

Design Solutions for Orthopedically Challenged in Higher Education Institutions

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ABSTRACT A good design aims to enable all to have equal opportunities to participate in every aspect of society. That is, it must be accessible, convenient for everyone. Four universities were identified for conducting research through purposive random sampling. Twelve student welfare officers were contacted in person to explore the services rendered by the university to this special section of student population. A check list cum observation sheet was prepared to explore information on the facilities made accessible for the orthopedically challenged students. It was observed in this study that the selected higher education buildings did not possess many design features as per standards and recommendations for physically challenged persons. Design guidelines and recommendations suggested by various commissions therefore considered evolving suitable design solutions to overcome the problems and also to meet the needs of non- ambulatory members who may enroll in University for higher education. Design solutions suggested in this study are proposed to overcome the problems in architectural elements in buildings environment like steps at threshold or access to main building, landing surface in front of threshold, entrance door to main building, ramp, pathways, curb ramps, stairs, lifts/elevators, corridors, water fountain, toilet, and parking.

INTRODUCTION

'Design for All' makes conscious use of the analysis of human needs and aspirations and requires the involvement of end users at every stage in the design process, including those with disabilities. It's a fact hard to believe that ninety percent of India's estimated 40 million children aged four-to sixteen years with physical and mental disabilities are out of school and are being systemically excluded from mainstream education. Only about five per cent of children with disabilities go to school because it has been felt that persons with disabilities need special arrangements in the environment for their mobility and independent functioning. It is also a fact that many institutes have architectural barriers that the persons with disabilities find difficult for their day-to-day functioning. Among different categories of disabled, educational level of people with movement disability is high compared to other categories because of the fact that they face only one barrier, that is, move-

ment which can be easily solved by removing constructional barriers (Bhanushali 2007). The Persons with Disabilities (Equal Opportunities Protection of Rights and Full Participation) Act 1995, states that the government endeavors to promote the education of Children with Disabilities within the normal schools. The built environment needs to incorporate level access, ramps, lifts/elevators, handrails and grab bars, larger toilet cubicles, clear signs, sufficiently wide paths, doors, entrances, lobbies and corridors. The educational institute within which physically handicapped children will be placed must be selected with care, and through discussion with all concerned, to describe the concept of designing all products and the built environment to be aesthetic and usable to the greatest extent possible by everyone (Anderson 2007). The rationale for the study is that although educational buildings are attempting to mainstream as much as possible, it is still necessary to design several specialized classrooms of varying sizes to accommodate the unique needs of the students with disabilities for some of the schools. The existing educational environment presents many obstacles, including small classrooms, changes in floor elevation, stairs, narrow halls, inadequate toilet facilities, poor ventilation, minimal electrical outlets and substandard lighting etc. The aim of the study is to make fewer individuals handicapped, by making the physical environment more accessible and supportive.

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METHODOLOGY

In the current study, design solutions for orthopaedically challenged in higher education institutions were studied to find out the existence of design features in selected educational institutions to meet the needs of orthopedically challenged. Of the six universities functioning in Hyderabad city, among them four universities were identified for conducting research as these fulfilled the requirements for the study through purposive random sampling. These are Acharya N.G Ranga Agricultural University, Osmania University, University of Hyderabad and Jawaharlal Nehru Technological University. A total number of 12 officers, that is, 3 from each university who are responsible for the welfare of students were contacted in person to explore the services rendered by the university to this special section of student population. A check list cum observation sheet was prepared to explore information on the choice of facilities made accessible for the orthopedically challenged students. The data obtained through the check list cum observation sheet and interview with students' welfare officers, are reported as case studies. Guidelines suggested by different authors were reviewed in literature survey, and were used for arriving at the appropriate design solutions.

RESULTS AND DISCUSSION

The information that emerged out of the case studies that were based on the check-list cum

observation sheet of the four universities was analyzed and it was seen that Jawaharlal Nehru Technological University (JNTU) which is the most recently established had all the buildings closely located to one other. This campus had number of accessible features provided like curb ramps, elevators, ramps in some blocks, well-designed stair ways with mid-landing and hand-rails on both sides, accessible furniture in classrooms, non-slippery floors, accessible heights of platforms in laboratories, accessible drinking water fountain. However, some of the accessible provisions like elevators, ramps in all main buildings, separate and accessible toilet in each block fitted with grab bars, accessible parking, were not present. Table 1 shows the accessibility provisions present in this university (Burgstahler 2007). An example of barrier-free design would be installing a ramp for wheelchairs alongside or in place of steps.

