

Universal design in housing for people with disabilities: A review

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Housing standard for disabled people is a new dimension in quality of life. To the disabled people who are housebound, the house is the central focus of their existence. Over the last ten years, more focused studies have been conducted on the relationship between housing and people with disabilities. This paper reveals the needs of universal design in housing for disabled people and policies that can be improved. The main focus is on housing design for people with disabilities that begins with an overview on housing needs concept, theory and model, and followed by the topics on housing crisis for disabled people. These reviews looked at the existing literatures on universal design in residential remodeling including the principles of universal design, housing features, design, space and accessibility. It concludes by providing housing strategy for people with disabilities including disabled rights, information and advocacy from various countries.

Keywords: *disabled people, housing, policy, universal design, accessibility, space*

1. INTRODUCTION

For disabled people, normally rehabilitation occurs in a specific period of time, but it can include a single or multiple interventions delivered by an individual or a group of rehabilitation members. Rehabilitation is needed from an acute or preliminary phase instantaneously following recognition of a health condition through the post-acute and maintenance phases (Unsworth et al., 1995). Rehabilitation is included in identifying the problems and needs of a person, connecting the problems to significant factors of the person and environment, defining the goals of rehabilitation, planning and implementing the methods and measures, and also evaluating the impacts and results (Helander, 2000). Rehabilitation in housing increases the quality of life. People want to stay living in their own homes and be part of the community. People with disabilities and aged people need freedom, independence and security to ease their accessibility around the house (Duncan, 2007; Verwer, 2012). Therefore, a house design is important to not only minimize the risk of trips but also to be easily accessible and effective.

The United Nations Convention is a potential medium for the 'shifting phenomenon' of the right and dignity for disabled people (Lang, 2009; WHO, 2003). Human rights concepts are now involved with disability rights and policy that are being implemented

nationwide (Thomas & Thomas, 1999). This paper focuses on housing design for people with disabilities (Gibson et al., 2011; Krahn, 2011; WHO, 2003). It begins with an overview of housing need's concept, theory and model. This is followed by a brief concept of disabled and housing crisis for disabled people that involve the housing owner and tenant. This review continues examining the existing literature review on universal design in residential remodeling including the principles of universal design, housing features i.e. door, entrance, window, stair etc., design, space and accessibility. Besides, this paper compares some previous writing in terms of applying the universal design index for the housing study. As the universal design is a worldwide concept, this paper includes recent acts and policy related with disability including, disabled right, information and advocacy from various countries (Dalilah, 2011; SFELP, 2002).

2. METHODS AND RESEARCH MATERIALS

This paper intends to carry out a review of the research area of housing, disabled people and universal design. As housing literature is expanding fast, this kind of reviews is an effective method of observing studies that have been carried out and the possible gaps that still exist in research. Two major types of supported studies which are housing and disability have been the main term and goal. With the focus of these two subjects, a combination of search terms "housing" and

“disability” were used in key word and title. The term “universal design” is also used in order to find suitable and related literature. The source of this review includes various types of research, publications, documents and articles.

This review is formed using Web of Science ISI journal searching that includes some journals from the JSTOR, Wiley online library, Sage Publication, Scopus and Science Direct database. In addition to searching the database, the citations in each article are observed for further possible articles and reports to review. Titles of the articles were initially examined for relevance to the supported topic. The abstract is reviewed only if it is relevant to the topic. The process continued by excluding editorials, brochures and multi-sectoral studies that are less related to housing, disabled people and universal design. Some papers are more related to the rehabilitation in terms of health and medication issues. At the end of this process, all related articles are selected. This resulted in having five general subtopics which are the housing need, people with disability, community-based rehabilitation, universal design and housing strategy.

