



CHAPTER 1

INCLUSIVITY AND SPACE DESIGN FOR PEOPLE WITH SPECIAL NEEDS

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Introduction

Inclusivity in space design is a concept that suggests the removal of all barriers in a designed space which create undue ordeals and separation on account of differences prospective users may have. Inclusive design rather seeks to ensure that designed space enables everyone to participate equally, confidently and independently in everyday activities, whatever the nature of their natural or afflictive physical, mental or intellectual compositions and configurations may be, or whatever, their social and background characteristics may subject their being to.

There is no gainsaying the fact that for effective interactions to be contemplated for any designed space, the designers must be deemed to have a clear enough grasp of what the principle of inclusivity entails. This is more so, when some, or all, of the interacting parties may be persons with needs that are not necessarily in tandem with those of persons considered to be 'normal'. To such individuals, with special needs, the varying spatial zones of interaction and the implications associated with them may vary significantly and will require adjustments to have been incorporated, *a priori*, within the design scheme.

Riedel and Mahole (2017), check reference 2017 or 2019? have cautioned, though, that there is not a one-side-fits-all model, hence, designs must be made to incorporate the best available information about a reasonable universe of recognizable and identifiable needs, with a diversity of needs that spans the spectrum of persons, both of normal and of special orientation. Since normal persons can also make use of design facilities which have taken care of persons with special needs, the easiest way to undertake the task is to begin by considering the design requirements of persons with special needs as the irreducible conceptualization of the design scheme, first. It is when design is made to take care of as much of the needs of all prospective users as considered practicable, that it is deemed to have attained the level of 'inclusivity' (see generally, Yilmaz, 2018; Joseph, 2019; Dunlop & Hawking, 2020). Check your reference Danlop or Dunlop, 2020 or 2021?

Concepts

Before considering special needs, persons with special needs and attention they deserve, it is important to note that there are common areas of experiences



that all people have with defined or designed space which virtually applies to all people in nearly the same way, whether they have 'regular or 'special' needs. As one of the likely precursors of what has come to be taken as 'usual standards' (Uji, 2002), these common experiences have the tendency of making some designers believe that once these needs are met, there are less or no other needs to consider in accomplishing what is required in space design task. A brief outline of some of these common needs are encapsulated as follows:

Common Needs of Man's Experience with Defined Space

Riedel and Mahoe (20017), have suggested that instead of insisting on providing design solutions which meet special needs of these people, individually, in all their ramifications, it would be more sensible to evolve inclusive design schemes that broadly accommodate the widest possible range of needs, thus creating room for variability and flexibility. A similar position had earlier been enlisted by Uji (1994), on certain 'needs' with designed space and form which present common experiences, whether the persons using the spaces are those considered regular, or those with special needs. It is one of several concerted efforts by researchers in space design which highlight those common factors that must be dealt with in any form of space design before consideration is given to those other special needs to be taken care of in order to make the design attain the level of the desired inclusivity for all persons of fairly universal consideration. Uji (1994), not cited in references had briefly outlined the experiences as shown hereunder.

While the three spatial qualities of length, breadth and height are what physically defined some space, such space becomes a domain only when it is lived in, moved through and an activity is performed in it (Uji, 2000). The effect of the physical relationship between man and any defined space will, thus, depend, to a large extent, on individual cultural conditioning. It will also depend on the physical characteristics of the enclosed space in question and the activities to be undertaken in the given space. It is among these parameters that commonalities are can be identified. For example, a room that has a particular shape or colour may make objects seem heavier or lighter than they naturally are, its space may seem warmer or cooler, its surfaces or planes might appear advancing or receding; even sounds within them could seem louder or softer (Tobore, 1984 & Wynn, 1977). A room that is far too long in proportion to its width, would evoke the feeling of living in a hallway, or in a tunnel, or cave. A polygonally shaped room or a curvilinear room might present problems of possible distortion and a faulty sense of orientation and location of objects, where rectangular or square rooms are more common, and vice-versa.

As may be seen in the four differently shaped rooms presented in Fig. 2, the shape of a given room, for example, would have a profound impact on the experience of size, sense of orientation and location of objects. The four room plans above, though of the same size, have different shapes and would thus



present varying experiences within their configurations. For people with special needs, these experiences with form and space might be the same and present variabilities only to the extent and peculiarities of their various individual challenges.

Even the colours on surfaces of the boundary features of a given space (walls and ceilings of a room, for instance) would appear to change its proportions. A bright warm deep-toned colour such as orange, scarlet, red, vermilion (which suggest cheer, excitement and exhilaration) would make a wall of a room seem nearer. Thus, the distant walls of a room that is much more than twice as long as it is wide, may be made to seem nearer by painting them with bright warm colours. Ceilings that are too high may be treated similarly. On the other hand, a light cool colour such as blue, foliage green, turquoise and lavender (which suggest freshness and repose) would make a room seem deeper thus, a ceiling that is too low can be made to seem higher by keeping it a lighter and cooler colour than the walls (Uji,1994).