University of Hyderabad had the buildings located in a scattered manner in the vast compound. However it had most of the features to provide access for both ambulatory and non-ambulatory orthopaedically challenged students like curb ramps, ramps, accessible parking space, comfortable water fountain, toilets etc. But these facilities were not extended to all buildings except for the few newly constructed buildings. Table 2 shows the accessibility provisions in this university.

Acharya N.G Agricultural University buildings were also distributed in a vast area through

Table 1: Accessibility provisions in JNTU

| <i>Functional area</i> | <i>Door and doorways</i> | <i>Stapes with handrails</i> | <i>Curb ramps</i> | <i>Ramps</i> | <i>Stairways</i> | <i>Elevators/Lifts</i> | <i>Furniture</i> | <i>Non slippery flooring</i> | <i>Parking area</i> | <i>Grab bars</i> | <i>Drinking water fountains</i> |
|------------------------|--------------------------|------------------------------|-------------------|--------------|------------------|------------------------|------------------|------------------------------|---------------------|------------------|---------------------------------|
| College building | ✓ | | ✓ | | ✓ | | ✓ | ✓ | | | ✓ |
| Classroom | ✓ | | | | | | | ✓ | | ✓ | |
| Laboratory | ✓ | | | | | | | ✓ | | | |
| Library | ✓ | | ✓ | | ✓ | | ✓ | ✓ | | | ✓ |
| Toilet | ✓ | | | | | | | ✓ | | | |
| Hostel | ✓ | | | | ✓ | | ✓ | | | | ✓ |
| Canteen | ✓ | | | | | | ✓ | | ✓ | | ✓ |
| Internet center | ✓ | | | | | | ✓ | | | | ✓ |
| Administrative office | ✓ | | | | ✓ | | ✓ | | ✓ | | ✓ |
| Principal office | ✓ | | | | | | ✓ | | | | ✓ |
| Bank | ✓ | | | | | | ✓ | | | | ✓ |

✓ Facility provided by JNTU

Table 2: Accessibility provisions in UH

| <i>Functional area</i> | <i>Door and doorways</i> | <i>Stapes with handrails</i> | <i>Curb ramps</i> | <i>Ramps</i> | <i>Stairways</i> | <i>Elevators/Lifts</i> | <i>Furniture</i> | <i>Non slippery flooring</i> | <i>Parking area</i> | <i>Grab bars</i> | <i>Drinking water fountains</i> |
|------------------------|--------------------------|------------------------------|-------------------|--------------|------------------|------------------------|------------------|------------------------------|---------------------|------------------|---------------------------------|
| College building | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Classroom | ✓ | | | | | | ✓ | ✓ | | | |
| Laboratory | ✓ | | | | | | ✓ | ✓ | ✓ | | |
| Library | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Toilet | ✓ | | | | | | ✓ | ✓ | | | |
| Hostel | ✓ | | | | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Canteen | ✓ | | ✓ | | | | ✓ | ✓ | ✓ | | ✓ |
| Internet center | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ | | ✓ |
| Administrative office | ✓ | | | | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Principal office | ✓ | | | | | | ✓ | ✓ | | | ✓ |
| Bank | ✓ | | | | | | | ✓ | | | ✓ |

✓Facility provided by UH

internal driveways and walkways to connect students for theory and research laboratories/fields. This building set-up also did not have many features specific to meet the needs of orthopaedically challenged population except for the wide doors without threshold, hand rails on both side of steps which connected different plinth levels, western type of toilets in the main college building. However, the most essential features like stairways with low riser, ramps, elevators, curb ramps, accessible parking etc. were not present in the building environment. This university did not provide opportunity for the wheelchair users to take admission. Table 3

shows the accessibility provisions in this university.

