Rooms per Person: 0.9 rooms		

Legislation influencing housing:

Influential Central Government domestic housing policies and laws since 1957 include:

I. 1957 – 1975 → Statute of Public Housing Loan
II. 1975 – 1982 → It is expressively specified in the "Statute of Public Housing Act" that all public housing units should be constructed by the government.
III. 1982 – 1989 → The Statue of Public Housing Act was revised to include the regulations of providing loans to people for construction of public housing units by themselves as well as incentive methods for investment in construction of public housing units. Meanwhile, people were encouraged to construct the public housing units with their own resources in order to attain the goal of restricting quantities by controlling prices.

Chapter III

Research Methodology

Description of Taiwanese housing types

This chapter illustrates the Taiwanese housing types, A through E, introduced earlier in chapter2.

Housing type A: Traditional Rural House—

This housing type is an independent, freestanding architecture. These are no common walls with neighboring housing. The base architectural plan develops from a linear organization ("—") that is "one continuous line or a connected sequence or a coordinated process. It is also found as an open-on-one-side"ㄇ" shape and even as large as an open-square "口" shape (see image 1 & 2 of appendix C table 2).

Housing type B: Semi-detached / Duplex house—

Housing type B is two houses joins a common wall. (See image 2 of appendix).

Housing type C: Terraced house—

Housing type C is so-called "tou-tian-cuo" that develops from a long narrow strip of form, from single-story houses and is no more than three stories. These kind houses have the common wall uniting neighbors together. Each unit has a corridor, which joins with similar corridors of neighbors across the front of the units. (See image 1 & 2 of appendix C table 2).

Housing type D: Five stories and fewer without elevators--

Housing type D includes apartments that began to be built in the 1960s. The total floor area of a typical type D unit is small and there are fewer rooms than in most other types. (See image 2 of appendix C table 2).

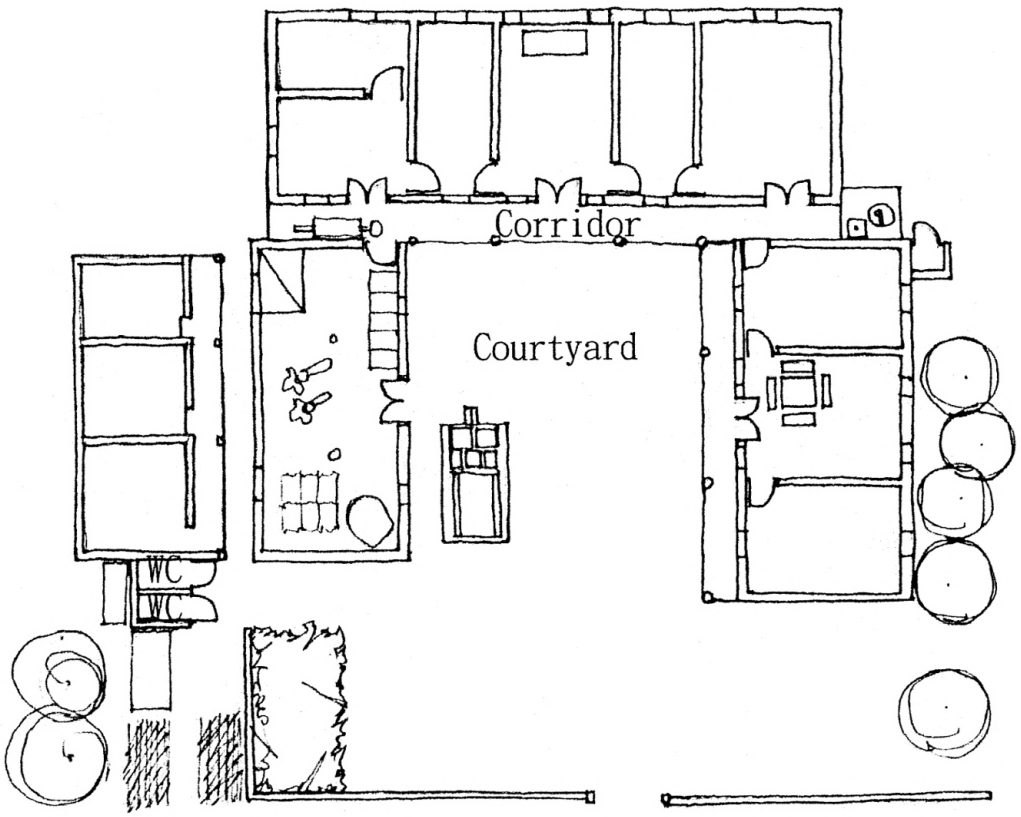
Housing type E: Over five stories--

Housing type E is similar to housing type D, but is built with elevator service. Also, the total floor area is larger and there are more rooms than found in type D units. (See image 2 of appendix C table 2).

Examples of Taiwanese Housing by housing type

Figure 3-1-1 Housing type A

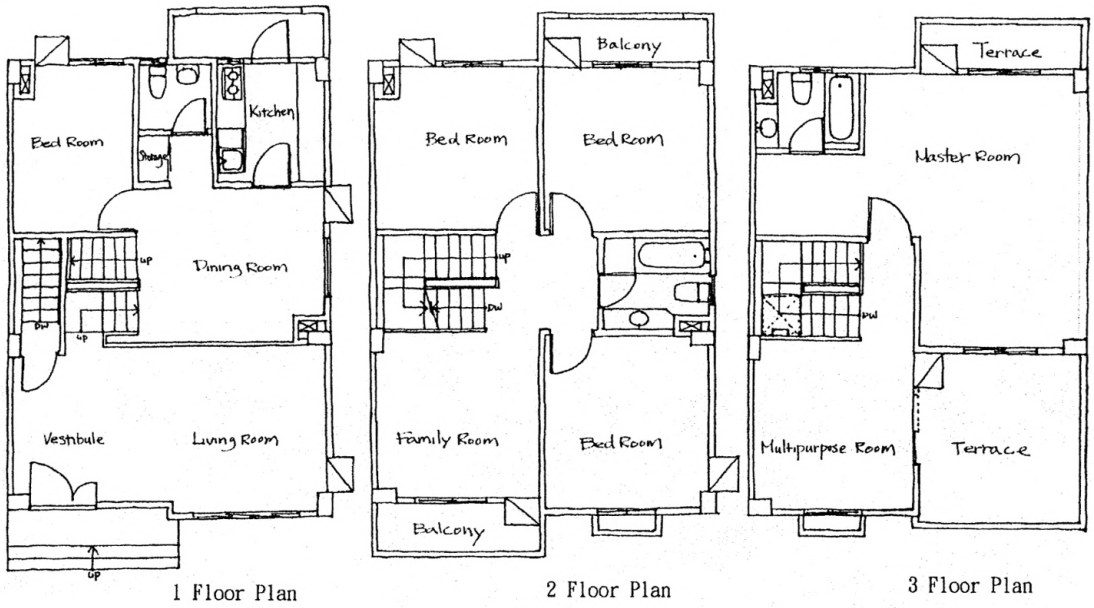
Housing type A: Traditional Rural House—



Housing Type A:
Traditional Rural House

Figure3-1-2 Housing type B

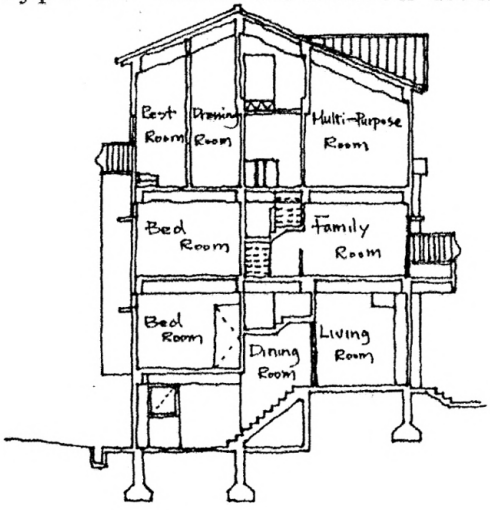
Housing type B: Semi-detached house/ Duplex house—



1 Floor Plan 2 Floor Plan 3 Floor Plan

Housing Type B:
Terrace House

Type B: Semi-Detached House

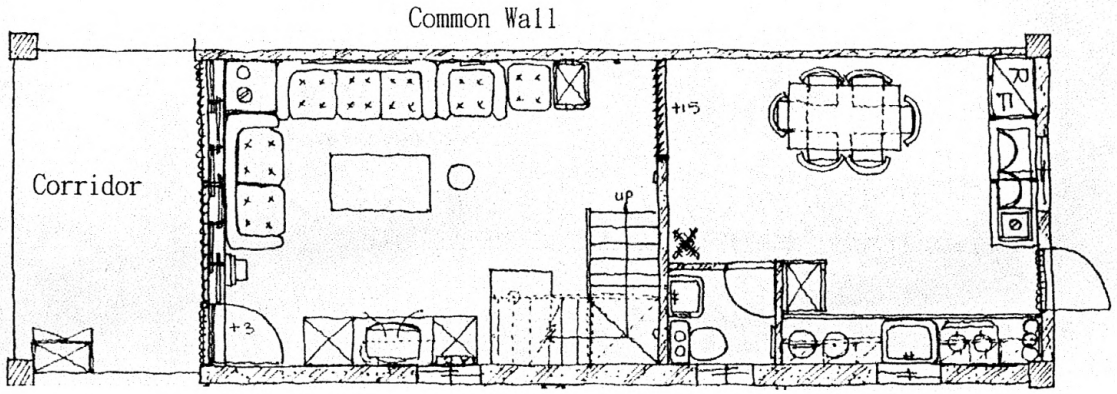


Section of house

North Elevation

Figure3-1-3a Housing type C: First Floor Plan

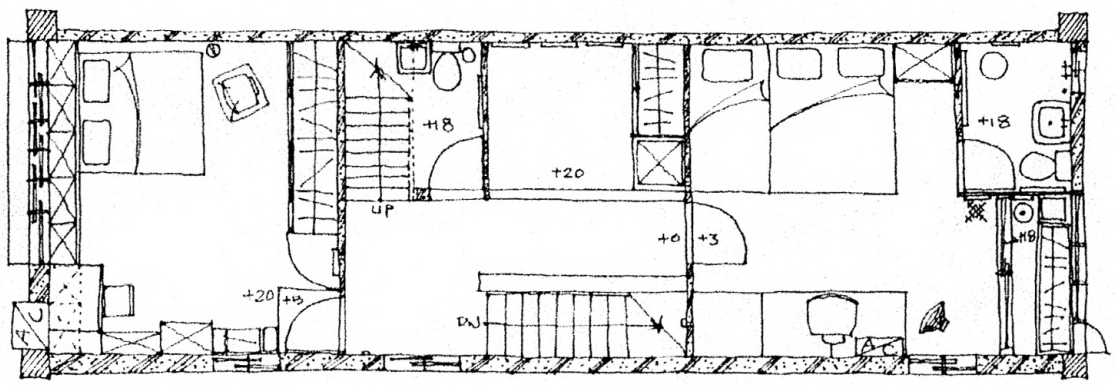
Housing type C: Terraced house—



Housing Type C

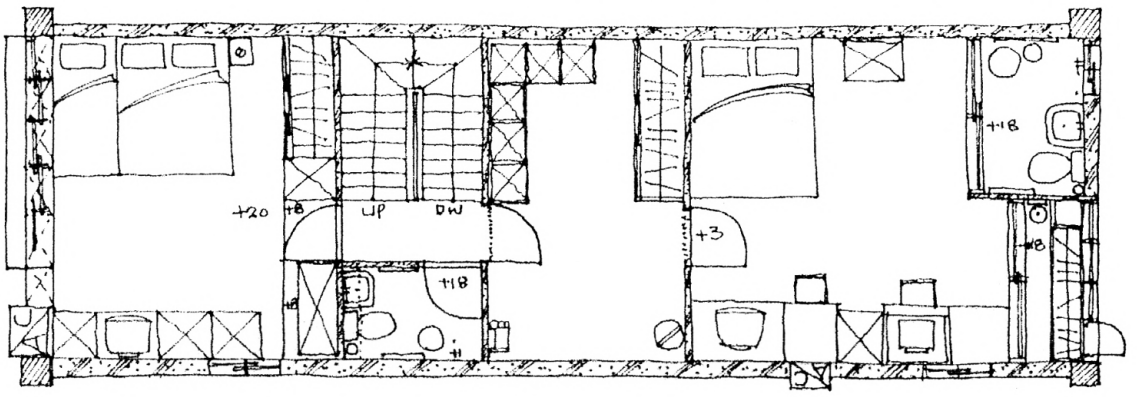
1 Floor Plan Scale:1:100

Figure3-1-3b Housing type C: Second Floor Plan



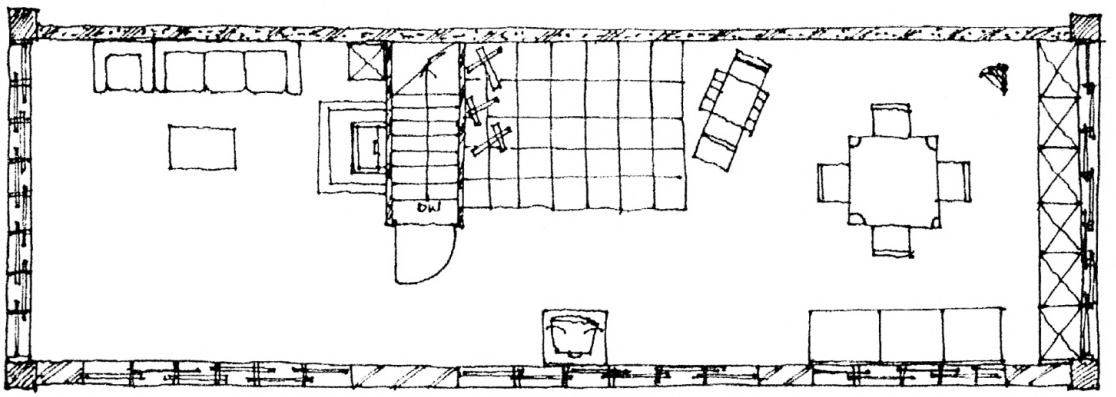
2 Floor Plan Scale:1:100

Figure3-1-3c Housing type C: Third Floor Plan



3 Floor Plan Scale:1:100

Figure3-1-3d Housing type C: Fourth Floor Plan



4 Floor Plan Scale:1:100

Figure3-1-4 Housing type D

Housing type D: Five and fewer stories, no elevator.