3. HOUSING FOR DISABLED

3.1 HOUSING NEED: CONCEPT AND THEORY

According to Bramley et al. (2010) there are different concepts and theory in housing need approaches. Housing need is a normative basis which depends on human choice (Bramley et al., 1999). It is a multi-dimensionality and flexible to different types of needs (Bramley, 2005). In other opinion, housing need concept is identified as between backlog and new need (Holmans, 2001). Backlog is a ‘stock’ concept where the households presently experiencing the need of housing, whereas new need is a ‘flow’ where the forecast need is predicted to happen over the planning time. According to Bramley et al. (1999; 2010) the requirement for housing is also related to the need and demand. Bramley et al. (2010) differentiates the need i.e. deficit from a certain normative standards of sufficient accommodation from the demand i.e. the housing quality and quantity which people choose for their preferences and affordability. In addition, Holmans (2001) stated that generally people need housing for various reasons including actual and potential of the households, suitability of current homes (cost and crowd), social tenants (disrepair, crowding, or children and elders in high flats).

Indigenous household is defined as a household where there are one or more residents which majority

lives by family households. Indigenous households are larger than non-indigenous (Forrest & Gombas, 1995). Housing ownerships are divided into three which are home owner/purchaser, private or tenure type and state or territory housing authority. Housing ownerships is important to support universal design application in housing. According to Mansell & Brown (2008) total number of people with disabilities who live at home together with their family and friends is increasing. Thus, housing design is significance to be the starting point to encourage rehabilitation and independent living for disabled people.

For people with intellectual disabilities, clustered housing gives them inferior results than the dispersed housing (Mansell & Brown, 2008). Dispersed housing improves better quality of life, better opportunity for choice-making, achievement of behaviors and it is cost-effective (Young, 2006). People with different or multiple disabilities have different needs and requirements for accommodations, supports and facilities compare to the normal people.

3.2 PEOPLE WITH DISABILITY

Based on a research done by New South Wales (NSW) Australia Department of Infrastructure Planning and Natural Resources (2004), disability can be defined as a limitation in the ability of individual of any age to do any business, profession, work or to participate in social life due to physical, sensory, mental health or intellectual impairment. Disability is classified as mentioned by (Battams & Baum, 2010) into four categories which are sensory disability, mental health disability, physical disability and intellectual disability. It is supported by National Housing Strategies for Disabled by the Department of the Environment Community and Local Government (2011). Disability is measured by numbers of types of disabilities including hearing disability, visual disability, cognitive disability, ambulatory disability, self-care disability, independent-living disability (Hoffman & Livermore, 2012). However, disability is again defined by society and culture without understanding the ability of disabled people to participate socially and the disability activity provides less chance of being sustainable (Coleridge, 2000). The element of care, concern and housing services and policies are highlighted on the basic of physical needs and less concentrated on health and well-being (Gibson et al., 2011).

Disability referred to the interaction of functional status for one person with the physical, cultural and policy environment (Loeb et al., 2008). Disability is a functional limitation when one person fails to use full

range of the body functioning and cannot collaborate with the accommodation and support properly. People with disability have negative aspects of interaction in terms of body impairment, limitation activity and contextual factors. Therefore, people with disabilities need proper housing and dwelling as they are housebound and dependable. Better housing can promote rehabilitation for them. Housing is considered as a necessary element to the public support system that will affect the quality of life and community variation of disable people (SFELP, 2002; Wong & Stanhope, 2009). People with disabilities probably move from one living area to another and will end up at social housing with improper, inefficient and failure accommodation, facilities and support from the community and development.

Research shows that working-age disabled people are less likely to be employed compared to people without disability. Disabled workers have less than 60 percents of household income of a normal person. The differences seemly related to the low level of their education (Hoffman & Livermore, 2012). This may affect the factor of housing ownership and type of housing. Housing characteristic for disabled i.e. footage, number of rooms, square feet, number of amenities and area must be equivalent as non-disabled. The disabled needs a reachable, accessible and reasonable price of housing to fulfill self-needs (Perl, 2008).

3.3 UNIVERSAL DESIGN IN RESIDENTIAL REMODELING

Universal design is design of objects and surrounding for all people with different ages and conditions. It is a great idea which enhances the possibility of design that does not require any adapting specific design (NAHB Research Center, 1996; Souza, 2004; The Center for Universal Design College of Design (CUDC), 2006). Universal design is a simple concept and theory but it is complicated in defining the term. The theory of universal design has conventionally used two strategies to describe the approach (Connell et al., 1997) which include; (a) through illustration of good examples and, (b) time proven test for the universal use. The universal design concept enlarges the numbers of usable housing by including universal features in houses (Connell et al., 1997).