Osmania University, the oldest university in Hyderabad city located in the heart of the city with big elaborate structures, did not give importance to the accessible features in design. However, its doorways, corridors, classrooms and laboratories were big and wide to give convenient access to the orthopedically challenged. It also had a hostel for physically challenged, but it had more of problematic features than the accessibility features. Students had to walk through narrow corridor after parking the two-wheeler and climb metal staircase to access their

Table 3: Accessibility provisions in ANGRAU

| <i>Functional area</i> | <i>Door and doorways</i> | <i>Stapes with handrails</i> | <i>Curb ramps</i> | <i>Ramps</i> | <i>Stairways</i> | <i>Elevators/Lifts</i> | <i>Furniture</i> | <i>Non slippery flooring</i> | <i>Parking area</i> | <i>Grab bars</i> | <i>Drinking water fountains</i> |
|------------------------|--------------------------|------------------------------|-------------------|--------------|------------------|------------------------|------------------|------------------------------|---------------------|------------------|---------------------------------|
| College building | ✓ | ✓ | | | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Classroom | ✓ | | | | | | ✓ | | | | |
| Laboratory | ✓ | | | | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Library | ✓ | | | | | | ✓ | ✓ | ✓ | | |
| Toilet | ✓ | | | | | | ✓ | ✓ | | | |
| Hostel | ✓ | | | | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Canteen | ✓ | | ✓ | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Internet center | ✓ | | | | | | ✓ | ✓ | ✓ | | ✓ |
| Administrative office | ✓ | | | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Principal office | ✓ | | | | | | ✓ | ✓ | | | ✓ |
| Bank | ✓ | | | | | | ✓ | ✓ | | | ✓ |

✓Facility provided by ANGRAU

rooms. Table 4 shows the accessibility provisions in this university.

Interview of the administrative officers of all the four universities revealed that, administrators encouraged students for higher education by providing scholarship and 3% reservation for admission. Only in one university, officers were less aware of the need to provide accessible features in the campus. In the other three universities, officers recognized the need for provision of this facility and stated that it is very essential to provide accessible features in all the buildings in campus.

The analysis of the checklist cum observation sheet and student welfare officers views reveal that there is a need to find solution to the problems faced by this section of population. In order to evolve solutions to design problems, various guidelines and recommendations suggested were reviewed for each element, and consolidated for exploring the intricacies in the design.

Building Design Solutions to Higher Educational Buildings

The solutions to overcome the problems of both non-ambulatory members and the ambulatory members who may be the students of these universities in future are as follows. Design solutions suggested for higher educational buildings are:

Step/Steps at Threshold / or Access to Main Building: Curb ramps of 1:12 degree slope with width 1.20m should be provided in level between the road surface and pathway at building entrances, with both the sides hand railings at a height between 0.85m 0.90 m. Landing surface in front of threshold: Enlarge landing area with non slip-flooring should be provided for body steadiness.

Door/ Doors Giving Access to Main Building and Interiors: An accessible, threshold free door with opening of at least 0.90m for exterior and 0.80m for interior door should be provided. The door handles and locks should be mounted at a height between 0.90 m and 1.00 m from the floor surface. Wherever possible automatic doors should be provided for any kind moving aid users, and also at the place like library where book load is to be carried along. Study conducted by (Ansley J. 2001) suggested that Lever handles for opening doors rather than twisting knobs should be present.

Ramp: Accessible, well illuminated, non-slip ramps of minimum 0.90 wide with 1:20 steeper slopes having both side railing mounted at a height between 0.85 m and 0.90 m and landing not less than 1.8 m should be provided. Ramps with hand rails should have kerbs not less than 75 mm of height. According to the view of (Chambers C 2008) an exterior location is preferred for ramps. Indoor ramps are not recommended because they take up a great deal of space and circular or curved ramps are not recommended