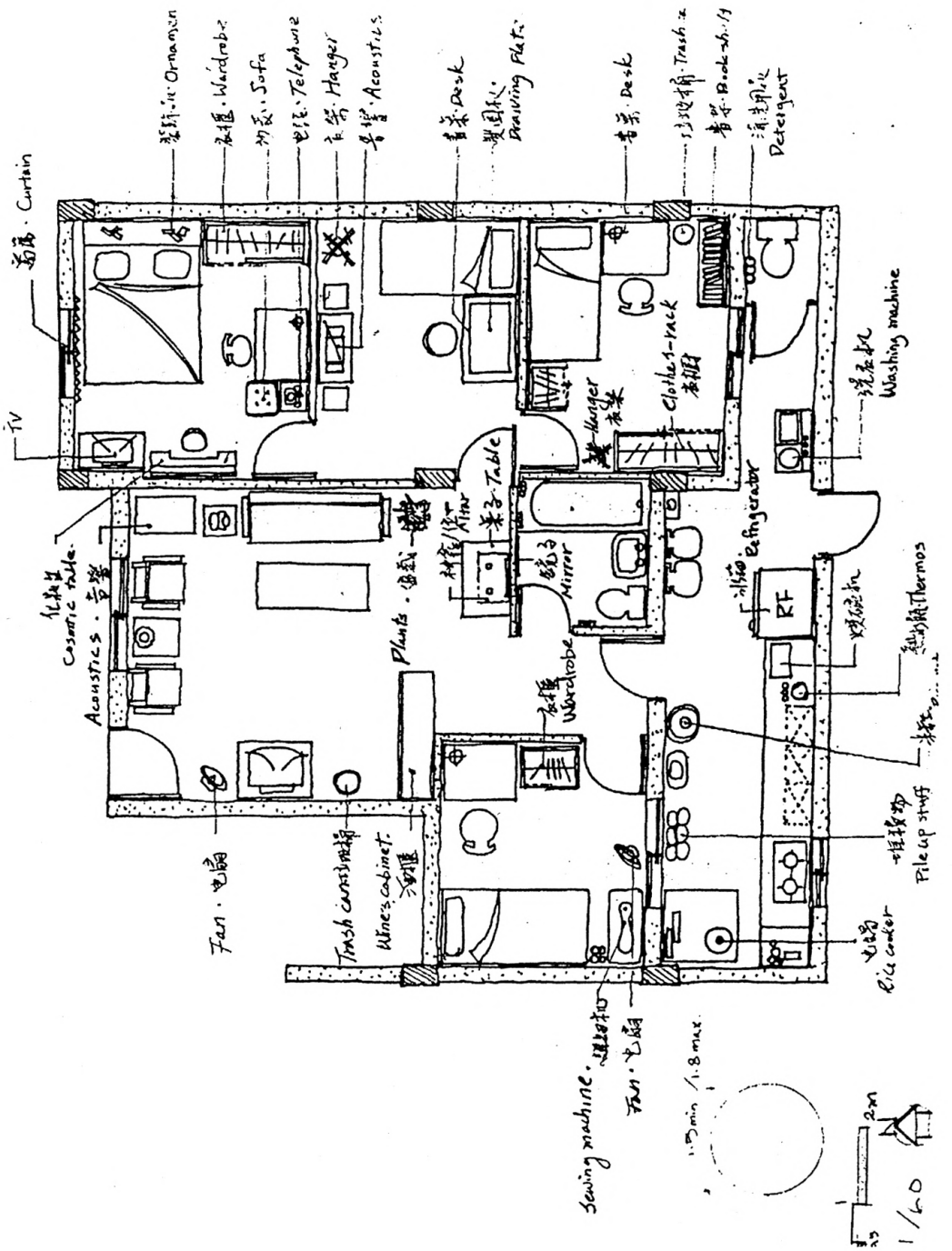
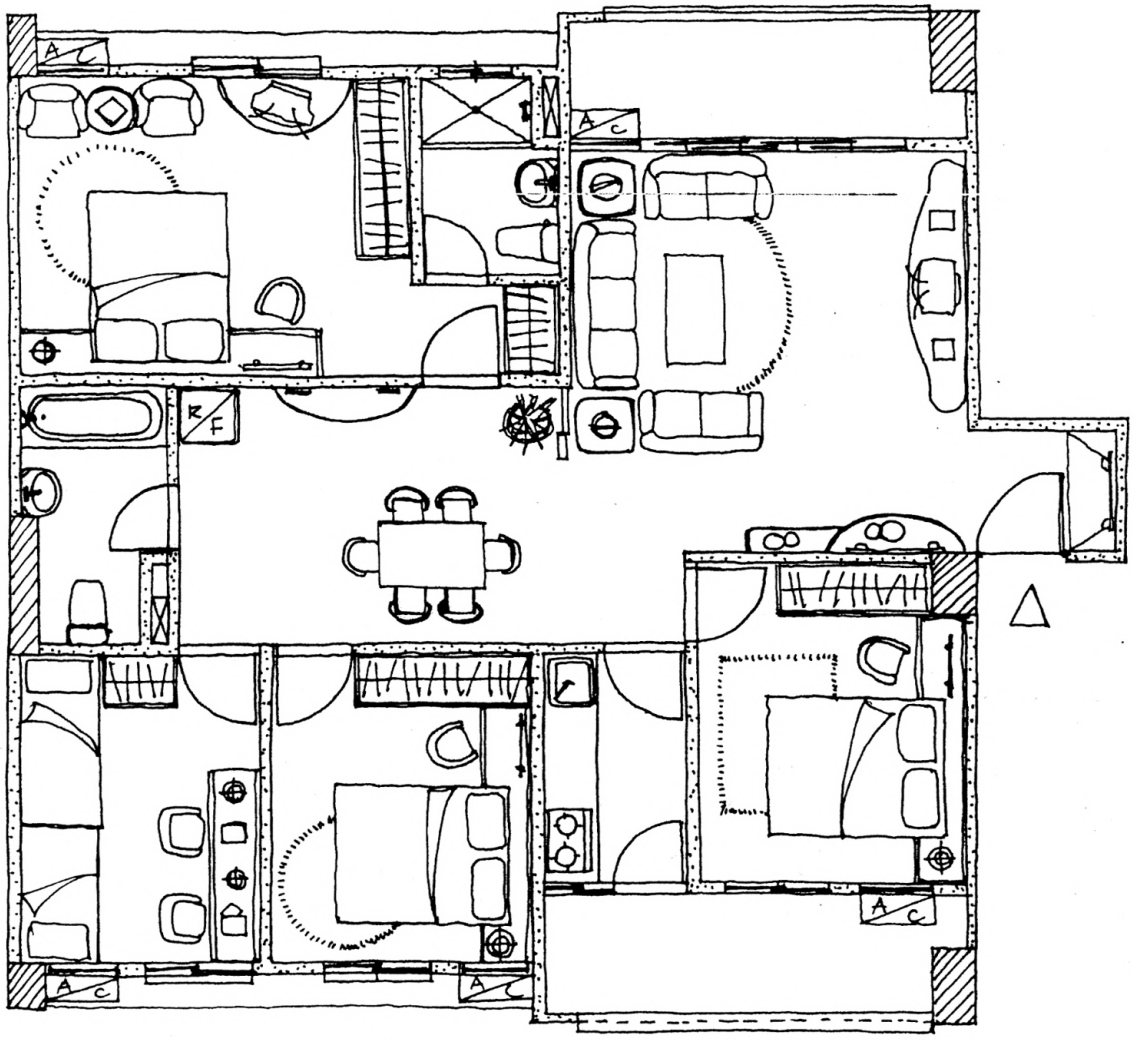
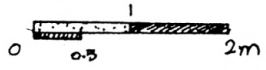


Figure3-1-5 Housing type E

Housing type E: Over five stories—





Universal Design issues regarding generic housing features

"What is good design? What does one mean by "a responsive place"? What housing does one really want to have now? What is "quality of life" and what do we truly have today? Does anyone ever think about our environment especially whether it is accessible for all people? I believe Universal Design is a guide to keep answers those sorts of questions.

Common issues and problems are described and solutions are proposed using UD principles to the examples of Taiwanese housing types.

General issues of the Taiwanese housing are identified and solutions proposed:

- **Layout:**

Issue: location of bedrooms

Considering UD principles # 6, the following issues emerge.

In the housing types B and C, there are no bedrooms on the first, or ground, floor. Therefore, people with disabilities or with loss of mobility (e.g. as may be experienced in aging), who often have difficulty going up and down stairs, have limited choices and may spend much time isolated on an a

bedroom floor level or on the first floor without a proper bedroom.

Solutions –

These solutions follow from UD principles # 6

Two solutions include:

1. The most direct way, and for many persons the "best" way to solve this issue, is to create a bedroom and bathroom on the first floor.
2. A generally more expensive way is to build a household elevator or stair lift to assist people, needing to move from one floor level to another. (See figure 3-2-2&figure 3-2-3)

For example, my own grandmother lives in a housing type C. She needs to go up-and-down stairs every day because spaces for necessary functions are on different floor levels of her house; recently, she slipped and fell while on the stairs, an unfortunate, painful, and certainly undesired "accident."

- **Stairs, Steps, and Thresholds:**

Issues –

Considering UD principles # 6, the following issues emerge.

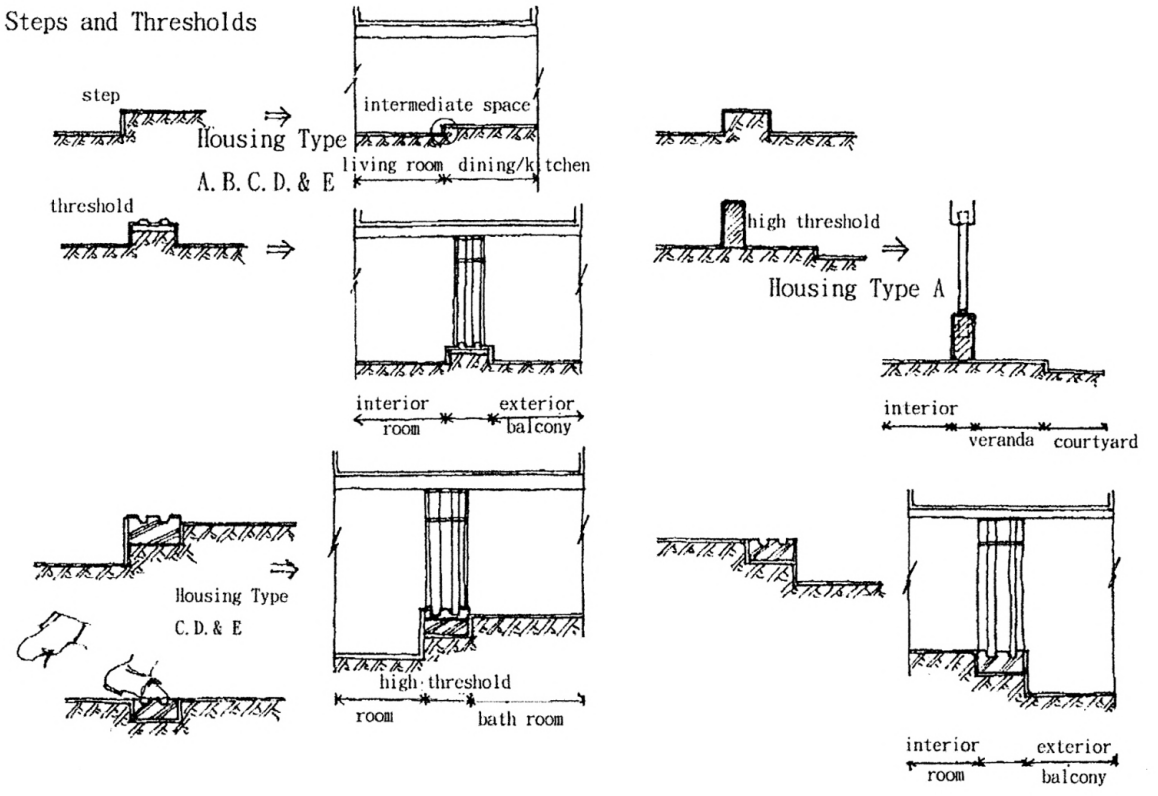
A. Stairs: In the housing types B and C, the stairs are be used for bridging between different layers or building stories. In the apartment- on-a-single

floor (flats) represented by housing types D and E, the vertical movement between floors occurs in the public space. In housing type D, vertical access is via (public) stairs. Thus, only in housing type E, with an elevator for vertical movements, and housing type A, which is all on the ground floor, are stairs not a problem in Taiwan.

B. Steps: The steps always occur in the each of the housing types, including type A to E, to bridge from room to room, from outside to inside, or from inside to balcony, garage, and so on. In Taiwan, residents often do laundry in the balcony, bathroom, and garage; steps between such spaces make, for some persons, the space or activity inaccessible or not safe. (See figure 3-2-1)

C. Thresholds: "High thresholds" are not limited to outside doors. They are also found especially in ant "traditional" house, (new or old) in doorways between indoor rooms. Some believe that these details originated as a solution to typhoons and flooding conditions. High thresholds are common elements in all housing types. At 18cm (7+ inches), some are as high or higher than a normal step; but most thresholds are about 5cm (2 inches) high. Even on these lower thresholds, people, especially, kids and the elderly, often trip and fall. (See figure3-2-1)

Figure 3-2-1 Steps and Thresholds



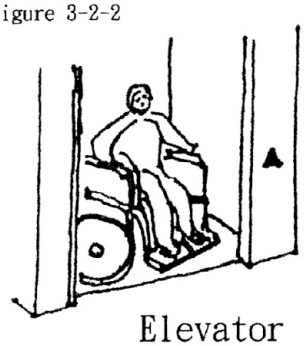
Solutions –

These solutions follow from UD principles # 6

A. Stairs: For independence throughout ones life cycle, build a household elevator or stair lift to assist people, or make provisions such that elevators or lifts can be installed later with ease, or little additional cost beyond the mechanical device itself. (See figure 3-2-2& figure 3-2-3)

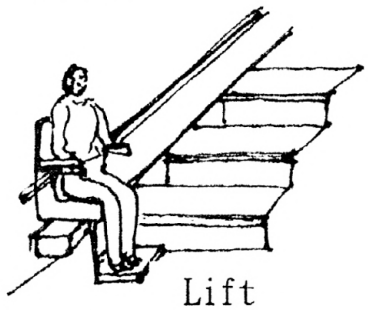
Figure 3-2-2 & 3-2-3 Elevator & Lift

Figure 3-2-2



Elevator

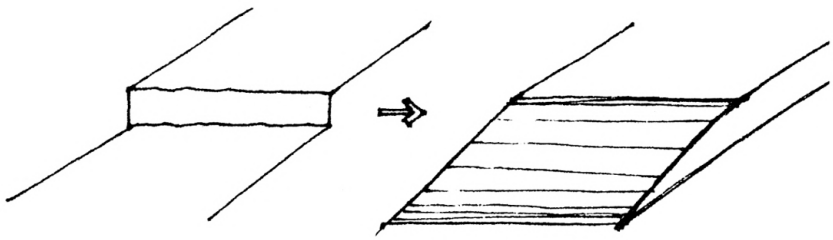
Figure 3-2-3



Lift

B. Steps: The best solution is to remove the steps if they are not necessary to have in the house. However, if the steps are in an existing house, or because steps are necessary because of planning, design, or construction decisions, the steps are necessary, a solution is to create a ramp for accessibility by people with a wheelchair or assisting devices. (See figure 3-2-4)

Figure 3-2-4 Step & Ramp

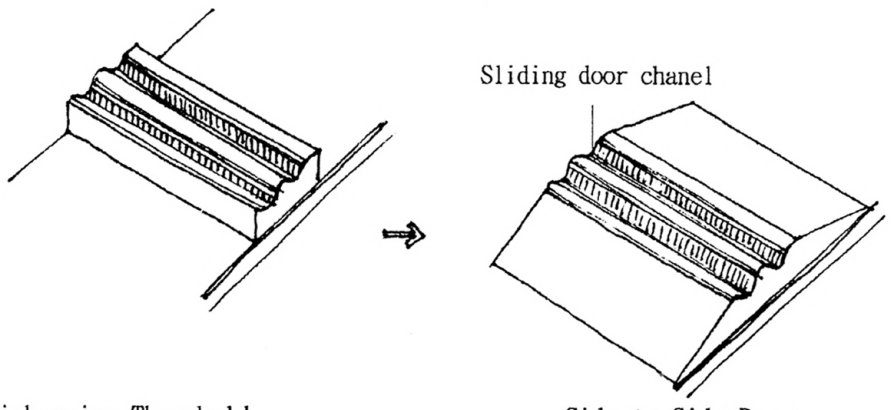


Step Ramp

C. Thresholds: To create a ramp in the both sides of the threshold to reduce the injury happening and assist people accessibility and safety to go in-and-out, assuming that the ramp itself does not add a new barrier, especially for travel

perpendicular to the ramp, nor is the ramp so steep as to not aid in accessibility. (See figure 3-2-5)

Figure 3-2-5 Threshold & Ramp



- **Doors:**

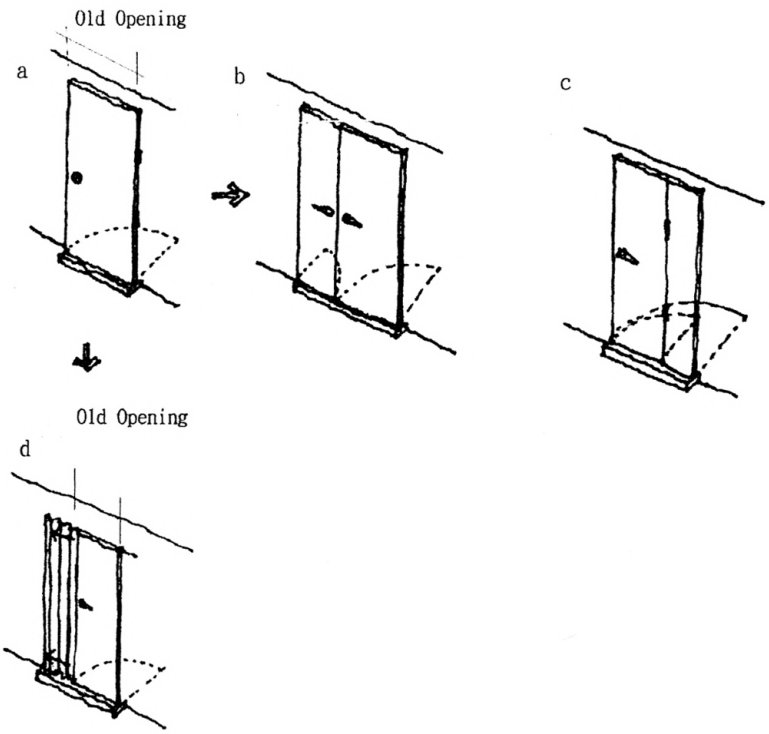
Considering UD principles # 5, and # 7, the following issues emerge.