A research project was conducted by a production team includes designer, architects, engineers and researchers from environment plan from center for universal design to evaluate the products, spaces and building elements with the intention of determining optimal products performance and environments

usable including the characteristics and use features by different type of consumer (Connell et al., 1997). The Center for Universal Design (1997) summarized the world existing knowledge base with a set of principle design concerning the characteristics of more usable products and environment. Universal design differs from accessible design as referred to the Universal Standard (2007). The accessible design only benefit people with disabilities while the universal design concepts covers all people with different abilities and ages including pregnant women, children, disabled and aged people. Universal design in housing is an appliance of building concept that integrates products, layout designs and features into housing.

The universal design principles can be implemented in all types of design that can be used by everyone. This concept can be used during evaluating existing designs, guiding the design process and educating people including designers, developers and consumers. The principles and guidelines of universal design concepts (Burgstahler, 2012; Case, 2008; Duncan, 2007) are presented as follows: (a) Equitable use which is practical, useful, fair and viable to everyone with various types of abilities, (b) Flexibility which provides variety of choices for personal preference and skills, (c) Easy, simple and perceptive where it must be easy to grab and understandable, (d) Perceptible information which is effective to user, (e) Tolerance for error which minimize dangers and the unpleasant accidental, (f) Low physical effort which is efficient and comfy to use with minimum exhaustion, and (g) the dimension in term of size and space which is suitable for reach, manipulation, use and grab.

Accessibility in a building including housing is important. In Universal Design Index, there are six aspects to rate accessibility i.e. connectivity (15%) accessibility (25%), usability (20%), safety (20%), integrated design (10%) and operation and maintenance (10%) where the passing score is 65% (Dalilah, 2011). All of the six aspects are related to each other. The access within the site, building location, landscape, car parking, rooms, living room, and kitchen are connected and linked to each other (NSW Department of Infrastructure Planning and Natural Resources, 2004). The design housing layout for example creates a long straight corridor that connected to all rooms and consists of circulation nodes and shorter corridors. Accessibility housing fit people with disabilities for independent living (East Metro Seniors Agenda for Independent Living, 2002; Verwer, 2012). The internal design of housings must be in the appropriate measurement and efficient as agreed by Park (2006) so it will be usable and safe.

Table 1: Housing features and Universal Design Index (UDI)

Authors	Case Study	Housing Features	Universal Design Index (UDI)					
			1	2	3	4	5	6
Department of Infrastructure, Planning and Natural Resources, Australia (2004)	Housing for seniors or disabled people	Wheelchair access, security, letterboxes in multi-unit development, car parking, entries, lighting, room size, corridors, bathroom, kitchen, location of room.	✓	✓		✓	✓	
Dalilah (2011)	Laws for people with disability	Ramp, toilet, parking, lift, refuge	✓	✓	✓	✓	✓	✓
Deardorff & Birdsong (2003)	Universal design: Clarifying common vocabulary			✓		✓	✓	
Verwer (2012)	Livable housing design guidelines	Dwelling access, entrance, parking, door and corridors, toilet, shower, kitchen, laundry, stairways, room, door, window, floor		✓	✓	✓	✓	
Iowa Program for Assistive Technology (2004)	Universal home design: Convenience, ease and livability.	Step-free entrance, kitchen, bathroom, laundry, rooms, floor, windows, electrical outlets and controls.		✓	✓	✓	✓	✓
(NAHB Research Center, 1996)	Re-modeling and universal design to make housing more comfortable and accessible.	Entrance, kitchen, door, bathroom, laundry area, window, parking and walks, stairs and floor surface.	✓	✓	✓	✓	✓	
(Young, 2006)	Rehabilitation, re-modeling and universal design in residential.	Entrances, general interior, kitchens, bathrooms, landscape, ramp		✓	✓		✓	✓
(Yeans, 2000)	Universal design in housing	Handrails, bathroom, doorways, kitchen, storage, interior circulation		✓	✓		✓	
(Duncan, 2007)	Universal design: Clarification & development	Desk, wheelchair access, entrance		✓	✓			