Table 4: Accessibility provisions in OU

| Functional area | Door and doorways | Stapes with handrails | Curb ramps | Ramps | Stairways | Elevators/ Lifts | Furniture | Non slippery flooring | Parking area | Grab bars | Drinking water fountains |
|-----------------------|-------------------|-----------------------|------------|-------|-----------|------------------|-----------|-----------------------|--------------|-----------|--------------------------|
| College building | ✓ | ✓ | | | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| Classroom | ✓ | | | | | | ✓ | | | | |
| Laboratory | ✓ | | | | | | ✓ | ✓ | | | |
| Library | ✓ | | | | ✓ | | | ✓ | | | ✓ |
| Toilet | ✓ | | | | | | | | | | |
| Hostel | ✓ | | | | ✓ | | | ✓ | ✓ | | |
| Canteen | ✓ | | | | | | ✓ | | | | ✓ |
| Internet center | ✓ | | | | | | ✓ | ✓ | ✓ | | ✓ |
| Administrative office | ✓ | | | | | | | ✓ | ✓ | | ✓ |
| Principal office | ✓ | | | | | | | ✓ | | | |
| Bank | ✓ | | | | | | | | ✓ | | ✓ |

✓Facility provided by OU

Pathways: Clear and obstruction free steps, creating free travel path with at least 1.80 m wide, slope less than 1:20, smooth, continuous, non-slip and even surface should be provided for barrier free environment.

Curb Ramps: The curb ramp of 1.20m and having slope 1:12 should be provided at level differences between the road surface and pathway level, at pedestrian crossings, drop-off zones, accessible parking spaces and building entrances

Stairs: Steps with minimum width of 1.50 m, riser of 0.12 and tread of 0.30m, equal height of the riser, flush or rounded nosing, intermediate landing of 1.20m, handrails for gripping and extended hand rail between 0.30 m and 0.45 m at the top and bottom of the stairs, slip-resistant and well-illuminated (more than 11 lux) stairways should be provided. The study of (Meo 2008) revealed that stairs with open risers are hazardous to persons who need a solid riser to guide their foot up the riser to the next step or who place canes or crutches against the riser of the next step.

Elevators: Well-illuminated elevator which connects all floors of the building with minimum dimensions of 1.00m x 1.30m, having door opening of more than 0.80m and with three side handrails mounted at 0.80 to 0.85 m from the floor, accessible control panel, call buttons mounted at 0.90 m to 1.20 m from the floor should be provided.

Corridors: Obstruction free, 1.80m wide, non-slip and even corridor should be provided. Where steps are present to connect the level differences, in those places curb ramps with hand railings should be provided.

Toilet: Separate toilets with 1.5m diameter, wall-mounted water closets with seat height between 0.45m to 0.50m from the floor along with wall mounted grab bar at a height between 0.85 m and 0.95 m from the floor in the toilet should be provided. According to (Gradel and Edson 2010) Capacitive Sensing Faucets automatically activate water flow through proximity sensing. Activation without grasping, pinching, or applying more than 5 lb pressure is required.

Parking: Space of at least one for every 50 spaces, recommended width of 3.90m, access aisle of 1.20m wide in between two ordinary parking spaces, 3.60m wide drop-off area, bollards in between transition from normal to vehicular area, close to the buildings.

Other Provisions: All wall mounted drinking water fountain in an alcove drinking water cooler / tap with open space 0.75m underneath the fountain, mounted at a height of 0.90 m should be provided.

By introducing these entire accessible features in different parts of the educational building we can welcome all type of students irrespective of their kind, type, and extent of disability.

CONCLUSION

Everyone has the right to education and higher education shall be equally accessible to all in spite of their disability. Designing a user-friendly educational building for students with disabilities, and designing one for those without disabilities, really should be one and the same. Conceptually, there should be no visible difference if the design is developed in a sensitive and sensible manner. It is necessary to make the educational buildings friendlier to the users'. Barriers like money, procedures, lack of awareness of their problems is sure to make them more barrier-bound instead of barrier-free. Hence, irrespective of hurdles, every effort should be made in all the universities to introduce all the accessibility features in college and hostel buildings as per the standards and by using given design solutions.

RECOMMENDATIONS

- ♦ Similar study may be conducted for blind as well as hearing impaired students on barrier free facility provided for them in educational buildings.
- ♦ Same study may be conducted for primary, middle and high schools.
- ♦ The study was restricted higher educational institutions. Hence the same may be extended to shopping complexes, food centers, post offices, banks, corporate offices including places of worship.
- ♦ Similar study may be conducted on a large sample of orthopedically challenged respondent's students possibly in different districts or states so that the results may be generalized.

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