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Monika
PhD Scholar, Department of Family Resource Management, I.C. College of Home Science, CCSHAU, Hisar, Haryana, India

Dr. Kavita Dua
Assistant Scientist, Department of Family Resource Management, I.C. College of Home Science, CCSHAU, Hisar, Haryana, India

Corresponding Author:
Monika
PhD Scholar, Department of Family Resource Management, I.C. College of Home Science, CCSHAU, Hisar, Haryana, India

Housing design and dimensions for disabled person

Monika and Dr. Kavita Dua

Abstract
Every sector of society and government should offer a barrier free access. An environment that is friendly for the differently able people should be a space that allows free and safe movement function and access with dignity and independence. A successful design should ensure provision of an environment that supports the independent function of individuals so that they can get to and participate without assistance in everyday activities. In India, a majority of the disabled resides in rural areas where accessibility, availability, and utilization of rehabilitation services and its cost-effectiveness are the major issues to be considered. Housing standard for disabled people is a new dimension in quality of life. The disabled people who are house bound, the house is the central focus of their subsistence. Earlier studies have been carry out on the relationship between housing and people with disabilities. In the course of their bodily interface with the designed environment, disabled people can perceive obstacles and understand spatial qualities architects may not be accustomed to. This paper deals with the needs of general design in housing for disabled people and policies that can be improved and housing strategy for people with disabilities including disabled rights. In this paper we will discuss about the housing need, design, space and accessibility.

Keywords: accessibility, disability, rehabilitation

Introduction
The disability discrimination act (DDA) defines a disabled person as someone who has a physical or mental impairment that has a substantial and long term adverse effect on his or her ability to carry out normal day to day activities. A person is considered to be disabled if: they have a mental or physical impairment.

People of varied abilities should be able to use buildings and places comfortably and safely, as far as possible without special assistance. They should be able to find their way easily, understand how to use building facilities. An environment that is friendly for the differently able people should be a space that allows free and safe movement function and access with dignity and independence. A successful design should ensure provision of an environment that supports the independent function of individuals so that they can get to and participate without assistance in everyday activities.

According to WHO, disability is an umbrella term, covering impairments, activity limitation and participation restriction. Impairment is a problem in body function or structure an activity limitation is a difficulty encountered by an individual in executing a task or action, while a participation restriction is a problem experienced by an individual involvement in life situation. Thus disability is a complex phenomenon, reflecting an interaction between features of a person body and features of a person body and features of the society in which he or she lives.

As per the Census 2011, the differently-abled population in India is 26.8 million. In percentage terms, this stands at 2.21%. There has been a marginal increase in the differently-abled population in India, with the figure rising from 21.9 million in 2001 to 26.8 million in 10 years. There are 14.9 million men with disabilities as compared to 11.8 million women in the country. The total number of differently-abled people is over 18 million in the rural areas and just 8.1 million enumerated in the urban settings. The percentage of men with disabilities is 2.41 as against 2.01 in women. Social groups wise analysis shows, 2.45 per cent of the total disabled population belong to the Scheduled Castes, 2.05 to the Scheduled Tribes and 2.18 per cent to other than SC/ST. Even among these two social groups, the proportion of men with disabilities is higher as compared to women.

It is noticed that disabled persons with 'Any other disability' shows the highest percentage (71.2%) in attending educational institution followed by 'Seeing' (68.0%), 'Hearing' (67.0%), 'Movement' (59.6%), 'Speech' (58.9%), 'Mental retardation' (47.2%), 'Multiple disability'

(37.2%) and least with 'Mental illness' (34.1%). Maximum percentage of disabled persons who attended educational institution earlier is seen in 'Movement' (17.7%) followed by 'Mental illness' (15.5%), and least in 'Multiple disability' (8.4%). The proportion of disabled persons, who never attended any educational institution in 2011 was found to be highest among persons with 'Multiple disability' (54.4%), followed by 'Mental illness' (50.3%) and 'Mental retardation' (41.2%) whereas persons with 'any other disability' (17.7%) show the least percentage.

Objective

1. To discuss the need, universal design in housing for disabled people.
2. To discuss the design consideration and law, regulation and policies for people with disabilities including disabled rights.

Research methodology

This paper is a descriptive study in nature. The secondary data and information have been analyzed for preparing the paper extensively. This paper proposes to take out a review of the research area of housing, disabled people and house design. The secondary information have been collected from different scholars and researchers, published books, articles published in different journals, periodicals, conference paper, working paper, blogs and websites. Some of papers are more related to the rehabilitation in terms of health and medication issues. All related articles are selected. In this paper we cover the need of housing for disabled people, universal house design, design consideration and law regulation for disabled people.