*Note: 1. Connectivity
 2. Accessibility
 3. Usability
 4. Safety
 5. Integrated Design
 6. Operation and maintenance

Home design and modification needs to meet the requirements of household. Most residents regardless of age, size, physical or ability have benefits from universal design in housing (Burgstahler, 2012; Deardorff & Birdsong, 2003; NAHB Research Center, 1996). A universal design in housing should provide a ramp, toilet, appropriate space, entrance, handrail and

practical design (City of Irvine, 2014; The Center for Universal Design College of Design (CUDC), 2006). Table 2 shows the list of housing features with the characteristic to summarize the function of universal design in housing and the benefits of universal design application in housing.

Table 2: List of housing features with the characteristics and benefits

Housing Features		Characteristics	Benefits
Main	Details		
Entrance	Step and Slope	<ul style="list-style-type: none"> • Stepless entrance • Sloping walks at 1:20 max. 	<ul style="list-style-type: none"> • Easier to move. • Safer in wet condition. • Easier to maintain and repair.
	Height	<ul style="list-style-type: none"> • Min 5'x5' level clear space inside and outside door. • Lighted doorbell at reachable height. 	<ul style="list-style-type: none"> • Allows all residents to see who is at the door before opening it.
Circulation	Nodes	<ul style="list-style-type: none"> • Interior and vertical circulation • 30"x48" clear floor space 	<ul style="list-style-type: none"> • Improve circulation • Easy access • Accessible for wheelchair users.
Bathrooms and toilet	Space	<ul style="list-style-type: none"> • Provide clear floor space • Curbless shower 	<ul style="list-style-type: none"> • Space for transfers to/from toilet.
	Handrail	<ul style="list-style-type: none"> • Provide handrails 	<ul style="list-style-type: none"> • Easy to grab and move.
	Handle, faucet, control.	<ul style="list-style-type: none"> • Single lever handles 	<ul style="list-style-type: none"> • Easy to open.
	Dimension	<ul style="list-style-type: none"> • 36"x69" toilet with min 32" width door. 	<ul style="list-style-type: none"> • Accessible.
Kitchen	Space	<ul style="list-style-type: none"> • Space between face of cabinets and walls. • 30"x48" clear floor space 	<ul style="list-style-type: none"> • Usable by children, shorter adults and disabled.
	Height	<ul style="list-style-type: none"> • Clear knee space under table and sink. • Adjustable height in wall cabinet. • Max reach controls 24"x46" 	<ul style="list-style-type: none"> • Allow person to work while seat (e.g. wheelchair users).
Switches and controls	Height	<ul style="list-style-type: none"> • Reachable height. • 15"-48" 	<ul style="list-style-type: none"> • Accessible to children and wheelchair users.
	Type	<ul style="list-style-type: none"> • Easy-touch or hands free switch • Portable battery powered/ using remote control. 	<ul style="list-style-type: none"> • Easier to reach with hands full (e.g. with elbow). • Usable.
Windows	Height	<ul style="list-style-type: none"> • Windows for viewing, 36" max sill height 	<ul style="list-style-type: none"> • Can look out from seat. • Reachable to open, close and lock.
Doors	Width	<ul style="list-style-type: none"> • Clear opening. Open door should extend 2' min or more 90 degree. 	<ul style="list-style-type: none"> • Accessible.
	Handles	<ul style="list-style-type: none"> • Outside open-loop handles • Latches operable without grasping or twisting. • Max 48" height 	<ul style="list-style-type: none"> • Easy to open • Easier to reach with hands full (e.g. with elbow).
	Sidelight	<ul style="list-style-type: none"> • Sidelight or glass panel in door. 	<ul style="list-style-type: none"> • Allow view of on-coming people.
Floor	Type	<ul style="list-style-type: none"> • Non-slip floor surface • 30"x48" clear floor space 	<ul style="list-style-type: none"> • Avoid slippery • Easy to move
Stairs	Handrail	<ul style="list-style-type: none"> • Provide handrails 	<ul style="list-style-type: none"> • To grab and for barrier.
	Ramp	<ul style="list-style-type: none"> • Provide ramp, 1:2 max 	<ul style="list-style-type: none"> • Accessible for all people.
Ramp/curb	Height	<ul style="list-style-type: none"> • Slope of 1:2 max 	<ul style="list-style-type: none"> • Easy for mobility impairment and stroller.