Issues –

A. The width of the door: Most inside doors in Taiwan are too narrow for assisting-devise use, or if another person is helping someone and their path includes a doorway. This is especially true for bathrooms where the door of typically is about 60-65cm (23.6 – 25.5 inches) wide. The door into many rooms is about 70-75cm (27.5 – 29.5 inches) wide. Although, recent doors are wider than the past, it is still a problem for access. For instance, people

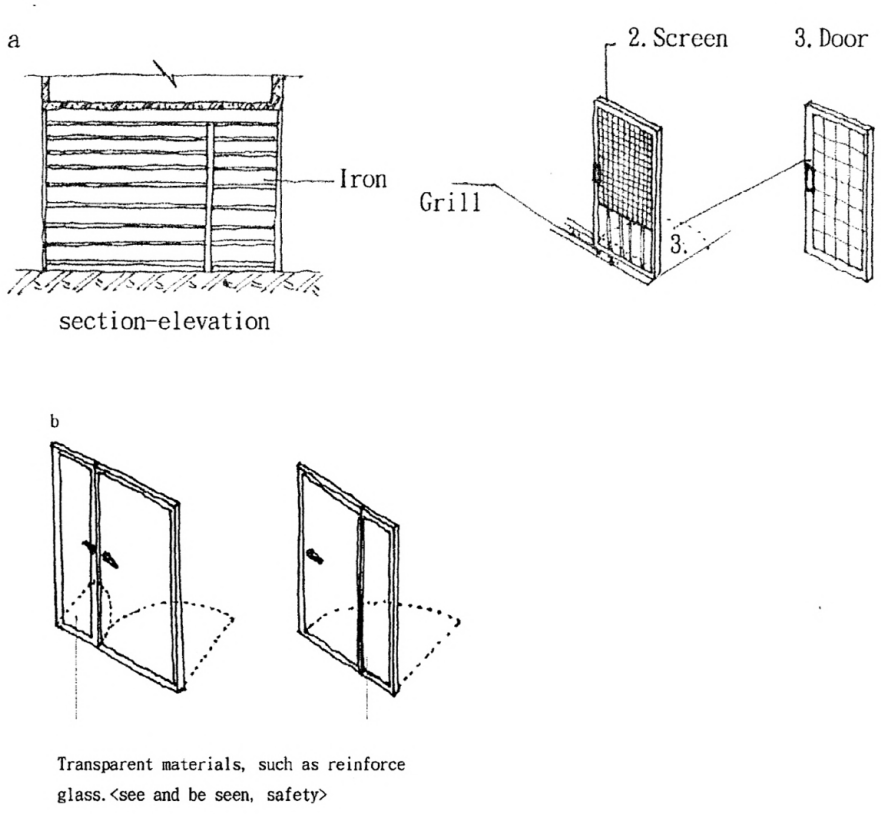
with wheelchairs, walkers, a big body, or even those who are pregnant, find regular doors at least uncomfortable if not actually inaccessible. (See figure 3-2-6)

Figure 3-2-6 The width of the door



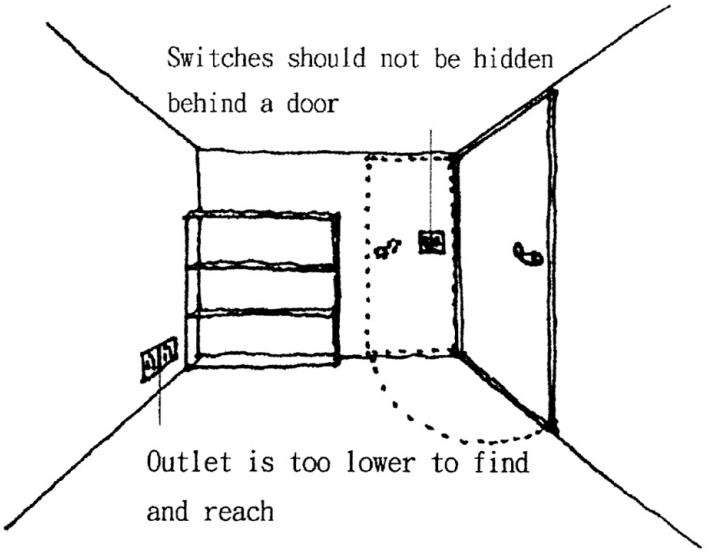
B. The materials of the door: In Taiwan, most of the doors are made of iron, glasses, aluminum, and wood. Also, people often use double layers of the doors including a screen. Especially, in the housing type C, people build an extra iron grille in the entrance to prevent unauthorized entry by thieves or undesired persons. Because the iron grille is heavy, even health people often find such doors difficult to open. (See figure 3-2-7)

Figure3-2-7 The materials of the door



C. The function of the door: A door plays a vital role in housing. Doors can provide a function of safety and identification, which is "see and be seen", when there is a full-length transparent element in the door itself. (See figure 3-2-8) Housing in Taiwan, rarely utilizes this form of door, i.e., most doors are solid; thus, people cannot see into a residence. Therefore, when people are injuried or have an undesired accident, such as slipping and falling on the floor, no outsider can see that condition. This is especially true for the elderly, where unfortunate, but common, solutions happen in every day life.

Figure 3-2-8 The function of the door



Solutions –

These solutions follow from UD principles # 7 and #5

A. There are three ways to solve narrow size of the door:

1. Enlarge the width of the door, or use a bi-fold door that can be wider when people need a wider space, such as in moving big furniture. (See figure 3-2-6-b)

2. Build an extra small leaf of a new door next to the existed door. (See figure 3-2-6-c)

3. Change to an accordion-fold door. (See figure 3-2-6-d)

B. People use iron-grille doors, because they believe that such doors provide a better defense and are more burglarproof than other standard doors. However, such doors are often too heavy to easily open. Two ways of providing solutions are as follows:

1. If iron grille is believed necessary, utilizes an electric-opening one instead a manually operated one.

2. A simple and direct solution is to use a solid or steel push-open door to replace the iron grille. Moreover, the safety concern in having a transparent material can here be reinforced glass to" see and be seen."

(See figure 3-2-7)

C. The function of the door: The door plays a critical role in the spirit of a house, just as eyes are the spirit of the window. If we can use transparent material, such as reinforced glass in part of the door, people can see and care for each other. It will be functional and safety for people living in the building.

(See figure 3-2-7)

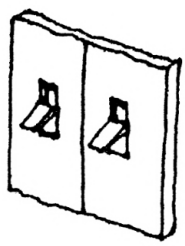
- **Switches, outlets, and controls:**

Issues –

Considering UD principles # 3, and # 4, the following issues emerge.

A. In Taiwan, switches, outlets, and controls are regularity inappropriately placed, such as those located on the hinge-side of the door, so, when people open the door, the controls are difficult to find and turn on the light. In addition, some controls are located nearer the floor and are not obvious. Hence, when people have physical problems, low-vision, or who are pregnant, the controls are difficult to find and to operate. This is considerable issue for some people. (See figure 3-2-8 & 3-2-9)

Figure 3-2-9 Switches

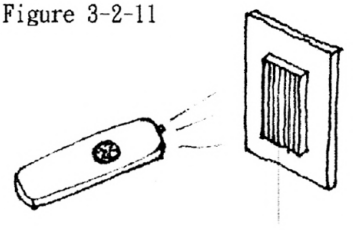


It may be too hard to operate, require dexterity, or awkward with hands and arms filled with packages

B. The shapes and operational way of the switches, outlets, and controls: In Taiwan, many of existing switches, outlets, and controls are difficult to operate. People should not have to exert much strength to use these devices. People who have physical disabilities or who are merely carrying many packages or groceries should not have to be challenged by turning on a light. Therefore, a simple, obvious, and easy operating design is valuable for people are safety and convenience. (See figure 3-2-8, 3-2-11, 3-2-12)

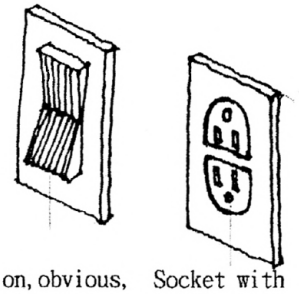
Figure 3-2-11 & 3-2-12 The shapes and operational way of the switches

Figure 3-2-11



Light on, touchable, and remote controler

Figure 3-2-12



Light on, obvious, and touchable

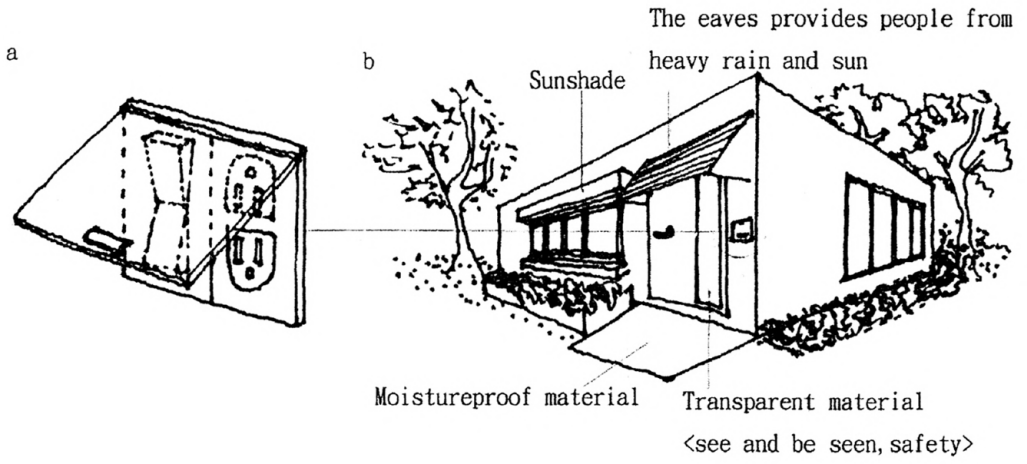
Socket with light

Solutions –

These solutions follow from UD principles # 3 and # 4

A. The switches, outlets, and controls as far as possible should set together and should be located in an obvious and easy to operate place. (See figure 3-2-10)

Figure 3-2-10 The switches, outlets, and controls



B. Solutions for the shapes and operations of the switches, outlets, and controls, include:

1. Use remote and touch-sensitive controls to operate lights and other electric devices. They should all operate the same way. In these ways, people can find such easy to use. (See figure 3-2-11) In addition, the outlets should have circuit protection especially those near water.

2. Switches, outlets, and controls, must be shaped in a way that they can be seen or felt and the meaning of the action, usually on or off, clear. The action should not require high dexterity, nor strength. Some controls may need an always-on-control light so the control can be located in the dark or low-light conditions. In most cases these is a need for a high contrast

between the control and its background so its location and action are obvious. (See figure 3-2-12)

- **Bathroom:** Provide the grab bars at toilet and bathtub, and also a seating at bathtub

Issues —

Considering UD principles # 5 the following issues emerge.

In Taiwan, grab bars have rarely been installed at bathtubs, shower baths and toilets, nor has seating been provided for bathtubs and showers. Grab bars provide safely and convenience as people age, become pregnant, have physical problems, or are uncoordinated as may be the case with little kids. In addition, bathrooms are used everyday. For that reason, people have many chances of an undesired injury, such as a fall from such as slipping on a wet floor. Therefore, it is significant to consider grab bars as part of a safe and accessible bathroom and toilet area for people across their whole life cycle.

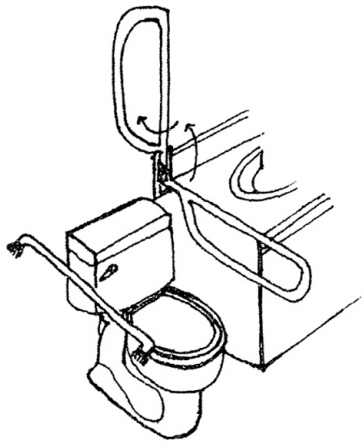
Solutions —

A originates in UD principles # 5, # 2, and # 7

Two solutions include:

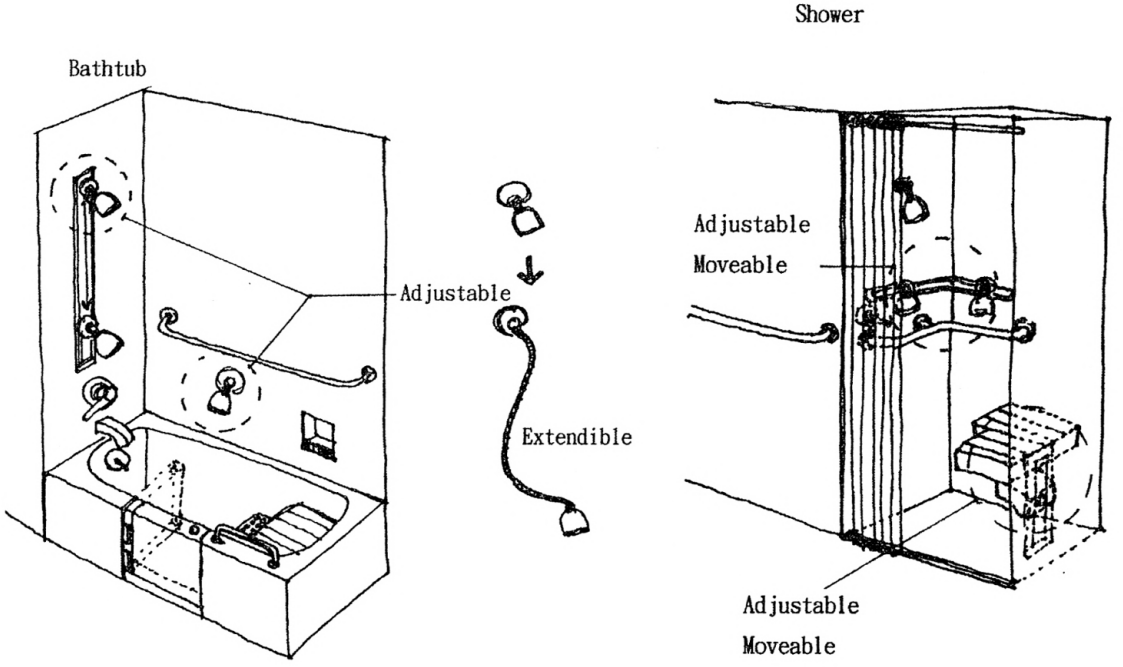
1. It is appropriate to have the grab bars on the both sides of a toilet; one can be removable if it is close to a washbasin or bathtub. (See figure 3-2-13) At the very least, the walls at a toilet, bathtub, and shower should be reinforced such that grab bars can be easily installed later when the need is more obvious.

Figure 3-2-13 Toilet



2. Setting the grab bars and seating at either bathtub or shower bath improve safety and convenience. Seating can be removable and does need to be adjustable for people of different sizes, shapes, and weight. (See figure 3-2-14)

Figure 3-2-14 Bathtub & Shower



- **Kitchen:** Includes cabinets, sinks, faucet, and ventilation.

Issues —

Considering UD principles # 2, and # 7, the following issues emerge.

Most kitchens in Taiwanese housing, including throughout types A to E, are small and narrow. This is especially true in housing types D and E. The question is how to make such small spaces usable.

A. Cabinets, sinks, work zone, and faucets and exhaust fans are almost always fixed by walls and the overall dwelling unit's arrangement. The kitchen is

almost always too small for access and accommodation of people with wheelchair or assisting devices. Exhaust fans are almost always fixed at a given height and are not adjustable. Therefore, during cooking, some cooks may hit the fan, because it is too low. The faucet, too, is almost always fixed, so that it is not easy to operate for people in wheelchairs or for the kids, nor is the sink accessible for use widely around it.

B. The cabinets under the sink are almost always fixed, and some cabinets are located too high for reach by kids and other short people, or for those using wheelchairs, or who have physical problems.

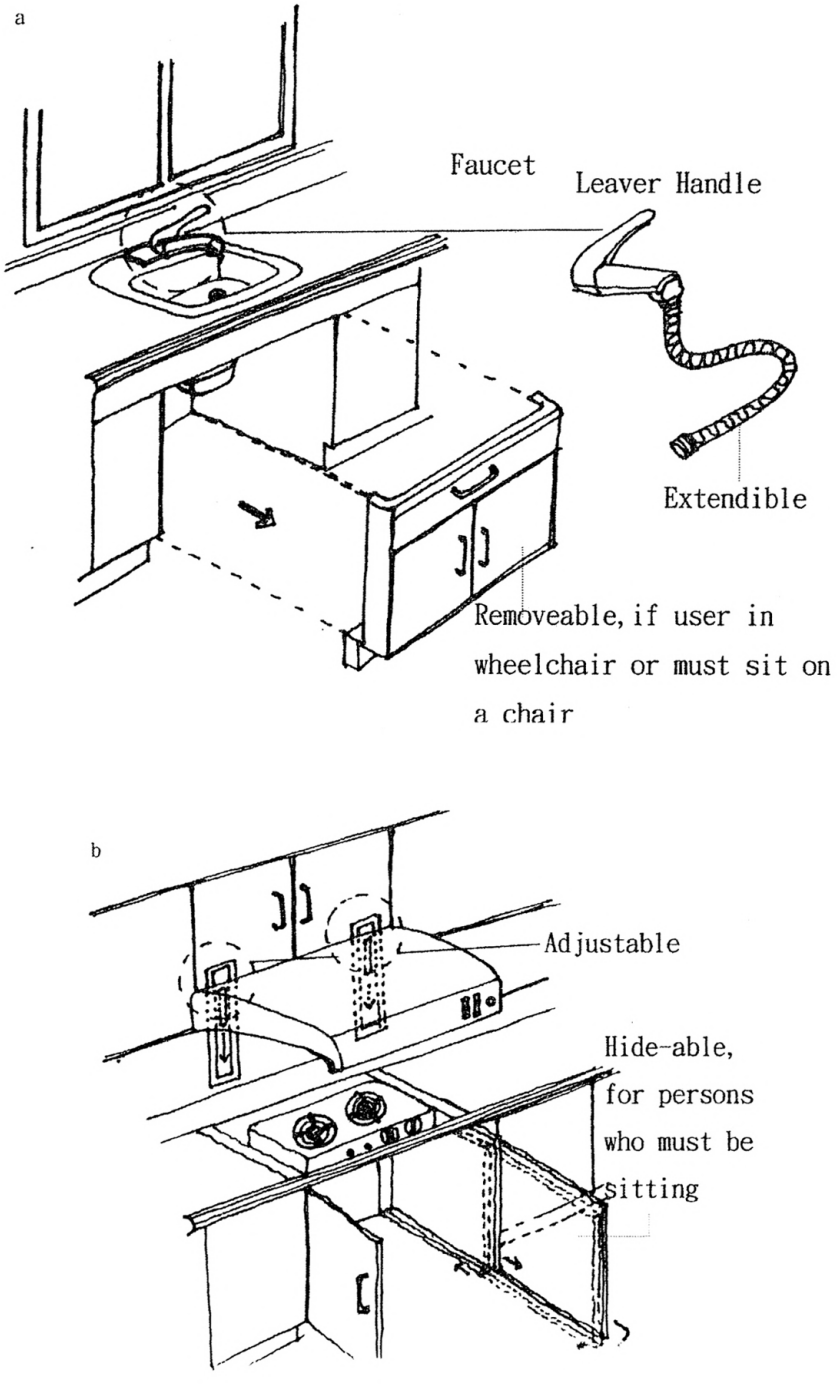
Solutions —

These solutions follow from UD principles # 2 and # 7

A and B: The challenge is to design and build cabinets, sinks, faucets, and exhaust fans, so they are adjustable in a way to make small spaces functional and accessible. For example, make removable or return- and hide-able cabinets under the sink or oven, when people need a clear floor space they can move the cabinets to be usable. Besides, the other cabinets and exhaust fans should be adjustable so that, people can adjust them to a suitable height to fit their abilities.