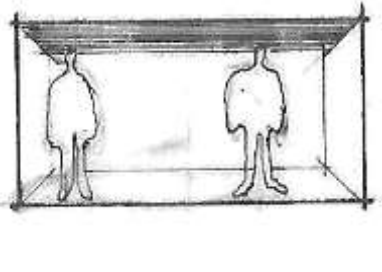
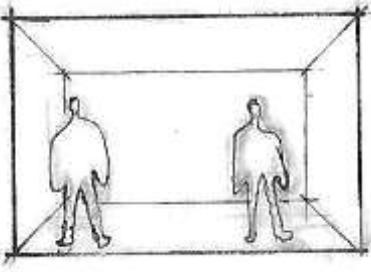
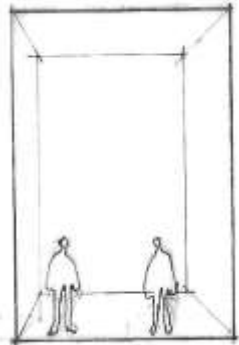
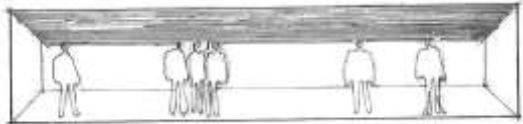
	
(i) Tight and oppressive	(ii) Normal human scale
	
(iii) Hollow and expansive (completely out of scale)	(iv) Though normal height, width out of proportion with depth

Fig 1. Man's varying experiences with room dimensional proportions

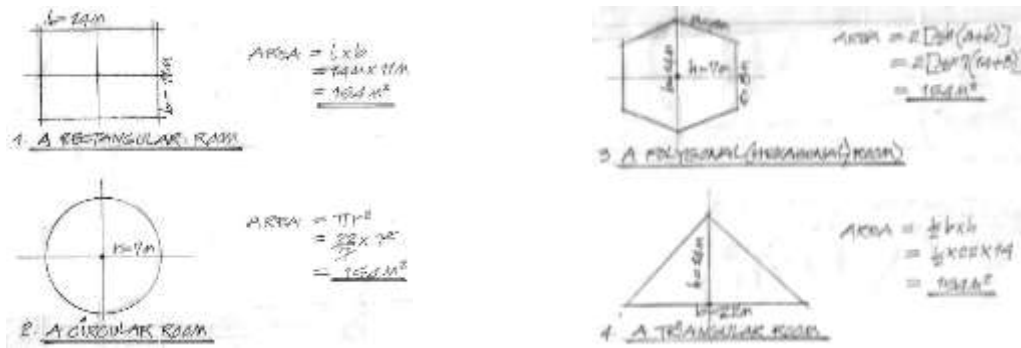


Fig. 2. Man's experience with defined space: different configurations of room spaces present different experiences in spite of area of rooms being the same

Generally, rooms can be made to seem smaller by painting in dark colours (Tobore, 1984, Wynn, 1977). Even two dimensional spaces such as pages of paper can evoke a diverse variety of feelings: material that is broken up into short paragraphs will be more appealing to reading than that which completely fills the page in an unbroken, unpunctuated composition (Kemper, 1979).

Special Needs

In a lot of designs in the built environment, it has become common practice that, once architects carry out a design task, following the laid down minimum standards of space organization, form evolution and construction specifications, they believe they have fulfilled all requirements for the particular building designed for the intended users. Yet, such adherence to minimum standards, more often than not, excludes concern for other users who may have 'special needs' such as various degrees of physical disabilities, visual, auditory and even olfactory challenges. As long as these categories of people are neglected and to the extent of such neglect, the built space in question comes that much shorter of the required universal expectations of 'inclusivity' of building design. Regrettably, though, even where some of these special needs are recognized, some more of the challenges may yet rear their heads and militate against full incorporation of those special needs to be able to achieve an inclusive design. These other challenges may be identified as follows:

- Lack of clarity over what those needs are, that really deserve special consideration, their scope, and how they can be incorporated in all designs to be able to achieve inclusivity ;
- paucity of data on number of people with special needs (expected to use the building);
- insufficient information on frequency of use of certain public buildings by persons with special needs;
- inadequate information on specific areas and component parts of certain buildings expected to be specifically designed for use by persons with special needs; etc.



- lack of clear understanding on the concepts that underpin interaction, in any designed space, by humans whether they have special needs or not (see generally, Yilmaz, 2018 and Joseph, 2019).

However, an attempt has been made by Yilmaz (2018) and Joseph (2022), in putting together some important areas that most closely address the concerns over the challenges of proper identification of those special needs listed above, which, if considered in their broadest sense can be treated more inclusively in an evolving design. The authors underscore these needs with a summary which includes:

- physical mobility disabilities involving some levels of incapacity or impaired capacity with the use of the limbs;
- visual impairment which may involve reduced or limited eyesight, colour blindness, and certain levels of sensitivity to light;
- auditory disabilities which may include deafness: sensorial, or conductive hearing loss, delayed speech processing ability and mixed hearing loss;
- cognitive disabilities, like seizure, dyslexia, and respectively.