(Source: City of Irvine, 2014; The Center for Universal Design College of Design (CUDC), 2006)

3.4 HOUSING STRATEGY FOR PEOPLE WITH DISABILITY

Disabled people with their families experience better health, wellbeing and physical condition when they become partners in rehabilitation. According to the

World Health Organization (WHO) in 1981, intimately, 70% of disabled people can be assisted at the community stage, while the remaining 30% requires specialist involvements. However, the specialist is unavailable in their community (Thomas & Thomas, 2002). By using the universal concept in

housing, everyone including normal, disabled, children and elders can enjoy exciting life easily, safely and freely. Three approaches in housing strategy for disabled people can be adapted. These approaches include:

3.4.1 Information, Advices and Advocacy

The availability of these three keywords, namely “information, advice and advocacy” are important to reach the need of housing for people with disability (Department of the Environment Community & Local Government, 2011). Everyone is necessary to take part to achieve a more universal environment by sharing knowledge for the present and future development. The awareness on the basic needs of the disabled should be disseminated to all stakeholders including the public to instill barrier free built environment (Hussein, 2005).

People with disabilities need to be educated to develop their knowledge and skills for individual-help, decision-making, management and concern. Housing information and advice must be reliable, precise and comprehensive that has variety of choices for disabled need as there are person with visual or/and hearing impairment (Department of the Environment Community & Local Government, 2011). Furthermore, there are teams and organizations at national and local level that can give advices for people with disabilities i.e. agencies of statutory, disability organization and private agencies.

Adequate advocacy services should be available to enable disabled people to access and manage housing process. With these services, they will be able to obtain accurate information and empower them to make decision and to participate in policy making (Battams & Baum, 2010; Department of the Environment Community & Local Government, 2011).

3.4.2 Disabled Right: Law, Policy and Regulation

European Disability Policy has been inexistence since early 1974 where the first action was to focus on vocational rehabilitation. However, in 1980 it was changed by global policy to stagnation in disability policy (Waldschmidt, 2009). The policy of vocational rehabilitation was shifted to equal rights in 1996 and until now the implementation of non-discrimination policy is applied worldwide (Mansell & Brown, 2008; Waldschmidt, 2009).

According to the United States Department of Housing and Urban Development, the Fair Housing

Act prohibits housing discrimination based on handicap or disabilities and they will be protected by the act (SFELP, 2002). The Act also states in the act that the landlord or the housing owner in which person with disabilities lives have to make reasonable modification to the house and provide necessary accommodation for the disabled person. In addition, to preserve and protect disabled right, the United States Department of Housing and Urban Development allows people to complaint for any alleged violation against disabled rights.

The National Disability Strategy in Ireland built on their present policy and legislation of Employment Equality Act 1998, Equal Status Act 2000 that comprises of the Disability Act 2005 and Citizen’s Information Act 2007. Under the Acts, they guarantee that people with disabilities are included for any services and will receive the appropriate housing and accommodation, to facilitate access, promote equality, choices and independent living (Irish Wheelchair Association, 2011). The existence of this law protects the disabled rights.

China places the central government as the main actor to provide a good protection of the disabled people’s rights. Later, it was shifted to The Chinese Disabled Person Federation (CDPF). Unlike other countries, the disabled people in this country prefer access to social association due to the limited governmental channels and resources.