Faucets, too, are available, such as pull-extend lengths that are adjustable and usable for a wider range of people. (See figure 3-2-15)

Figure 3-2-15 Cabinets, sinks, faucet, and ventilation



- **Laundry Room and Balcony:**

Issues —

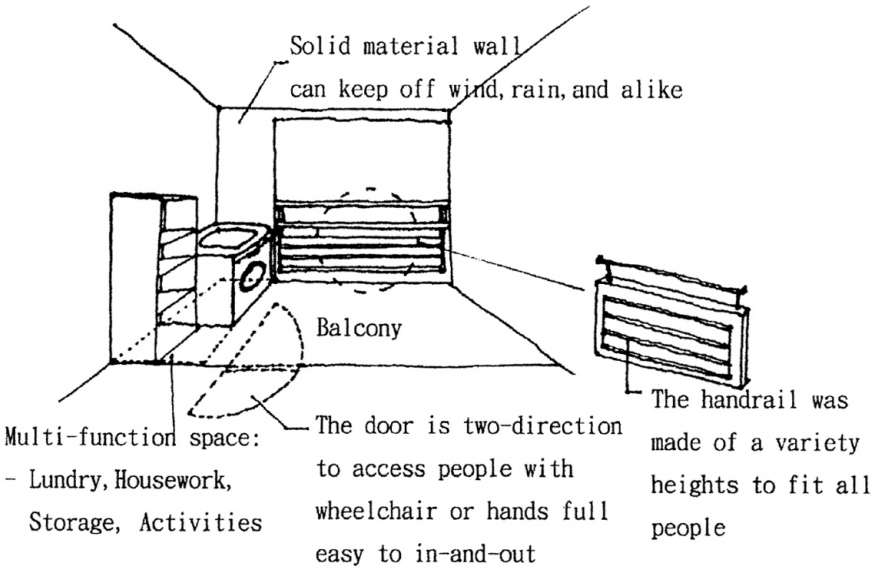
Considering UD principles # 2, # 4, and # 7, the following issues emerge.

Architects, designers, and builders have traditionally ignored the need to accommodate laundry facilities in Taiwanese housing. When people move into a house, they find it hard to locate the washing machine. The most popular place for people do laundry is on their balcony or in their bathroom. Apparently, first choice for most people is on the balcony.

A. If it is necessary for people doing laundry on their balcony, architects and builders should create a clear and accessible space for all users including those with wheelchairs or physical problems. According to the architectural standard of Taiwan, if the depth of the balcony exceeds 1.5M, it adds to the total floor area of the dwelling unit. The obvious result of this accounting policy is that balconies are never deeper than 1.5M (4'-11') and that the area of the balcony is too small to be usable. In the other words, household

needs and human behavior have not been design priorities for balconies in Taiwan. (See figure 3-2-16)

Figure 3-2-16 Balcony



B. It is humid, rainy, and warm in Taiwan. It is a considerable challenge for architects, designers, and builders in Taiwan to design a suitable, accessible, and safe balcony that will accommodate all the activities – laundry, housework, eating, viewing, and sleeping – for which balconies are appropriate and needed. (See figure3-2-16)

Solutions –

These solutions follow from UD principles # 2, # 4, and # 7

A and B: There are two ways of the solutions as follows:

1. Because of the weather, the balcony should least has one side made of the solid materials to keep off rain and wind as well as to be a multi-function space that accommodates valuable and accessible uses, such as doing laundry, housework, and so on. (See figure 3-2-16)

2. In recognition of differences in size and abilities of users, should be two or more different heights of the handrail and/or the railing-patterns. (See figure 3-2-16)

- **Details:** Handles/Door Knob, Faucet, Signal/Sign, Emergency/Fire Alarm, and Furnishing

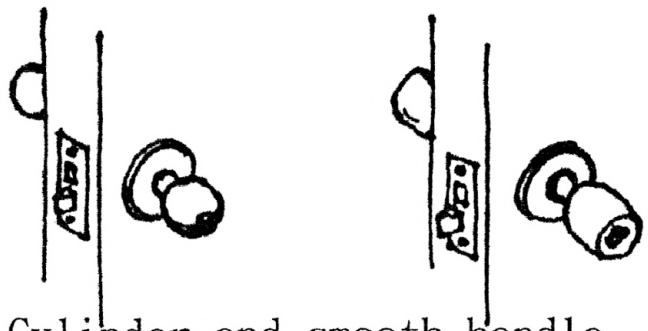
Issues –

Considering UD principles # 1, # 2, # 3, # 4, # 5, # 6, and # 7, the following issues emerge.

A. Door Knob/Handles: Most existing Taiwanese housing uses the cylinder or ball door knobs handles fabricated in metal or wood. People with low physical strength, such as from aging, from, some disability, or just being a kid, have difficulty operating traditional doorknobs. Besides, people with wet or

sweaty hands also find traditional doorknobs are difficult to operate. (See figure 3-2-17)

Figure 3-2-17 Handles/Door Knob

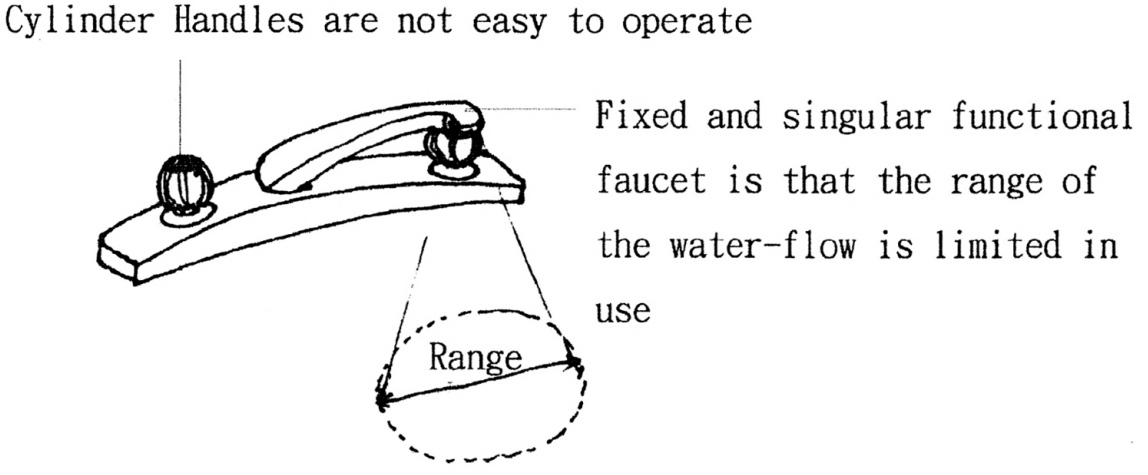


Cylinder and smooth handle

< Those are not easy to use>

B. Faucet and its handles: The traditional faucet handles are cylindrical or ball shaped, especially, in older C and D types of housing. Therefore, many of the same problems identified for doorknobs apply to faucets. (See figure 3-2-18) In addition, most faucets have a single outlet in a fixed location and fixed function that such that people cannot distribute the water widely. Therefore, when people need to wash whole sink, they need to use on extra tool, such as a cup, or bowl, and often both hands. This activity is especially difficult for people with physical disabilities, or for little kids. (See figure 3-2-18)

Figure 3-2-18 Faucet



C. Emergency/Fire Alarm: General emergency/fire alarms use sound to warm people of danger. This is limitation for people with hearing problems, or who are deaf. Besides, people with weak sensory abilities may have other limitations as well as hearing problems. Therefore, it is a considerable challenge for designers to create a multi-functional alarm to help keep people safe.

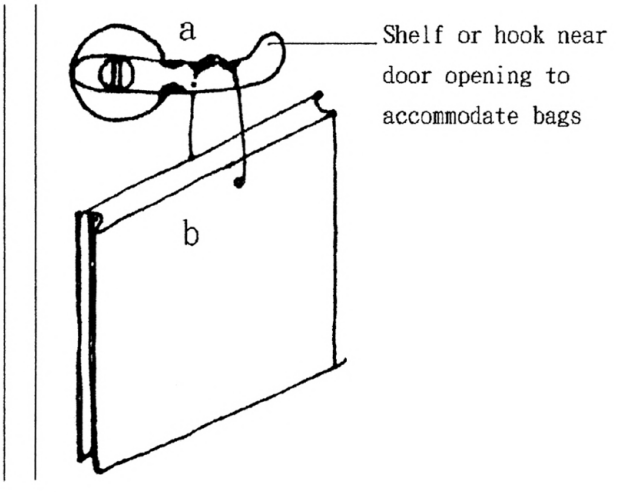
D. Signal/Sign: Signals or signs should not be limited to public buildings. Actually, it is appropriate to utilize such in the home in order to accommodate guests, recognize, the wide range of user abilities, and to anticipate changes in abilities over one's life span.

Solutions –

These solutions follow from UD principles # 1, # 2, # 3, # 4, # 5, # 6, and # 7

A. Door openers: Use a lever handle/door knob to replace the traditional cylinder or ball handle. These lever handles are easier to operate by joint persons with joint, muscle, and related conditions, or those (many) carrying groceries and packages. Elbows and other body parts can operate some levers. It is also convenient to have a hook or shelf near the door opening for placing bags temporarily while the door is being unlocked and opened. (See figure 3-2-19)

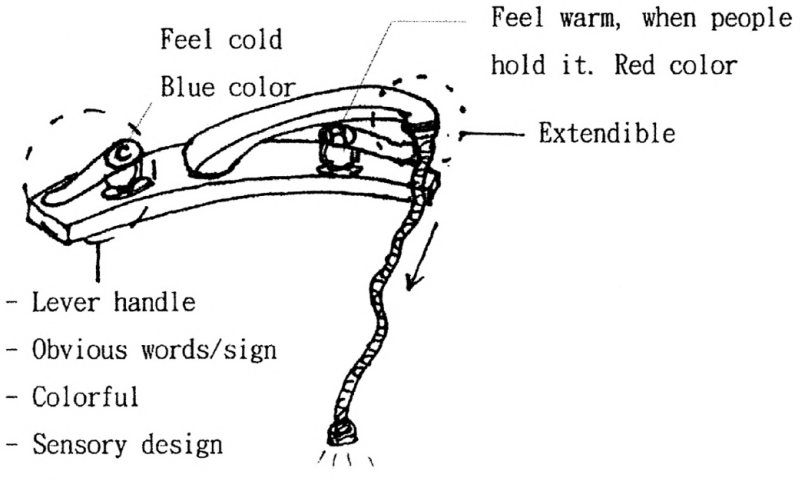
Figure 3-2-19 Handle/Door knob



B. Faucet and its handles: The lever shape is accessible and usable for many types of handles including water faucets. When the faucet provides both cold and hot water, its design must consider safe use. This concern can be accommodated by a design that uses color and words to indicate cold and hot water temperature and flow. In addition, the hot/cold information should be provided tactually for those who are blind or with low vision since, with a single handle, the ability to touch the faucet to determine hot or cold is lost.

(see figure 3-2-20)

Figure 3-2-20 Faucet and its handles

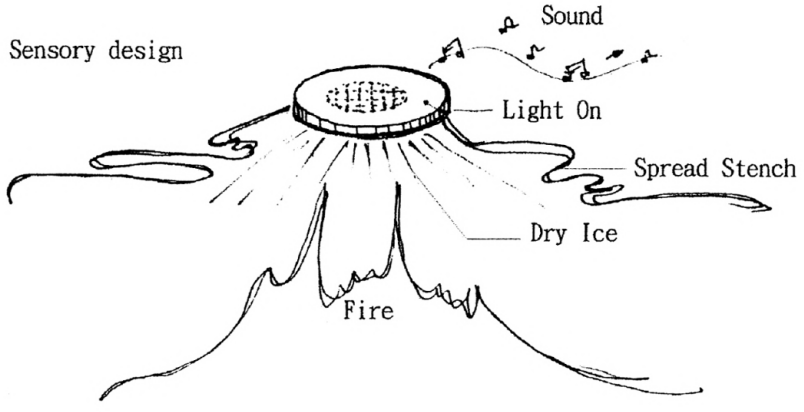


C. Emergency/Fire Alarm: An alarm with a variety of functions, including sound, light, smell and physical sensory such as a blast of cold air is valuable and in replacing traditional alarms that just makes noise. During a fire, the new

multi-functional alarm could spread, odor, carbon dioxide, turn on lights, and produces alarm sounds to assist people with limited sensory awareness in one or more sensory system

(sight, touch, taste, smell, and hearing). However, the choice of odorant is important; because of human instinct, that when people smell stench inside, they often will try to open the door or windows, not flee the building. (See figure 3-2-21) These is also a need for alarms for garden pools, swimming pools and other water areas.

Figure 3-2-21 Emergency/Fire Alarm



D. Signals/Signs: People may believe that signals or signs are only to be used in public buildings. Actually, it is appropriate in the residences as well. Guests and visitors as well as residents of all ages need clearly identified signs identify exists, dangers, as well as hazardous spaces, materials, and

objects. Such signs can be elegant, or decorated as need be, but do need to be legible and functional. Legibility is influenced by size and figure/ground contrast. Just as with alarms, some signs may need an aural component for those with low vision and for people who are not familiar with the house. (See figure 3-2-22)

Figure 3-2-22 Signals/Signs

- **Storage:**

Issues –

Considering UD principles # 2, # 5, and # 6, the following issues emerge.

A. Except for type housing B building, storage has not been a feature of most Taiwanese housing. The result is that people will pile goods, boxes, or the like on the top of the cabinets, tables, or any place around house. These

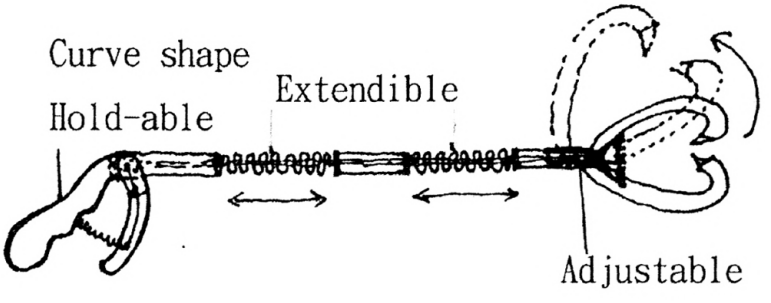
objects are often stocked too high such that, when people need something, it is difficult to do. Even if they choose to use a chair or step-ladder to assist themselves, is very dangerous. Once for example, I used a chair to reach something and, because no one helped me by holding the chair, I slipped and hit my head on the floor.

Solutions –

These solutions follow from UD principles # 2, # 5, and # 6.

A. A house needs at least one storage area. If it is difficult to spare space for storage in an existed house, then well-organized cabinets or cupboards can be effective substitutes. In addition, there are many safe devices, such as a grabbers, movable ladders or adjustable cabinets, to assist people to place, store or retrieve objects and materials on shelving. (See figure 3-2-23)

Figure 3-2-23 Grabbers



Chapter IV

Results: A re-design of Type C housing in Taiwan

This chapter is about the results of the case study of housing as applied to the Type C housing in Taiwan and appears as a re-design within the walls of an existing (typical) Type C dwelling. Type C was selected because it is popular (more than 40 percent of the population live in this housing type), it is built with more than one floor, and it exhibits all the general issues of Taiwanese housing as described in chapter 3.