Need of Housing for disabled people

According to Bramley *et al*. (2010) [3] study revealed that there are different concept and theory in housing need approaches. It is a multi-dimensionality and flexible to different types of needs (Bramley, 2005) [2]. In additional opinion, housing need concept is identified as between backlog and new need (Holmans, 2001) [6]. According to Bramley *et al*. (1999; 2010) [3] studies showed the necessity for housing is also associated to the need and demand. Bramley *et al*. (2010) [3] differentiates the need i.e. deficit from a certain normative standards of adequate accommodation from the demand i.e. the housing quality and quantity which people choose for their preferences and affordability. Holmans (2001) [6] 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).

According to Mansell & Brown (2008) [12] revealed the total number of people with disabilities who live at home together with their family and friends is increasing. Thus, housing design is consequence to be the starting point to persuade 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) [12]. Dispersed housing improves better quality of life, better opportunity for choice-making, achievement of behaviors and it is cost-effective (Young, 2006) [20]. People with different or multiple disabilities have different needs and requirements for accommodations, supports and facilities compare to the normal people.

According to (Battams & Baum, 2010) [1] stated that disability is classified into four categories which are sensory disability, mental health disability, physical disability and intellectual disability. It is sustain by National Housing Strategies for Disabled by the Department of the Environment Community and Local Government (2011). Disability is considered by numbers of types of disabilities including hearing disability, visual disability, cognitive disability, ambulatory disability, self-care disability, independent-living disability (Hoffman & Livermore, 2012) [7].

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) [5]. Housing is measured 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) [15, 19]. People with disabilities most likely move from one living area to another and this will end up at social housing with indecent, incompetent and failure accommodation, facilities and support from the community and development.

Universal Housing design

Universal design is design of objects and nearby for all people with different ages and conditions. It is a idea which improve 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) [13, 7].

Universal design be different from accessible design as referred to the Universal Standard (2007). The accessible design only benefit people with disabilities while the universal design idea covers all people with different abilities and ages counting pregnant women, children, disabled and aged people. Universal design in housing is applications of building concept that incorporate products, design and features into housing.

The universal design principles can be put into practice in all types of design that can be used by everyone.

The principles and guidelines of universal design

(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. 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).

Indian society is basically based on cultural harmony and perfect division of labor. It is dominated by man due to the outdoor work and overall security. We think that women are safe in four walls of a house. But it is not possible or right from the starting of society till the end. A country could progress only when both genders

Table 1: List of housing features with the characteristics and benefits

Housing Features		Characteristics	Benefits
Main	Details		
Entrance	Step and Slope	• Stepless entrance • Sloping walks at 1:20 max.	• Easier to move. • Safer in wet condition. • Easier to maintain and repair.
	Height	• Min 5'x5' level clear space inside and outside door. • Lighted doorbell at reachable height.	• Allows all residents to see who is at the door before opening it.
Circulation	Nodes	• Interior and vertical circulation • 30"x48" clear floor space	• Improve circulation • Easy access • Accessible for wheelchair users.
Bathrooms and toilet	Space	• Provide clear floor space • Curbless shower	• Space for transfers to/from toilet.
	Handrail	• Provide handrails	• Easy to grab and move.
	Handle, faucet, control.	• Single lever handles	• Easy to open.
	Dimension	• 36"x69" toilet with min 32" width door.	• Accessible.
Kitchen	Space	• Space between face of cabinets and walls. • 30"x48" clear floor space	• Usable by children, shorter adults and disabled.
	Height	• Clear knee space under table and sink. • Adjustable height in wall cabinet. • Max reach controls 24"x46"	• Allow person to work while seat (e.g. wheelchair users).
Switches and controls	Height	• Reachable height. • 15"-48"	• Accessible to children and wheelchair users.
	Type	• Easy-touch or hands free switch • Portable battery powered/ using remote control.	• Easier to reach with hands full (e.g. with elbow). • Usable.
Windows	Height	• Windows for viewing, 36" max sill height	• Can look out from seat. • Reachable to open, close and lock.
Doors	Width	• Clear opening. Open door should extend 2' min or more 90 degree.	• Accessible.
	Handles	• Outside open-loop handles • Latches operable without grasping or twisting. • Max 48" height	• Easy to open • Easier to reach with hands full (e.g. with elbow).
	Sidelight	• Sidelight or glass panel in door.	• Allow view of on-coming people.
Floor	Type	• Non-slip floor surface • 30"x48" clear floor space	• Avoid slippery • Easy to move
Stairs	Handrail	• Provide handrails	• To grab and for barrier.
	Ramp	• Provide ramp, 1:2 max	• Accessible for all people.
Ramp/curb	Height	• Slope of 1:2 max	• Easy for mobility impairment and stroller.