In Malaysia, Act 685 from Person with Disabilities Act 2008 was passed for registration, protection, rehabilitation, health and development of disabled people. This Act 685 declares that people with disabilities have equal right and chances as the normal people. According to this Act (2008), the authority, private sector and NGO must take necessary action to encourage and support services at housing, living area and other facilities for the disabled. In construction development, Uniform Building by Law (UBBL) drafts a guide for developer to build a standardized building. This is an alternative to avoid discrimination between people with disabilities from the community as well as providing flexible satisfaction of everyone needs.

In addition, Malaysia has also produced standards or code of practice on access for disabled persons to public buildings, MS1184: 2002 (SIRIM, 2009b) and code of practice for access of disabled persons outside buildings, MS 1331:2003 (SIRIM, 2009a). These codes of practice should be met in all new developments. Malaysia also provides guidelines in housing developments. Drafted by the Department of

Town and Country Planning, provisions for people with disabilities are allocated in the guidelines which not only cover the housing design but also the surrounding developments of amenities and facilities (JPBD, 2013). A universal development approach is highlighted in these guidelines.

3.4.3 Challenges to Implementation

Many factors are necessary to be considered which can be obstructions and challenges to implementation. In Japan for example, natural disasters like tsunami and earthquake reduce the potential of temporary housing and residential planning area. Besides, Universal Design Institute in 2010 stated that the implementation of universal design is unobstructed due to lack of education among residents. Previously it was thought that universal design in housing is only cares about accessibility but the concept of universal itself shows it is usable for everyone. Furthermore, government in every country needs to take action as there is existing laws and policy that support these but only some countries have specific guidelines for the developers and home owners.

4. DISCUSSION

Home owners and tenants have to take part in supporting and protecting the disabled person's rights. The remodeling and housing modification is important to provide an accessible home design for all. A house is the first place to regenerate energy and determination. Universal design in housing will encourage the disabled people to live independently and rehabilitate themselves at home.

The Universal Design Index especially accessibility, safety and integrated design should be implemented in every housing unit and it is necessary to be adopted for adaptive and usable housing features (Dalilah, 2011). Besides, connectivity, integrated design and operation and maintenance are also required in contributing universal design in housing. As according to (The Center for Universal Design College of Design (CUDC), 2006) the universal design principles can be applied at the entrance, circulation, bathrooms and toilet, kitchen, switches and controls, windows, doors, floor, stairs, and ramp/curb (Park, 2006; Souza, 2004; Teaford & Zavotka, 2010; Welch & Palames, 1995). The application of these principles which are relevant with housing features' types, height, width and spaces is necessary to fulfill the needs of people with different disabilities.

The existence of laws and policies support housing for people with disabilities to be improved. Policies in other countries such as European Disability Policy, Fair Housing Act, Equal Status Act 2000 and Disability Act 2005 are defending disabled rights and protecting them from being discriminated (Hoffman & Livermore, 2012; Waldschmidt, 2009). Some countries allow them to modify their house to suit their needs. In Malaysia, disabled people rights are stated under Person with Disabilities Act 2008 (Act 685). The guidelines and requirements in UBBL for building construction need to be taken into account and to consider people with different abilities since it applies universal design standard. In addition, provision of guidelines for housing development provided by the government departments need to be adhered in order to fulfill the needs of people with disabilities. Therefore cooperation from all stakeholders is required in order to make this happen. The results of this cooperation will lead to a livable and vibrant housing development. People oriented housing development should be the theme for future city development.

5. CONCLUSION

In conclusion, there are already research and studies done by researchers that relate housing design for people with disabilities. Disabled people have the same needs and right as normal people. Suitable housing design is applicable for disabled by practicing universal design concept in housing development. Moreover, many nations worldwide has applied the universal standard. Local authority, community, family and individuals need knowledge, advice and advocacy to the concept and guideline of housing for disabled. Many acts, policies and laws arise from time to time to promote universal design. The management control and maintenance is important to make sure every housing development obeys the law. Awareness on the needs of the disabled should also be disseminated to everyone to provide clear understanding among stakeholders.

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