First floor Issues:

Considering principles of UD, the following issues emerge:

There are no bedrooms and bathrooms on the first, or ground, floor. Therefore, people with disabilities or with loss of mobility (e.g. as may be experienced in aging), who often have difficulty going up and down stairs, have limited choices and may spend much time isolated on an a bedroom floor level or on the first floor without a proper bedroom. Few storage places are found in typical Taiwanese housing; especially in this case, no storage units or closets are found in the house. Therefore, people will pile goods, boxes, or the like on the top of the cabinets, tables, or any place around house. Many pre-1970 housing type C units often

originated as single-story houses and now have grown to as many as three and half stories. The space arrangements and the stairs make this type inconvenient and unsafe for kids, the elderly, and people with disabilities. Issues for type C were also listed in chapter 3. The seven principles of UD have been used to redesign and remodel the housing making this housing type accessible and adjustable using for people within a variety of conditions. (See figure 3-1-3a, also reference issues of chapter 3)

First Floor Solutions: (See Figure 4-1)

These solutions follow from principles of UD and from those solutions indicated in chapter 3. On the first floor plan of the re-design, I create a bedroom and bathroom on the first floor. As a second possible solution, I recommended a household stair lift to assist people in moving between floor levels. (See figure 3-2-3) In addition, I have added storage and a handrail along on the sidewall, as well recommending the clearing of spaces to allow for circulation by people with assisting devices. (See figure 4-1 and compare to figure 3-1-3a)

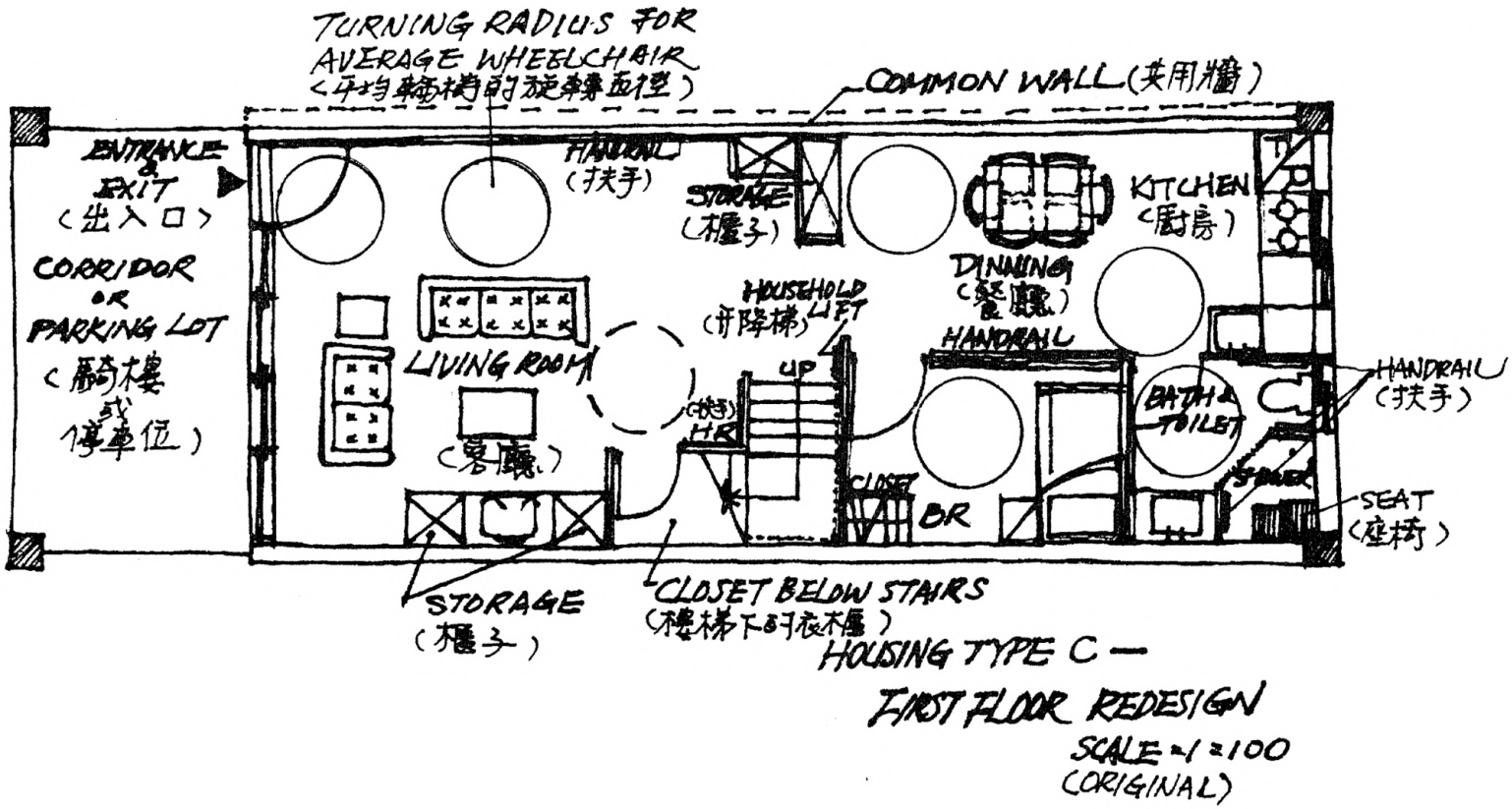


Figure 4-1 First Floor Re-design

Second Floor Issues:

Considering principles of UD, the following issues emerge:

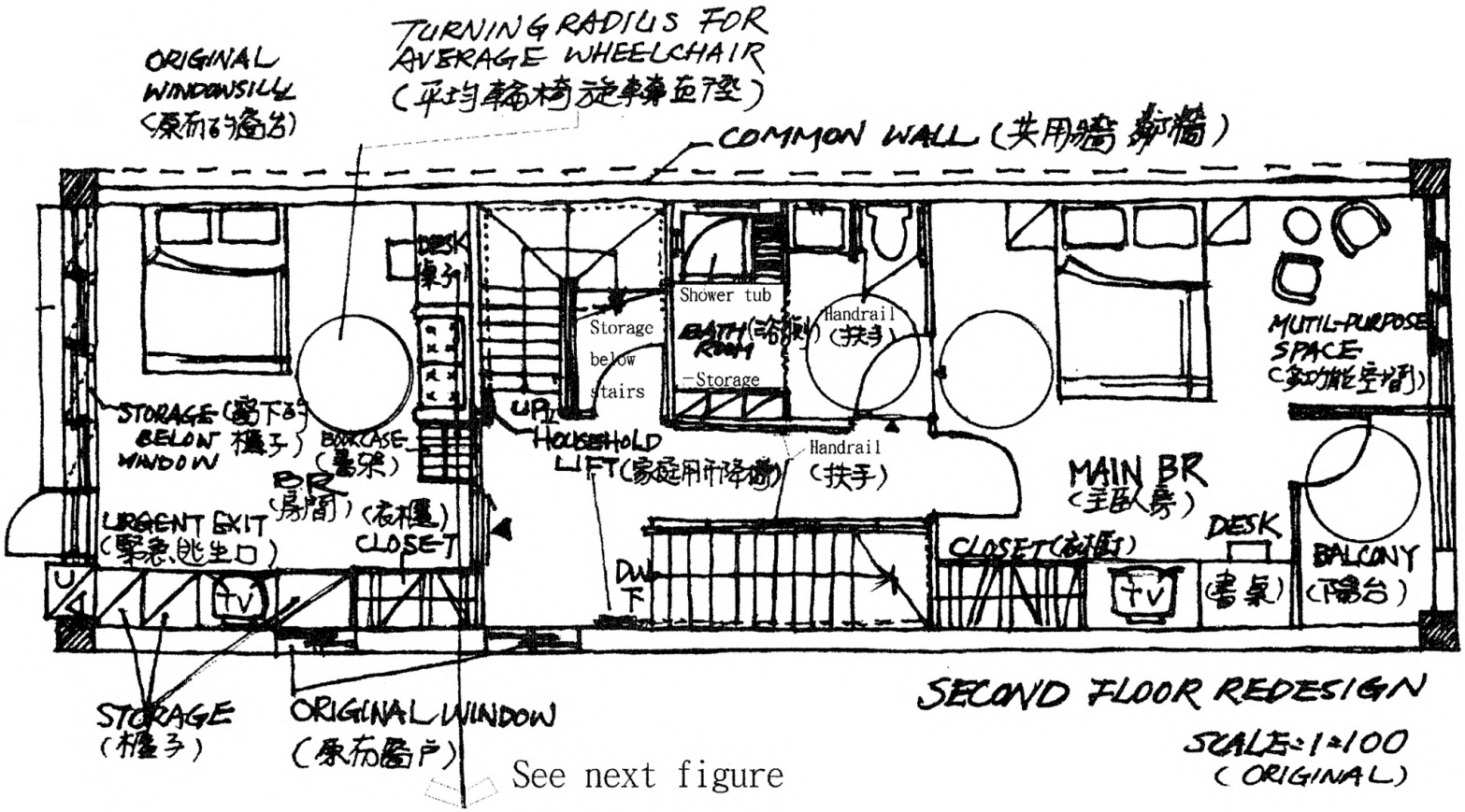
The threshold is a common element built into the entrance, balcony and the bathroom. Some, at 25cm (10 inches), are higher than a step (usually no more than 18cm, or 7 inches), but most of that are closer to 5cm (2 inches) high. Therefore, people often trip and fall in an undesired accident, especially, kids and the elderly. (See figure 3-1-3b & figure 4-2a) In this example case, the space of bathroom is too small to use safely, for people with assisting device and thus is impropriate for their use. In addition, the space of shower and toilet are on the same level of the ground, therefore, when people take shower, the whole floor is wet. For that reason, people often slip and fall when the floor is wet. (See figure 3-1-3b) Moreover, there are no storage areas or closets.

Second Floor Solutions: (See Figure 4-2-1&4-2-2)

These solutions follow from principles of UD and solve problems indicated in chapter 3. On the second plan of re-design, I create a large bathroom such that the bath and toilet are separate, but on the same floor level, making certain that a clear space was available for people with assisting devices. In the each room and

space such as balcony, I also create a clear space for people with assisting devices that can also functional for use with other household needs, for example, people can take a break at the balcony, or plant the flowers, or even do laundry.

(See figure 4-2-1, 4-2-2, 4-2a & compare to figure 3-1-3b)



See next figure

Figure 4-2-1 Second Floor Re-design

Figure 4-2-2 Second Floor Re-design

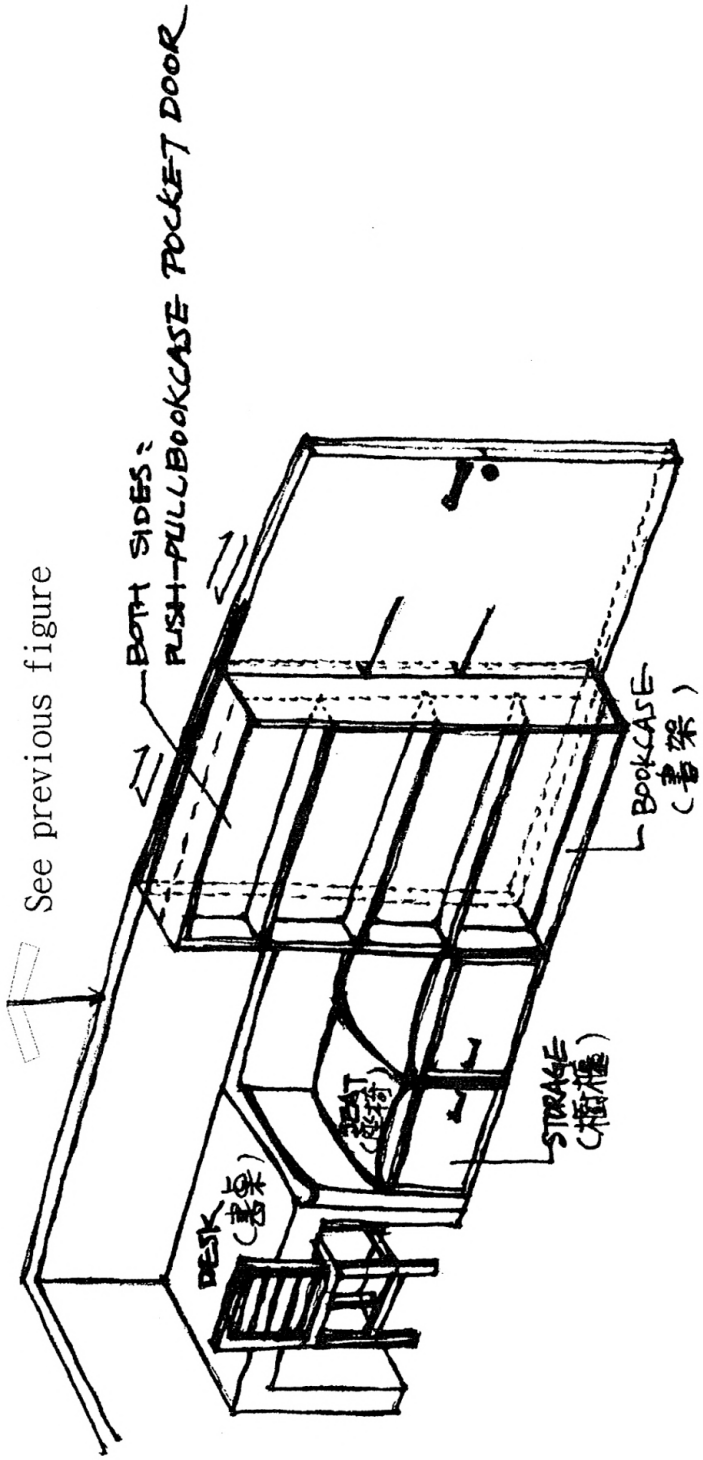
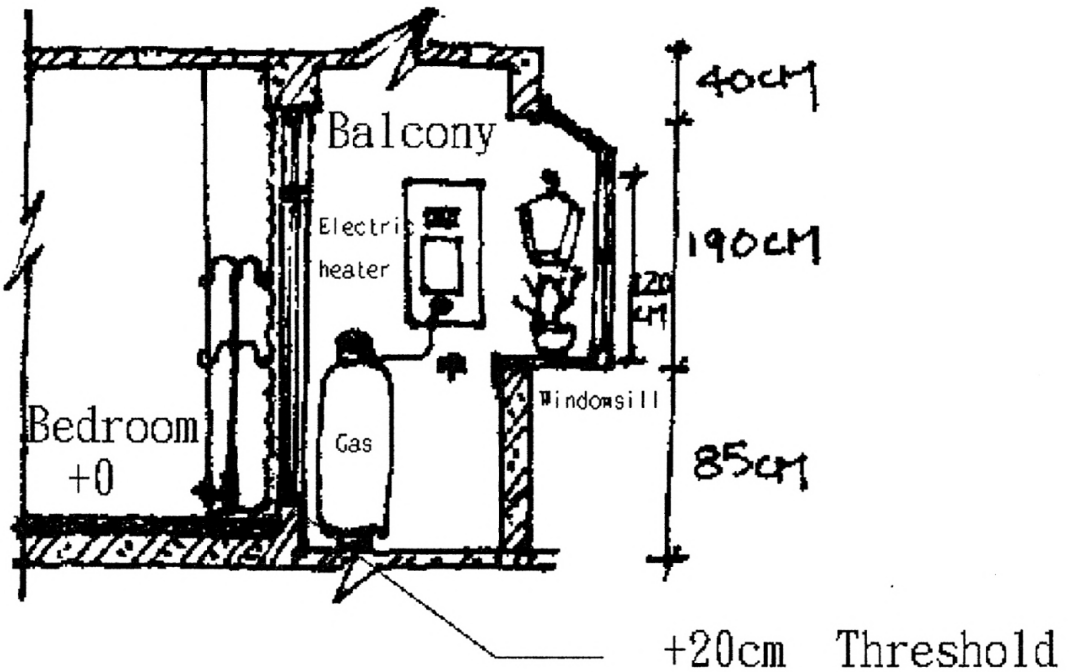


Figure 4-2a Section of original balcony & bathroom



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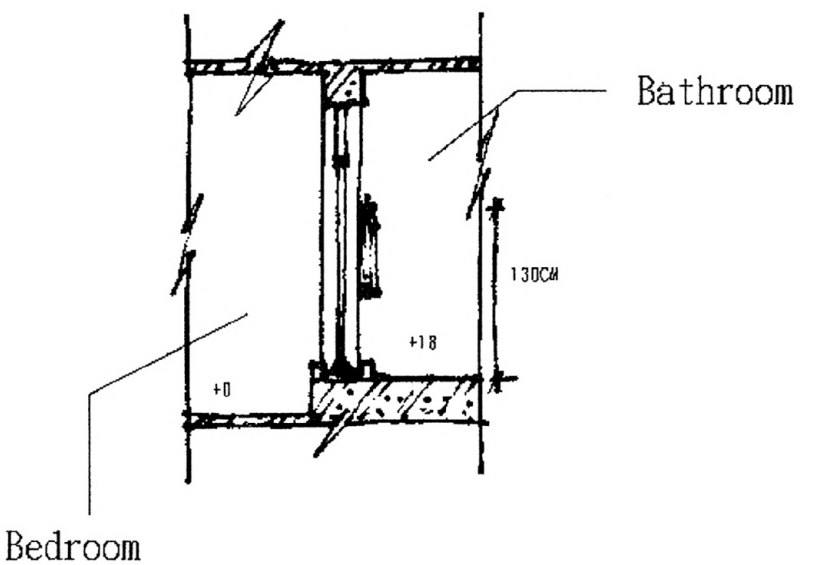

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Third Floor Issues:

Issues are the same as for second floor.