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

Design consideration

Walks and paths

- Walks should be smooth, hard level surface suitable for walking and wheeling. Irregular surfaces as cobble stones, coarsely exposed aggregate concrete, bricks etc. often cause bumpy rides.
- The minimum walk way width would be 1200 mm and for moderate two way traffic it should be 1650. mm - 1800 mm.
- Longitudinal walk gradient should be 3 to 5% (30 mm - 50 mm in 1 meter)
- When walks exceed 60 Meter in length it is desirable to provide rest area adjacent to the walk at convenient intervals with space for bench seats. For comfort the seat should be between 350 mm - 425 mm high but not over 450 mm.
- Texture change in walk ways adjacent to seating will be desirable for blind persons.

- Avoid grates and manholes in walks. If grates cannot be avoided then bearing bar should be perpendicular to the travel path and no opening between bearing bars greater than 12 mm in width.

Lifts

Wherever lift is required as per bye-laws, provision of at least one lift shall be made for the wheel chair user with the following cage dimensions of lift recommended for passenger lift of 13 persons capacity by Bureau of Indian Standards.

- Clear internal depth: 1100mm.
- Clear internal width: 2000 mm.
- Entrance door width: 900 mm.

A. W A hand rail not less than 600 mm. long at 800-1000 mm. above floor level shall be fixed adjacent to the control panel.

B. The lift lobby shall be of an inside measurement of 1800 x 1800 mm. or more.

C. The time of an automatically closing door should or minimum 5 seconds and the closing speed should not exceed 0.25 M/ Sec.

D. The interior of the cage shall be provided with a device that audibly indicates the floor the cage has reached and indicates that the door of the cage for entrance/exit is either open or closed.

Car parking

- Width of parking bay shall be min. _3.60 Meter.
- Parallel designated parking spaces should be 7000mm in length canopy height clearance should be at least of 2600mm.
- In case of paid parking, the clear area at the front of the machine of at least 1850mm depth and 2100mm width.

Access routes

- A clear width of 2000mm is recommended.
- Where the clear width of an access route is less than 2000mm, passing places should be provided. It should be 2000mm wide x 2500mm long
- Guardrails or barriers should be 1200mm high

Ramp

- External ramps should have a gradient not exceeding 1 in 20, with a maximum rise of 450mm.
- Prevent the installation of steep ramps.
- Make sure the grade of a ramp is a moderate rise of 10 mm to each 120 mm of travel.
- Provide a flat surface 1500 mm or more in length at the top and bottom of the ramp for a wheelchair to pause and prevent it from going out of control.
- Step.ped Approach: - For stepped approach size of tread shall not be less than 300 mm. and maximum riser shall be 150 mm. Provision of 900 mm high hand rail on both sides of the stepped approach similar to the ramped approach.

External steps

- The clear width of external steps should not be less than 1200mm.
- The total rise of a flight of steps between landings should be no more than 1500mm
- Entrance Landing: - Entrance landing shall be provided adjacent to ramp with the minimum dimension 1800 x 2000 mm.

Corridors

- A minimum corridor width of 1500mm is recommended.
- In case there is a difference of level slope ways shall be provided with a slope of 1:12.
- Hand rails shall be provided for ramps/slope ways.

Entrances

- Adequate space should be provided outside all entrance doors to enable people to man oeuvre, understand, access, and use any intercom or entry system.

Doors

- The clear opening width of entrance doors to new buildings should be 1000mm and at least 850mm for existing buildings.
- Exit/Entrance Door:- Minimum clear opening of the entrance door shall be 900 mm. and it shall not be provided with a step that obstructs the passage of a wheel chair user. Threshold shall not be raised more than 12 mm.

Toilet

- Grab rails should be provided to both sides of the cubicle.
- The WC seat should be 480mm above floor level
- Enlarged cubicles should be 1200mm wide and provide a 900mm x 900mm circulation space clear
- A self-contained accessible changing area should have the recommended dimensions of 2300mm x 2500mm
- The minimum size shall be 1500 x 1750 mm.
- Minimum clear opening of the door shall be 900 mm. and the door shall swing out.
- Suitable arrangement of vertical/horizontal handrails with 50 mm. clearance from wall shall be made in the toilet.
- The W.C. seat shall be 500 mm. from the floor.

Public telephones

- The uppermost control should be no higher than 1370mm above floor level.

Vending machines

- Vending machines should be positioned b/n 750mm and 1200mm above floor level.

Internal stairs

- The clear width of internal stairs should not be less than 1200mm. it should be measured between handrails.
- Handrails should be positioned with the upper surface 900mm to 1000mm above the pitch line of the stair flight and 900 to 1100mm above landings.

Passenger lifts

- Passenger lifts should always be located adjacent to stairs
- A lift should have recommended internal dimensions of 1800mm x 1800mm.

Sanitary facilities

- The horizontal travel distance to the nearest toilet facilities within a public building should not exceed 40m.