Third Floor Solutions: (See Figure 4-3-1&4-3-2)

These solutions follow from principles of UD and solve problems identified in chapter 4. The layout-design is almost the same as for the second floor. However, on the third floor where there is little difference from the second floor, I propose a large space for storage and a multi-purpose room. (See figure 4-3-1, 4-3-2 and compare to the original design, figure 3-1-3c)

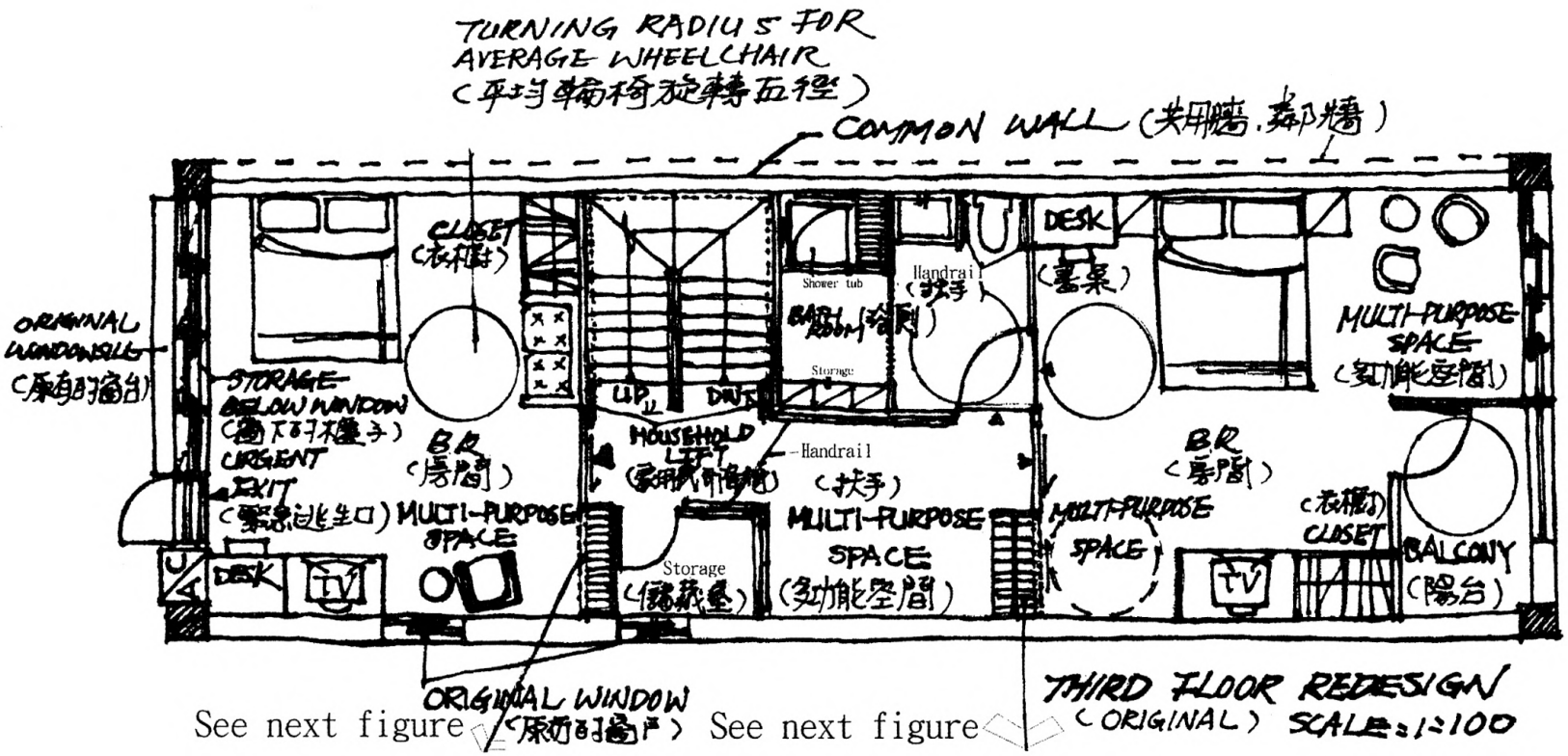
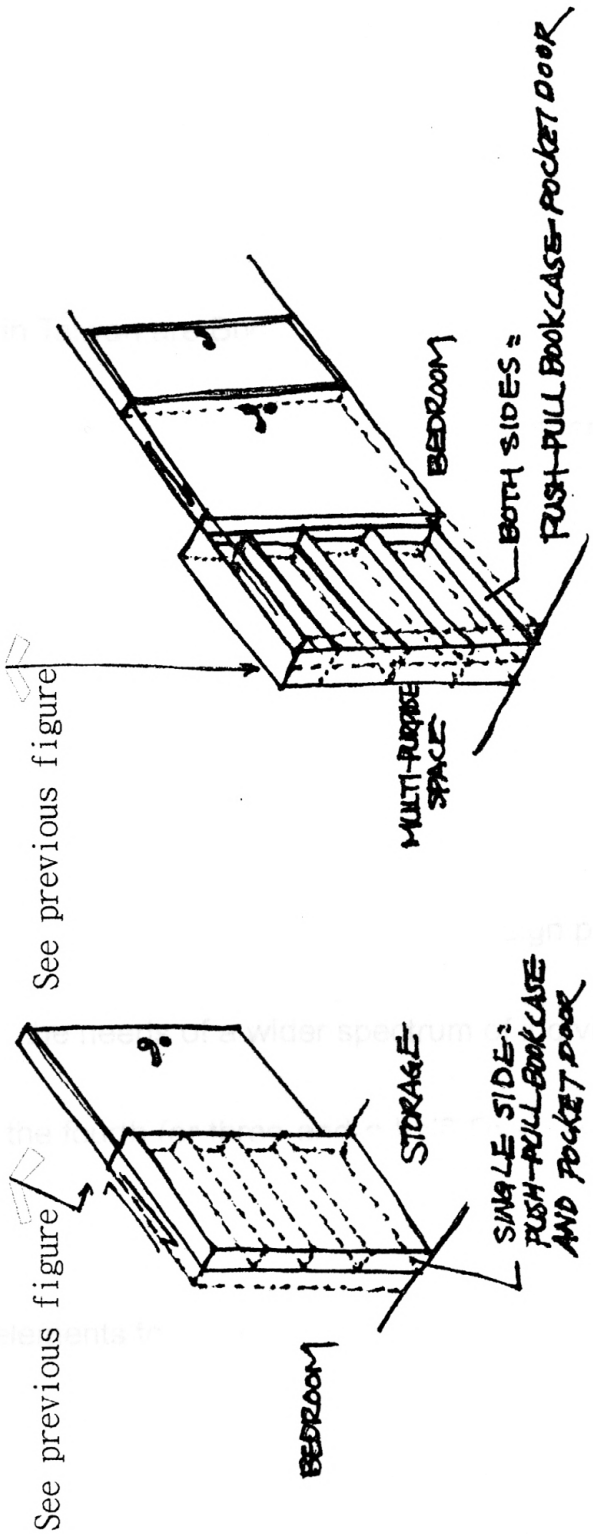


Figure 4-3-1 Third Floor Re-design

Figure 4-3-2 Third Floor Re-design



Fourth Floor Issues and Solutions:

Using the Principles of UD, the fourth floor problems indicated in chapter 3 are solved by adding a bathroom, a family room, an altar area, and storage (figure4-4).

Most people in Taiwan are Buddhist and Taoist and, even if they are not deeply religious, or are Christian or members of some other religious group, they create a space, e.g., an altar area, to worship their ancestors. According to Taiwanese culture, the altar should be at a high level. The altar is often placed at two meters(6 feet, 6 inches) plus the depth of a shelf, such that for shorter people and those with physical disabilities as well as many elderly, it is too high and it is too difficult to perform sacrificial rites. Thus, the re-design proposal includes an adjustable altar to fit the needs of a wider spectrum of individuals.

In addition, the fourth (or three-and-a-half) floor usually has neither bathroom service nor specialized storage (figure3-1-3) and the re-design proposal recommends new elements to make the floor more serviceable.

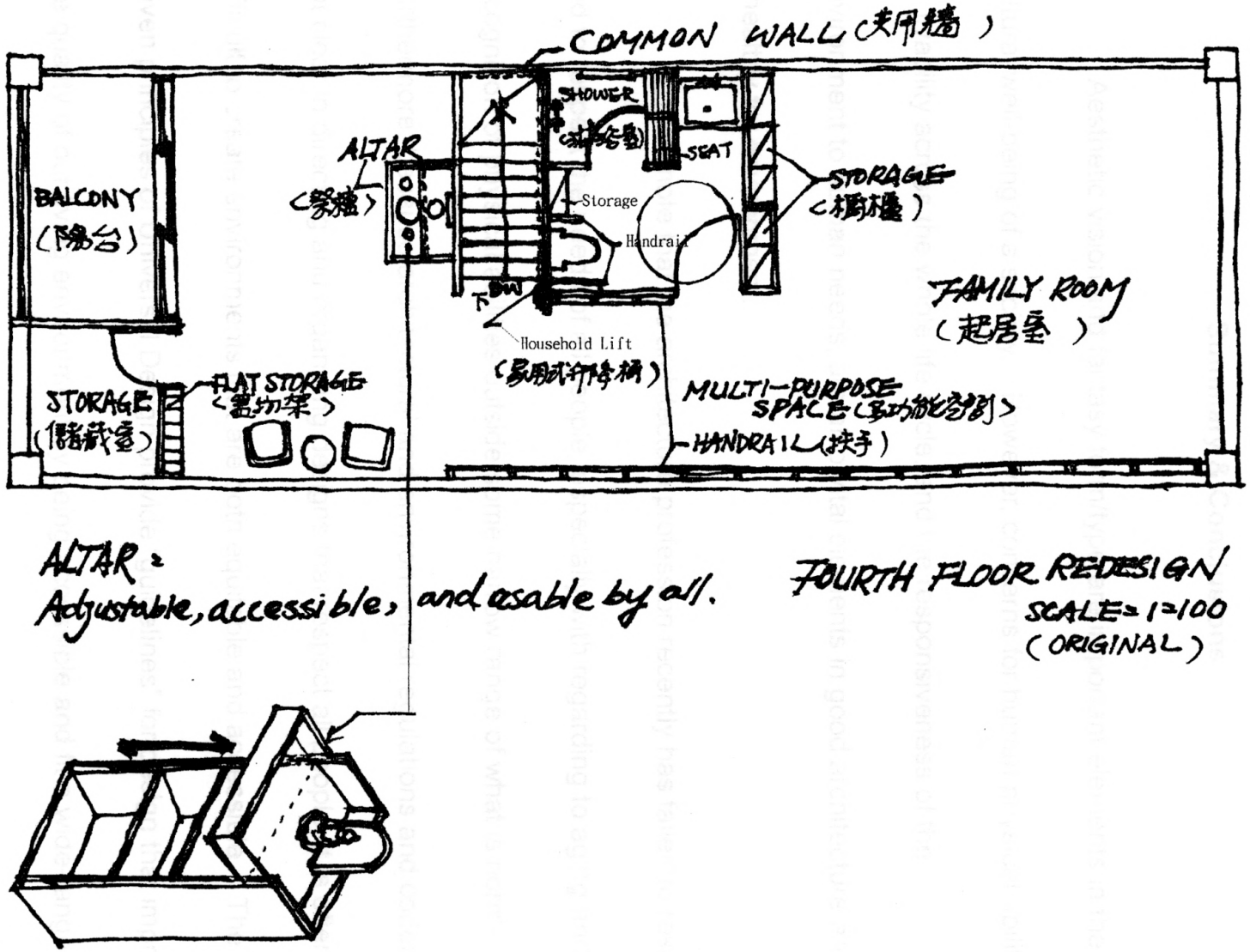


Figure 4-4 Fourth Floor Re-design

Chapter V

Summary & Conclusions

Aesthetic vision and fantasy form/type are important elements in the cultural well-being of a society. However, concerns for human physical abilities, for livability across the whole life cycle, and the responsiveness of the environment to human needs, are also vital elements in good architecture and for a healthy for environment.

Critics note that the architecture profession recently has failed to respond and to respect the needs of all people, especially with regarding to aging and the recognition of physical abilities outside some narrow range of what is normal. Furthermore, because architectural and environmental regulations and codes are not clear in directing and organizing designs that respect all people, it is often difficult to create environments that are both equitable and accessible. The seven principles of Universal Design provide "guidelines" for design that improves the quality of our living environment by being accessible and fit a wide-range of people.

Rationale for this topic

According to the Taiwanese 2000 census, the population of the elderly increased from 7%to 8.3% over the previous Census in 1994; in other words, Taiwan has become an "aging society" by the United Nations' definition. In addition, comparison of the aging populations in different countries shows that although both Sweden and France became aging societies early in 1890s and 1865s respectively, the total years for the aging ratio to increase from 7% to 14% (and over) had increased slowly over 83 years and 135 years in those two European countries. In contrast, Singapore, Japan, and Taiwan not only became an aging society later than numerous other countries, but they took fewer years to double the aging population ratio. (Table 11)

As shown in chapter 2, the birthrate in Taiwan ranks second only to Japan in being the lowest birthrate of industrialized countries. The higher number and percentage in the population of so-called Baby Boomers adds further to the emerging challenge of adequately serving the people of Taiwan. It is obvious to me that the built environment and architecture should be accessible and equitable to fit all needs of human with time.

My reading of Taiwanese literature suggests to me that UD is not well understood in Taiwan. Since I believe that a wide-ranging educational effort will be necessary to introduce UD properly in Taiwan, we need to begin now with the training and retraining necessary to create accessible and equitable places to live for all people in the coming decades. Therefore, I recommended the principles of UD as a means to improve the housing in Taiwan.

Rationale: Why is UD important in design, including architecture, and other physical environments, products, and equipment?

Universal design is an approach to design that honors human diversity. It addresses that right for everyone—from childhood into their oldest years—to use all spaces, products, and information in an independent, inclusive and equal way, it is a process that invites designers to go beyond compliance with access codes—to create excellent, people centered design (Elaine Ostroff,1999.)

UD is an approach to design not only for creating barrier-free environments, but also for design for a wide-range of people. While it has aimed at making spaces accessible, equitable, and adjustable to individuals with physical handicaps, its real goal is to improve access for all users to make life easier and safer, and equitable.

UD in Taiwanese housing:

From my analysis and evaluation utilizing the seven principles of UD of Taiwanese housing, and its related economics and culture, I found that there are many issues presented in the existing housing stock.

A summary of issues for each housing type follows:

Housing Type A: (Traditional rural house)

The toilet is often located outside the living quarters; connecting the toilet room main space or building is desirable. By changing the traditional spherical door knob to a lever-type [hold-able] doorknob would improve access and control for many users. Reducing the traditional high thresholds and steps perhaps by adding a ramp to the steps or both sides of the threshold or by removing the high threshold altogether would make room access more accessible, safe, and convenient.

Housing Type B: (Duplex House)

Here too, provisions for overcoming steps, change-in-floor-levels, and high thresholds would improve room access, safety, and convenience.

Housing Type C: (Terrence House)

The lack of a bedroom and toileting facilities on the first floor makes this housing type less attractive and convenient for many lifecycle stages. It is necessary to reconsider building a bedroom and restroom for people with disabilities and physical change with aging. Meanwhile, sometimes a stair lift or household elevator may make upper floors accessible. People often utilize an iron grille or gate in the entrance to prevent the thieves. Because the iron grille is heavy, it is not easy to open, even for healthy people. Therefore, there is a value in utilizing other materials in doors in maintaining security while not making the door and grill a barrier for household members.

Housing Type D: (Apartment- less than five storeys)

In the housing type D, there is no elevator provided in the building. People with disabilities or those having physical problems, find it difficult to traverse stairs. A lift is or elevator would greatly improve access.

Housing Type E: (Raise housing- more than five storeys)

Most kitchens in Taiwanese housing including type A to E are small and narrow, especially in housing type D and E. My analysis of kitchen and cooking tasks in such place, and recognizing the social roles of food and provisions for food outside the home, suggests that solving these problems will be difficult.

Is Universal Design universal in Taiwanese Housing?

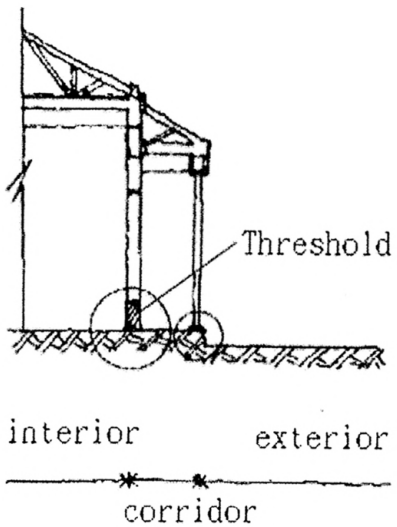
The earlier chapters introduce the seven principles of UD as a guideline for design. However, when the principles of UD are applied to Taiwanese housing, I have found that all principles are not completely utilized as appropriate to all housing types. Different cultures, religions, living styles, as well as living customs, give rise to different environmental design traditions. These traditions may be contrary to the underlying lease of guidelines conceived in a country with other traditions. In this case, the principles of Universal Design may be in conflict with the principles of "Feng-Shui." Feng-Shui is an important consideration issue to most persons in Taiwan, especially to the elderly and current adults.

For example, in 100 percent of the housing type A, there is a high threshold or doorsill in front of building. (See figure 5-1) This architectural feature, believed by some to have originated as a response to heavy rain flooding, and typhoons, is reinforced by Feng-Shui. That is, people should raise a foot to go into the inside building. Its threshold presents the meanings of respecting the ancestors of a household, a means of warding off evil spirits, and, still, protection from the rainwater flowing into the house. The high threshold makes access difficult for some people, especially for children, the elderly, and people with disabilities. However, it is a main point of design to consider "living custom" in Taiwanese housing, such as a bathroom which is also found high threshold to prohibit the water flowing out from the bathroom. Further, Taiwanese take showers on the floor in bathroom, not in shower stalls or tubs. In addition, because the drain plumbing is above the general floor-level, the bathroom floor-level is higher than neighboring room (See figure 5-2).

The principles of UD are design-guidelines; but when all principles are applied to Taiwanese housing, they may not all be appropriated within the housing-design tradition of Taiwan. Therefore, principles of UD are not

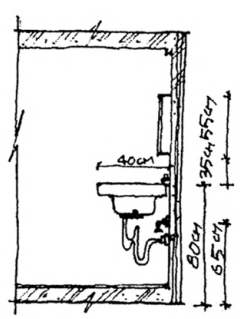
completely universal in all Taiwanese housing, especially considering the influence of Feng-Shui on living customs. However, I believe applying that the seven principles did identify problems inherent in Taiwanese housing. Applying some principles of UD will improve the design-quality of Taiwanese housing, as I indicated in chapter 4. The seven principles of UD will also assist designers, architects, and builders to consider accessible and adjustable designs in serving a wider-range of population needs and in limiting undesired accidents, in future housing construction in Taiwan.

Figure 5-1 High threshold or doorsill



Section of housing type A

Figure 5-2 Section of original bathroom



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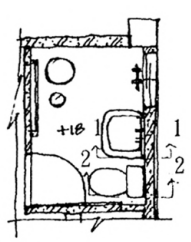
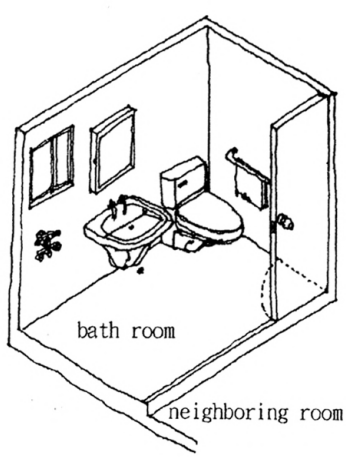
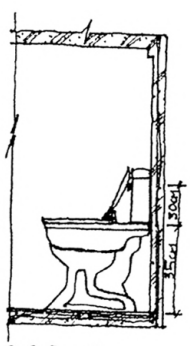


Plan of Bath Room





2 2 Section

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Appendix A

Universal Design Principles, extended version

Universal Design: The design of products and environments to be usable to the greatest extent possible by people of all ages and abilities that is not an adaptive or special design.

The principles could be applied to evaluate existing designs, guide the design process, and educate designers and consumers about the characteristics of more usable products.

The seven principles, definition, guidelines, and examples of UD:

Principle 1: Equitable Use- [the designs can be equitable use to every one.]

Definition:

The design is useful and marketable to people with diverse abilities.

d

Guidelines

1a. Provide the same means of use for all users: identical whenever possible; equivalent when not. [For instance, designs the same entrance to accommodate all people, by no means, to design the other entrance for people with disabilities.]

1b. Avoid segregating or stigmatizing any users. [In other words, the designs must be equitable to fit every user.]

1c. Provisions for privacy, security, and safety should be equally available to all users. [For example, people still have personal space in the public environment and territory, and its safety.]

1d. Make the design appealing to all users. [In a word, the design must be humanistic and can be interested to users.]

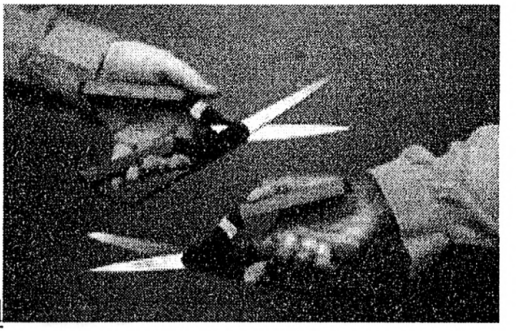
Examples

- Power doors with sensors at entrances that are convenient for all users. [Such as in the supermarket, while people carried grocery by both hands, they don't need to open the door, the door will be open automatic with sensors.]
- Integrated, dispersed, and adaptable seating in assembly areas such as sports arenas and theaters

Principle 2: Flexibility in Use- [the designs are base on the needs of people to achieve that every one can be flexible in use.]

Definition:

The design accommodates a wide range of individual preferences and abilities.



d

Guidelines

2a. Provide choice in methods of use. [In a word, it is multifunction in use to provide users can operate base on their needs and abilities.]

2b. Accommodate right- or left-handed access and use. [In a word, what ever users are used to use right hand or left hand, they can be effective in use.]

2c. Facilitate the user's accuracy and precision.

2d. Provide adaptability to the user's pace.

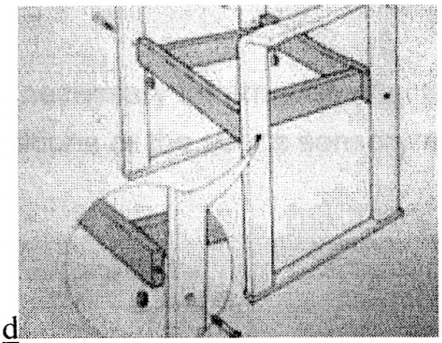
Examples

- Scissors designed for right- or left-handed users. [In another word, the designs must be adjustable for users to comfortable use by both hands.]
- An automated teller machine (ATM) that has visual, tactile, and audible feedback, a tapered card opening, and a palm rest

Principle 3: Simple and Intuitive Use- [Every one can be simple in use with intuition.]

Definition:

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.



d

Guidelines

3a. Eliminate unnecessary complexity.

3b. Be consistent with user expectations and intuition. [In a word, users can be easy to understand with intuition, while they are in operating.]

3c. Accommodate a wide range of literacy and language skills. [To assist users can be easy and clear to operate.]

3d. Arrange information consistent with its importance. [In another word, the information and its significance must be considered together.]

3e. Provide effective prompting and feedback during and after task completion.

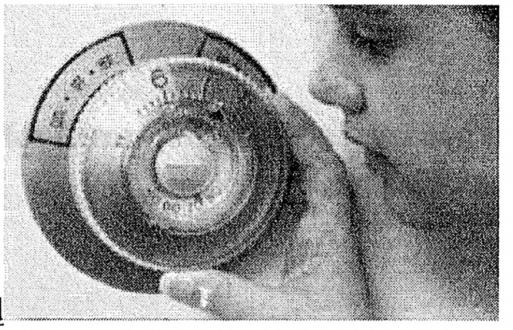
Examples

- An instruction manual with drawings and no text. [For instance, in the airport, while people carried baggage to get to the gate, a moving sidewalk or escalator can be attentive to reduce tired of traveler.]
- A moving sidewalk or escalator in a public space

Principle 4: Perceptible Information

Definition:

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.



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Guidelines

4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.

4b. Provide adequate contrast between essential information and its surroundings. [In a word, to make use of the contrast to emphasize essential information, to be easy identify to users while they are in operating.]

4c. Maximize "legibility" of essential information.

4d. Differentiate elements in ways that can be described [i.e., make it easy to give instructions or directions.]

4e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations. [In another word, to be completely deliver information to users by using diverse ways and devices, even though for people with sensory limitations.]

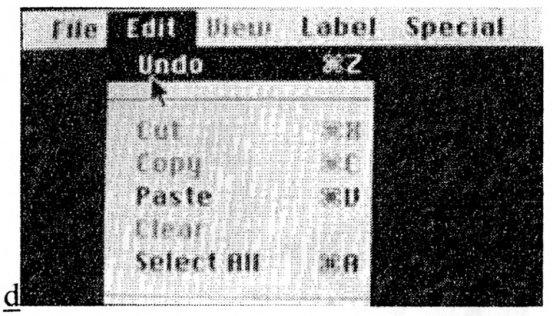
Examples

- Tactile, visual, and audible cues and instructions on a thermostat
- Redundant cueing (e.g., voice communications and signage) in airports, train stations, and subway cars. [To assist people to get to the destination clear and correct.]

Principle 5: Tolerance for Error- [the designs must can be allowed the users make a mistake and no dangerous occurring.]

Definition:

The design minimizes hazards and the adverse consequences of accidental or unintended actions. [In a word, the designs must be achieving minimum risk, even though making mistake its nothing to influence.]



Guidelines

5a. Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.

5b. Provide warnings of hazards and errors. [In another word, while in the operating, if the dangerous occurred or made mistake that will make sound to alter users to be safety.]

5c. Provide fail-safe features. [In a word, the products must provide an operation of procedures and installation of instruction in the using for users to prevent a breakdown and dangerous with making mistake to be safety.]

5d. Discourage unconscious action in tasks that require vigilance.

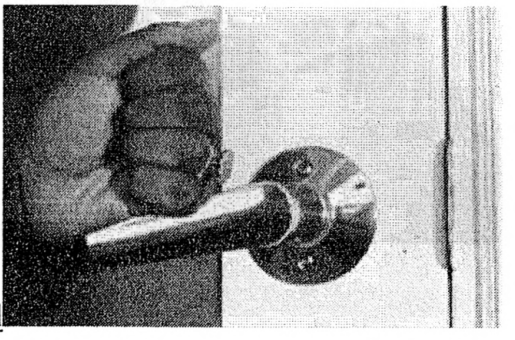
Examples

- An "undo" feature in computer software that allows the user to correct mistakes without penalty
- A double-cut car key easily inserted into a recessed keyhole in either of two ways

Principle 6: Low Physical Effort

Definition:

The design can be used efficiently and comfortably and with a minimum of fatigue.



d

Guidelines

6a. Allow user to maintain a neutral body position.

6b. Use reasonable operating forces.

6c. Minimize repetitive actions. [The designs must be operated without repetitive the same actions by users.]

6d. Minimize sustained physical effort. [To prevent coursing sustained physical effort to users, while they are in using.]

Examples

- Lever or loop handles on doors and faucets
- Touch lamps operated without a switch

Principle 7: Size and Space for Approach and Use

Definition:

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility. [In a word, the designs can be effective used by all people, even though the kids, people with disabilities or pregnant that can be use with barrier-free.]

d

Guidelines

7a. Provide a clear line of sight to important elements for any seated or standing user.

7b. Make reach to all components comfortable for any seated or standing user.

7c. Accommodate variations in hand and grip size. [In another word, whatever user's hand and grip size that can be suitable operated by all users.]

7d. Provide adequate space for the use of assistive devices or personal assistance. [In a word, the spacial design must be large enough to accommodate the needs of all users.]

Examples

- Wide gates at subway stations that accommodate all users
- Controls on the front and clear floor space around appliances, mailboxes, garbage dumpsters, and other building elements

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These Principles of Universal Design address only universally usable design, while the practice of design involves more than consideration for usability. Designers must also incorporate other considerations such as economic, engineering, cultural, gender, and environmental concerns in their design processes.

The principles offer designers guidance to better integrate features that meet the needs of as many users as possible. All Guidelines may not be relevant to all designs.

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Brackets [ ] indicate author's addition for improving the translation to Traditional Chinese (AppendixB)
The authors
Compiled by advocates of universal design, listed in alphabetical order: Bettye Rose Connell, Mike Jones, Ron Mace, Jim Mueller, Abir Mullick, Elaine Ostroff, Jon Sanford, Ed Steinfeld, Molly Story, & Gregg Vanderheiden

Appendix B

Universal Design Principles, extended version in Traditional Chinese

全面性或共通性之考量的設計準則

全面共通性設計:產品和環境的設計對於所有的人或使用者必須是有用的.使用方便的,使達到最大範圍的可能性,而不是一種適應或者是特殊的設計.

全面共通性的七項原則可能被使用於評估在存在的設計上,去導引在設計的過程上,並且教育設計師與消費者有關於更有用的產品與環境的特性.

全面共通性的七項原則,定義,指標與例子:

1. **原則(一):公平性的使用-[亦是達到一種每個人都可以公平使用的設計]**

   定義:

   設計需是提供給各種不同能力的人,能夠是非常有用的.有益的且可容易取得,使用無任何不平等之待遇.[換句話說就是一種市場化的提供,人人平等的設計.]

   指標:

   1a: 提供所有使用者相同亦是同等的使用方法, [例如設計共同的入口,提供給所有的人,而不是另外設計一個入口給身體不便者使用之.]

1b: 避免給於使用者一種差別待遇感,以及造成使用者有被歸納是殘障者的感受, [換句話說是一種同等性的設計,提供給每位使用者使用.]

1c: 提供使用者有自我隱私.防護與安全性的設計,亦是一種有效用的提供給所有的使用者, [例如在公共環境或領域,仍擁有屬於個人私密性的使用空間,並且具有安全感.]

1d: 設計需是可吸引使用者,並且令使用者產生興趣, [也就是一種人性化且能引起使用者有興趣的設計.]

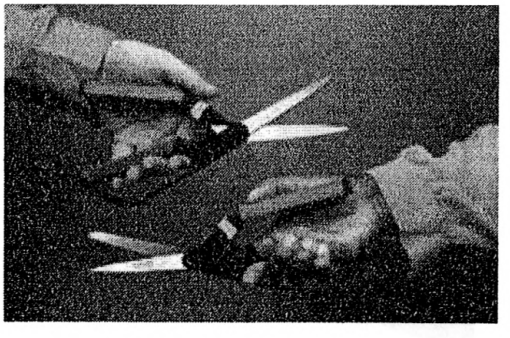
舉例範例:

- 在入口處,設有自動感知功能的門,以利於使用者進出方便, [好比在超市,當人們雙手皆提著物品時,可以不需用手推開門,即可藉感知器將門自動打開.]
- 採用集聚.分散,且可適應/任意移動的座位於集會的場所,例如運動場與戲劇院

2. **原則(二):有彈性的使用-**[亦是達到一種根據每個人的需求都可以彈性使用的設計.]

定義:

設計需能支持且廣泛的提供給每個人可根據其個人的偏好.習慣與能力使用之



指標:

2a: 提供一種彈性或是多選擇性的使用方法.[亦是一種多方位的功能性使用,給所有的使用者能依自己的需求.能力使用之.]

2b: 可容納左.右手都可使用的設計.[亦是不管慣用左手或是右手使用者都能有效使用之.]

2c: 使容易正確使用操作之

2d: 適應性/可塑性使用的設計,可依使用者的速度步伐或需求,而適應之

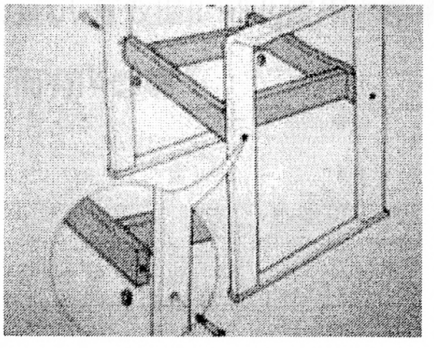
舉例範例:

- 剪刀設計可適用於慣用左.右手的使用者.[亦是設計一種符合雙手皆可舒適使用的剪刀.]
- 自動存提款機,其須具備視覺.觸覺及聽覺回應的功能,且還需具有刷卡與觸控面板即可操作之功用的設計

3. **原則(三):簡單且直覺的使用-**[亦是達到一種依憑每個人的直覺就可以簡單使用的設計.]

定義:

設計需能容易明瞭使用,無論使用者是否有無經驗,知識,語言或集中程度都能簡單的使用之



指標:

3a: 排除不必要的複雜,亦是簡單且易操作的設計

3b: 與使用者的期待和直覺一致的設計.[亦是可讓使用者在操作時,憑直覺即可了解.]

3c: 可容納廣泛的讀寫能力與多種語言的提供設計,讓使用者能容易的明瞭操作之

3d: 資訊的安排依其重要性作爲考量.[亦是資訊與其重要性一致考慮之.]