Signage

The main purpose of signs should be to provide a clear designation of places, warnings and routing information. A person in a wheel chair is less than 1200 mm high. A person

who is partially sighted needs contrasting texture alongside walkways and audible signs for dangerous areas. Signs should be useful to everyone, easily seen from eye level, readable by moving the fingers and well lighted for night time identification.

- Signs shall indicate the direction and name of the accessible facility and incorporate the symbol of access.
- The size, type and layout of lettering on signs shall be clear and legible.

Table 2: Height' of letter for varying viewing distance

Required viewing distance (M)	Minimum height of letters (MM)
2	6
3	1 2
6	20
8	25
1 2	40
1 5	50
25	80
35	100
4 0	130
50	150

Disabled Right: Law, policy and Regulation

The various central government schemes for differently abled person.

The disabled and constitution: fundamentals rights

- No person including the disabled irrespective of his belonging can be treated as an untouchable. It would be an offence punishable in accordance with law as provided by Article 17 of the Constitution.
- Every person including the disabled has his life and liberty guaranteed under Article 21 of the Constitution.
- There can be no traffic in human beings (including the disabled), and beggar and other forms of forced labor is prohibited and the same is made punishable in accordance with law (Article 23).
- Every disabled person can move the Supreme Court of India to enforce his fundamental rights and the rights to move the Supreme Court is itself guaranteed by Article 32.

Educational law for disabled

- The right to education is available to all citizens including the disabled. Article 29(2) of the Constitution provides that no citizen shall be denied admission into any educational institution maintained by the State or receiving aid out of State funds on the ground of religion, race, caste or language.
- Article 45 of the Constitution directs the State to provide free and compulsory education for all children (including the disabled) until they attain the age of 14 years. No child can be denied admission into any education institution maintained by the State or receiving aid out of State funds on the ground of religion, race, casteor language.

Health law

- Article 47 of the constitution imposes on the Government a primary duty to raise the level of nutrition and standard of living of its people and make improvements in public health - particularly to bring about prohibition of the consumption of intoxicating drinks and drugs which are injurious tone's health except for medicinal purposes.
- The health laws of India have many provisions for the disabled. Some of the Acts which make provision for health of the citizens including the disabled may be seen in the Mental Health Act, 1987.

Income tax concession

Relief for Handicapped

- **Section 80 DD:** Section 80 DD provides for a deduction in respect of the expenditure incurred by an individual or Hindu Undivided Family resident in India on the medical treatment (including nursing) training and rehabilitation etc. of handicapped dependants. For officiating the increased cost of such maintenance, the limit of the deduction has been raised from Rs.12000/- to Rs.20000/-.
- **Section 80 V:** A new section 80V has been introduced to ensure that the parent in whose hands income of a permanently disabled minor has been clubbed under Section 64, is allowed to claim a deduction up to Rs.20000/- in terms of Section 80 V.
- **Section 88B:** This section provides for an additional rebate from the net tax payable by a resident individual who has attained the age of 65 years. It has been amended to increase the rebate from 10% to 20% in the cases where the gross total income does not exceed Rs.75000/- (as against a limit of Rs.50000/- specified earlier).
- Persons with disabilities are exempted from payment of professional tax.

Providing accessibility and barrier free environment at work place

- There is a modification in all public buildings including Government offices to provide easy accessibility and barrier free environment for PWDs as per the provisions of the PWD Act, all Government offices should take special steps to provide barrier free and accessible work stations to PWD employees.
- Lifts/elevators should be made accessible by providing Braille signage and audio outputs.
- The scheme of setting up of Composite Regional Centres is a part of overall strategy to reach out to the persons with disabilities in the country and to facilitate the creation of the required infrastructure and capacity building at Central, State and District levels and below for awareness generation, training of rehabilitation professionals, service delivery etc.
- There are six CRCs functioning at Sundernagar, Srinagar, Lucknow, Guwahati, Patna and Bhopal.

Conclusion

In conclusion there are many researchers who already study that relate to the housing design for the disabled people. These people also have the same need and right as that of the normal people. There should be the proper house design for the disabled people. Many acts, policies and laws arise from time to time to promote universal design. Local authority and government need the knowledge about the concept of housing. The management has to take care that the laws, rules and regulation will be properly obyed by

Housing development for disabled person.

Suggestions

- Path leading to the front door should be wide, gently sloping and free from steps.
- Knob handles on doors should be replaced with lever-

handles
- Parking should be relatively larger (minimum 3,800 mm)
- Two-way-switch: One at the entrance of door and one at the bed side is always better than one-way-switch
- Shelves in rooms and kitchens should be of adjustable heights or pull-out style
- Bathroom should be spacious with wider entrance
- Stairs should have hand-rails on both the side. Rails should extend beyond first and last step
- Floor tiles should be skid-proof and slip-resistant.

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