3e: 提供有效力的提示,在於任務執行中與完成後

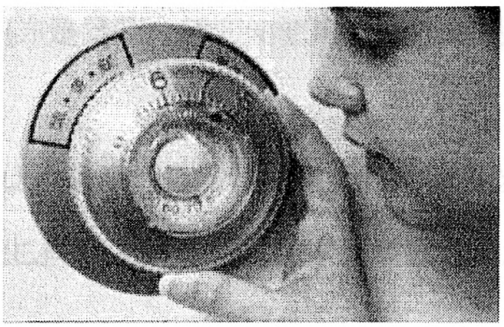
舉例範例:

- 使用說明書採用圖示方式來取代文字,讓使用者易於了解操作之
- 在公共建築空間,採用移動式的行走步道或電動手扶梯設置.[例如機場,當人們手提行李至各個登機門時,其設置可以體貼的減輕旅人的疲勞.]

4. **原則(四):可知覺識別的資訊-**[亦是達到一種每個人都能容易知覺識別的資訊設計.]

定義:

設計需呈現出主要必然的資訊,有效提供輔助使用者容易明瞭不因周遭狀態與感官能力的差別而有所影響



指標:

4a: 使用不同方法來傳遞/陳述重要資訊,像是圖文.觸覺感知方式的使用,讓使用者易於了解操作之

4b: 重要資訊與其環境背景採取適當的對比.[亦是利用對比手法來強調重要資訊,讓使用者在操作時,易於識別.]

4c: 盡可能讓重要資訊易識別,讓使用者易於了解

4d: 採取不同元素/原理的方法,使易於描述傳達.[亦是使其容易傳達使用者一個明瞭易懂的指示說明.]

4e: 多樣性的技法與設備的使用,使與人們的感知能力相配合.[亦是利用各種方法及設備,使資訊可以完全的傳遞給使用者,即使是有知覺能力障礙者.]

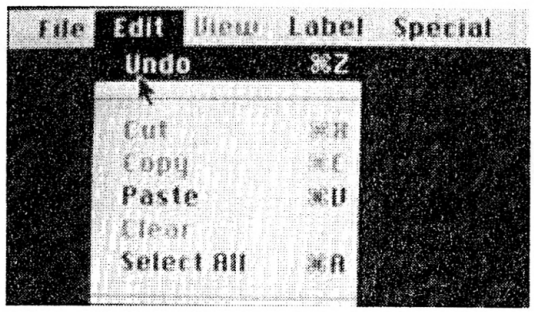
舉例範例:

- 採用具視覺.觸覺及聽覺之提示與說明功能的自動調溫器
- 於機場.車站.地鐵運輸站等場所,需採取重複的提示說明標示,以輔助人們可清楚且正確的到達目的地

5. 原則(五):容許錯誤-[亦是達到一種即使使用者操作錯誤也不生危險的設計.]

定義:

設計盡可能達到最低及最小的危險性與負面性的意外後果或亦是不預期的行爲活動產生,換言之就是將設計達到最低危險度，即使發生錯誤也不造成影響



指標:

5a: 盡可能避免元件.要素產生危險與錯誤.[亦是使大多使用的元件,易於操作,盡可能的減低其危險性產生,且將危險之物予以分離防護之.]

5b: 採取危險及錯誤發生的警鈴裝置設計.[亦是在操作中,若發生危險與錯誤會發出警告,警惕使用者,使達安全性.]

5c: 採取故障安全防護裝置.[亦是提供使用時的操作手續及裝置說明,以防止故障產生,不使因失誤而發生危險,達到安全性考量.]

5d: 防止在工作時,產生不可知的行爲與錯誤,需要求給予警惕的措施

舉例範例:

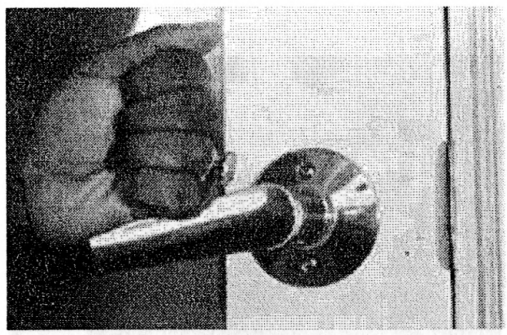
- 電腦軟體需具有可恢復先前狀態/原狀的性能,以允許使用者可校正錯誤,而不致遺失資料

- 雙面切換使用的車鑰匙,使容易插入鑰匙孔,無論任何一面皆可起用

6. **原則(六):低身體竭力.努力-**[亦是達到一種讓使用者不需費太大力就可以使用的設計.]

定義:

設計需達到有效率,舒服充裕且對身體不造成很大的負擔,換言之就是將設計達到即使不使用勞力也可有效使用



指標:

6a: 需容許使用者以最自然中立的姿勢來操作使用

6b: 採取適度的操作力量設計.[亦是讓使用者不需費力就可操作之.]

6c: 盡可能的減少重複動作的操作.[亦是讓使用者不須重複操作相同的動作,即可操作使用.]

6d: 盡可能的減低讓身體持續造成負擔的設計考量.[亦是避免讓使用者再操作時,對身體造成持續負擔.]

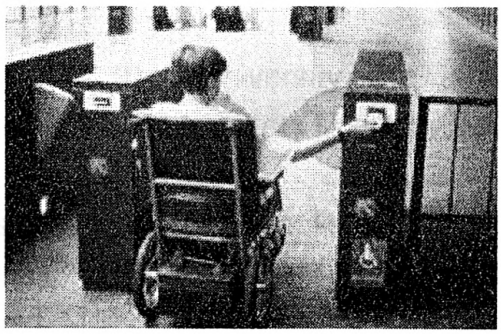
舉例範例:

- 門把與水龍頭採取桿狀式或是環套式設計
- 採取觸控式功能的照明燈.[亦是無需用手切換的照明燈.]

7. **原則(七):易接近且可使用的尺度與空間-**[亦是達到一種讓使用者無論處於何種姿勢或使用輔助性設備,如輪椅都可以容易使用的設計]

定義:

設計需達到易接近且可使用的尺度與空間,使之無論使用者的身體尺寸.姿勢以及能力如何都可容易接近到達與處理.[換言之就是將設計達到人人都可有效性的使用即使是小孩子,身體障礙者或是孕婦都能達到無障礙的使用.]



指標:

7a: 提供清礎的視線,使重要資訊可明確傳達於人們,不論坐著或站著,都可以明確看到重要的資訊

7b: 設計讓不論是坐者或站者,皆可輕易且輕鬆的用手接觸各處,並取得之

7c: 設計可容納各種大小不同的手及手可掌握的尺度.[亦是讓使用者不論其手與手可掌握的尺度大小如何,即可操作使用之.]

7d: 提供足夠的空間給需使用輔助設備或照護者的使用者.[亦是設計足夠的空間來容納使用者的需求.]

舉例範例:

- 在地鐵運輸站的出入口處,採取面寬廣的設計,以可以容納大批人潮
- 採建物前方監控管理設置,並且保持在設備.信箱.垃圾處理停車處及其他建築物周圍環境地面的流暢,使之無任何阻礙

原資訊來自北卡羅萊那州立大學

中文翻譯來自 B.C.Lin 以及括弧內之額外解釋來自 B.C.Lin

The authors:
Compiled by advocates of universal design, listed in alphabetical order: Bettye Rose Connell, Mike Jones, Ron Mace, Jim Mueller, Abir Mullick, Elaine Ostroff, Jon Sanford, Ed Steinfeld, Molly Story, & Gregg Vanderheiden

Appendix C

Additional Taiwanese Demographic Information

Table 1 A age cohorts for selected censuses and percent change

Taiwan population by age cohorts for 1980, 1990, and 2000

	Census 1980	Census 1990	Census 2000	Change 1980-1990 %	Change 1990-2000 %
Grand total	18,029,798	20,393,628	21,999,851	13.1	7.9
Less than 5 years	2,039,902	1,563,486	1,490,553	-23.3	-4.7
5-9 years	1,823,248	1,895,283	1,592,615	4.0	-16.0
10-14 years	1,934,565	2,031,614	1,581,723	5.0	-22.1
15-19 years	2,050,557	1,816,631	1,859,104	-11.4	2.3
20-24 years	1,967,593	2,004,404	1,991,513	1.9	-0.6
25-29 years	1,769,013	1,985,210	1,758,668	12.2	-11.4
30-34 years	1,181,574	1,870,818	1,852,870	58.3	-1.0
35-39 years	903,050	1,685,015	1,920,346	86.6	14.0
40-44 years	883,560	1,132,532	1,808,083	28.2	59.6
45-49 years	812,872	865,644	1,615,740	6.5	86.7
50-54 years	810,816	834,649	1,072,629	2.9	28.5
55-59 years	651,841	753,142	808,203	15.5	7.3
60-64 years	472,897	716,045	761,156	51.4	6.3
65 years and more	729,010	1,239,155	1,886,648	70.0	52.3
Source by Council of Labor Affairs, Executive Yuan					

Table 2 Selected housing characteristics for 1980, 1990, 2000

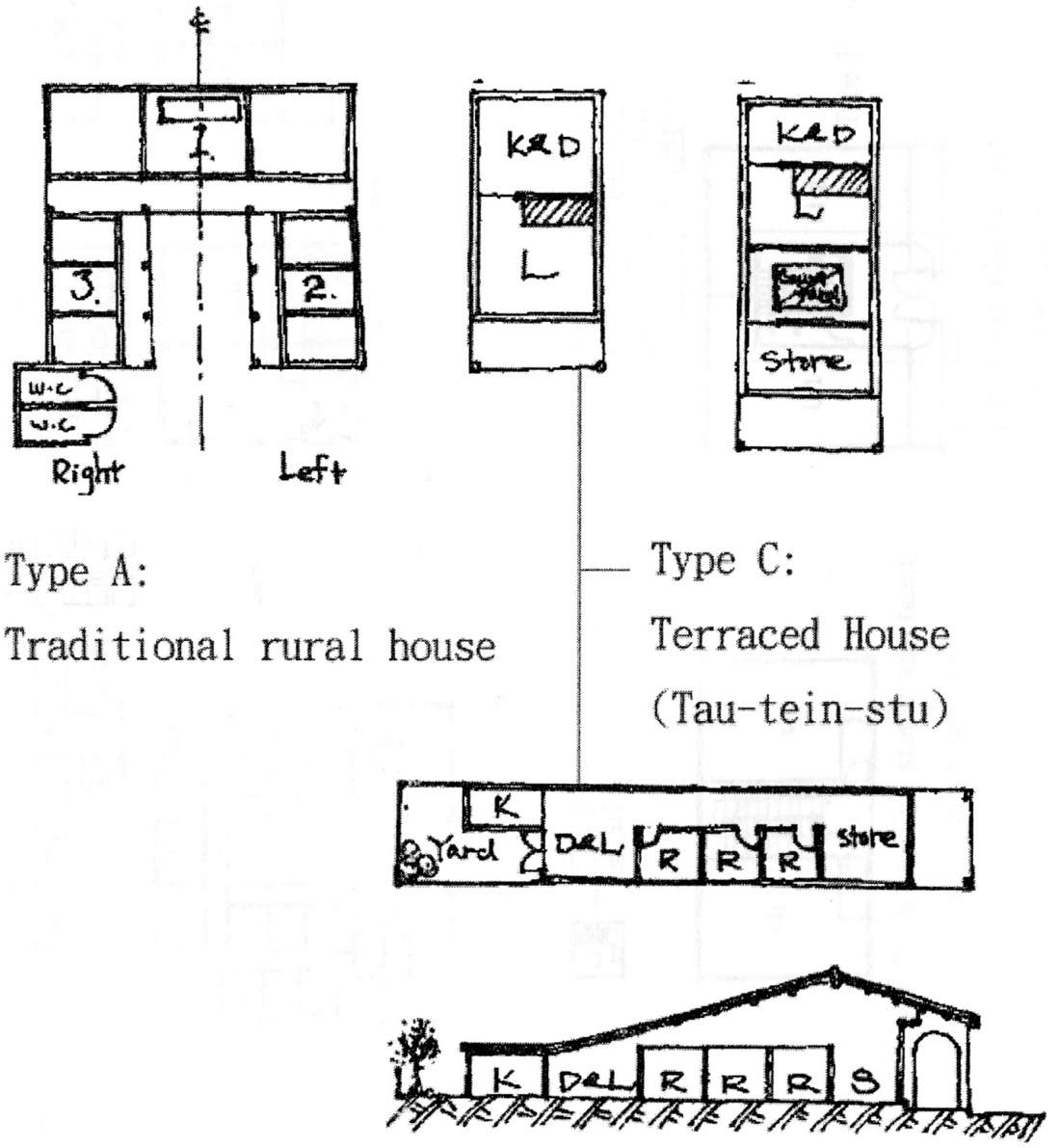
Selected housing characteristics for 1980, 1990, 2000

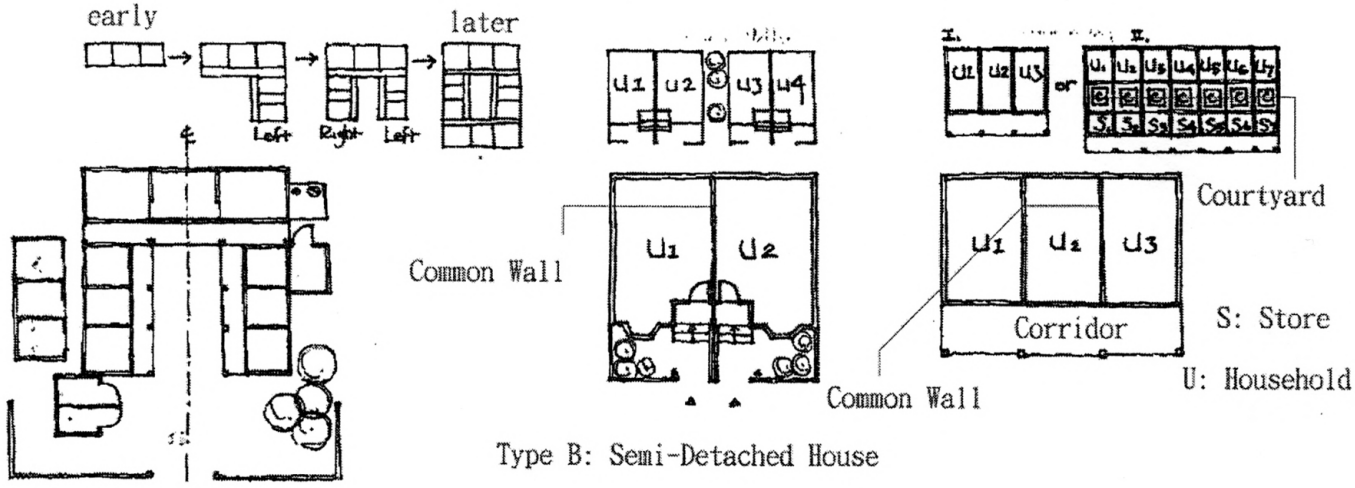
Abstracted Item	Unit	2000	1990	1980
Number of the ordinary household	household	6,470,225	4,943,257	3,740,176
Average number of person per housing unit	person/house unit	3.4	4.0	4.8
Housing ownership rate	%	82.2	78.5	72.5
Average number of rooms per housing unit	room/housing unit <including living/ dining room>	4.6	3.9	3.7
Average number of rooms per person	room/person	1.2	0.9	0.7
Number of households	household unit	6,993,099	5,088,232	3,677,300
Housing unit--occupied	household unit	5,509,974	4,246,751	3,171,876
Housing unit--unoccupied but for other use	household unit	250,997	162,961	23,103
Vacant housing units	household unit	1,232,128	678,520	482,321
Vacancy rate	%	17.6	13.3	13.1
Average number of housing per household	housing/household	1.1	1.0	1.0
Resource: The Ministry of Interior Department				

Appendix D

Additional Taiwanese Housing Diagrams for Housing Types

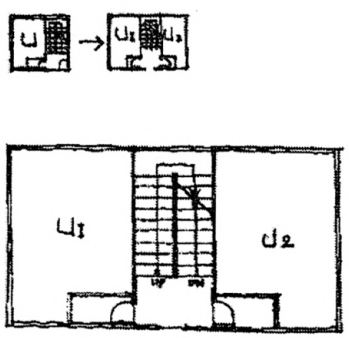
Figure 1 Type A&C Plans and Sections



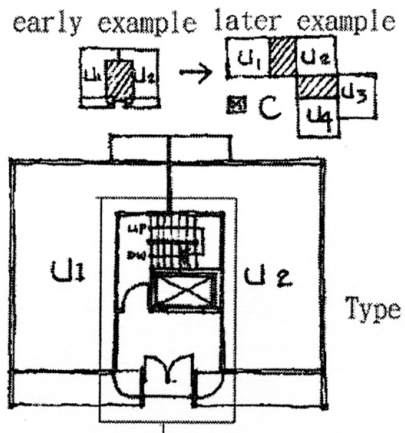


Type A: Traditional Rural House

Type B: Semi-Detached House



Type D: Below five-storey apartment
(no elevator service)



Type E: More than five-storey
building with
elevator service

vertical circulation with
stairs and elevator

Figure 2 Type A though E Plans