Specific Special Needs: Physical Body Challenges

Whenever discussing the physically challenged, what often comes to mind are the manifest inhibitions or limitations to the physical function of one or more of the limbs of the victims. The most obvious of such disabilities include total or partial loss of the arms or legs (fully or partially together with their fingers and toes) due, perhaps to amputation, limitation of the use of these limbs due to paralysis and disfiguring of the limbs through one form of accident or the other. On the other hand, the less obvious of physical challenges, may include disabilities that may emanate from aging, such as changes in body mass, muscle strength and stiffer joints, leading to compromised agility, gait alterations, reduced mobility and balance (see generally, Rutgers SAS Navigation) The most ubiquitous symbol of assistive locomotive device that has come to be associated with physical disability is the 'wheel chair'. But others less common include scooters, walkers, canes, crutches, prosthetic and orthotic devices.

One of the most critical requirements such physical disabilities demand in any designed setting is 'accessibility'. Accessibility simply connotes being able to access, reach, understand, interpret and make sense and use of space, including all that is contained in the given space without much difficulty (see generally, Complete Architecture Package, 2020). Buildings generally, require clear and defined access, right from the approach, the surrounding grounds, parking spaces, drop-off points, entrance, circulation routes within the functional activity spaces of the buildings from one room to another with minimal or no obstructions, as well as appropriate surface treatment of both floors, walls and ceilings.


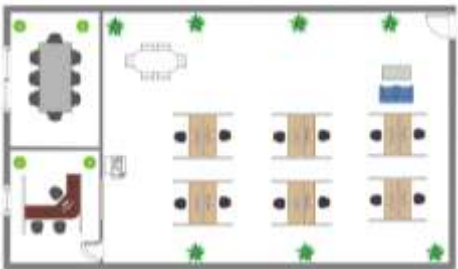
For the physically-challenged, accessibility is the single most important demand for the designed spaces to be considered effective (Yilmaz, 2018). It is



delusional to imagine that any given space facility will only have prospective users who are all able-bodied and hence there is no need to insist on going the extra mile to include the disabled in the designed space. It has to be remembered that, wellness could be temporary and that a young person of sound health, today, could, tomorrow, grow old, suffer an accident, and suddenly turn into a wheelchair-bound person, completely dependent on various types of assistive devices to have access to spaces and components of functional use within a building.

If buildings are multi-storeyed, vertical access will include the provision of staircases, elevators, lifts, ramps and any other forms of vertical transportation. Even for buildings that are not multi-storied, the ground on which the buildings are located may not be completely flat or level. It may be slightly or hugely undulating and sloping, creating the necessity to provide accesses like ramps of the appropriate slope and width for use of the most appropriate assistive locomotive devices (see generally, Forsling, 2019).

Access, however is not just a matter of conveying the body and limbs to an entry point into the designed space. Access also suggests the idea of being able to move around within the enclosed space along corridors and other circulation routes conveniently, with no, or minimal obstructions, to stretch or raise hands and reach a fixture, a building component such as a door knob, a kitchen counter, a sink, a wash hand basin, a ward robe, a urinal and, indeed, any such facility in the designed space with little or no hindrance. Any designed space for human use that cannot guarantee such access fails the test of inclusivity.

 <p>TOTAL AREA = 71 m²</p>	Open design of a small family house, with minimal mobility constraints with, or, without locomotive assistive devices
(a) Residential plan	
	Open office plan with spaces that can be divided with temporary partitions, permitting even the physically-challenged to access and navigate with ease around the spaces with their assistive devices for movement
(b) Open office plan	



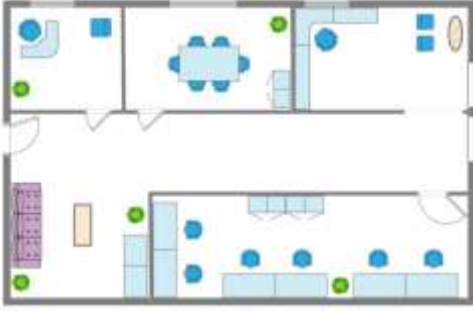

	Small office plan layout. Depicts wide door openings and corridors to accommodate the easy movement with wheel chairs with, no, or, minimal barriers.
(c) Small office plan with wide corridors	
	Flexible space design: could be used as office space; or, school building, with classrooms surrounding an open court, which could be turned into an assembly hall; or, shopping complex, or, at a larger scale, even a market complex. Movement highly efficient, predictable and inclusive of all persons, both normal or with special needs.
(d) Flexible design of space	

Fig 3. Taxonomy of space designs for enhancement of inclusivity of persons with or without special needs. (Source:<https://images.app.goo.gl/xDt7UDSwD3JgzFSS6>)



Fig. 4 Assistive mobility devices for the physically-challenged: crutches, walking sticks, wheelchairs, canes, scooters, etc. Source: <https://images.app.goo.gl/AY5pWApn7n2QXGqk8>

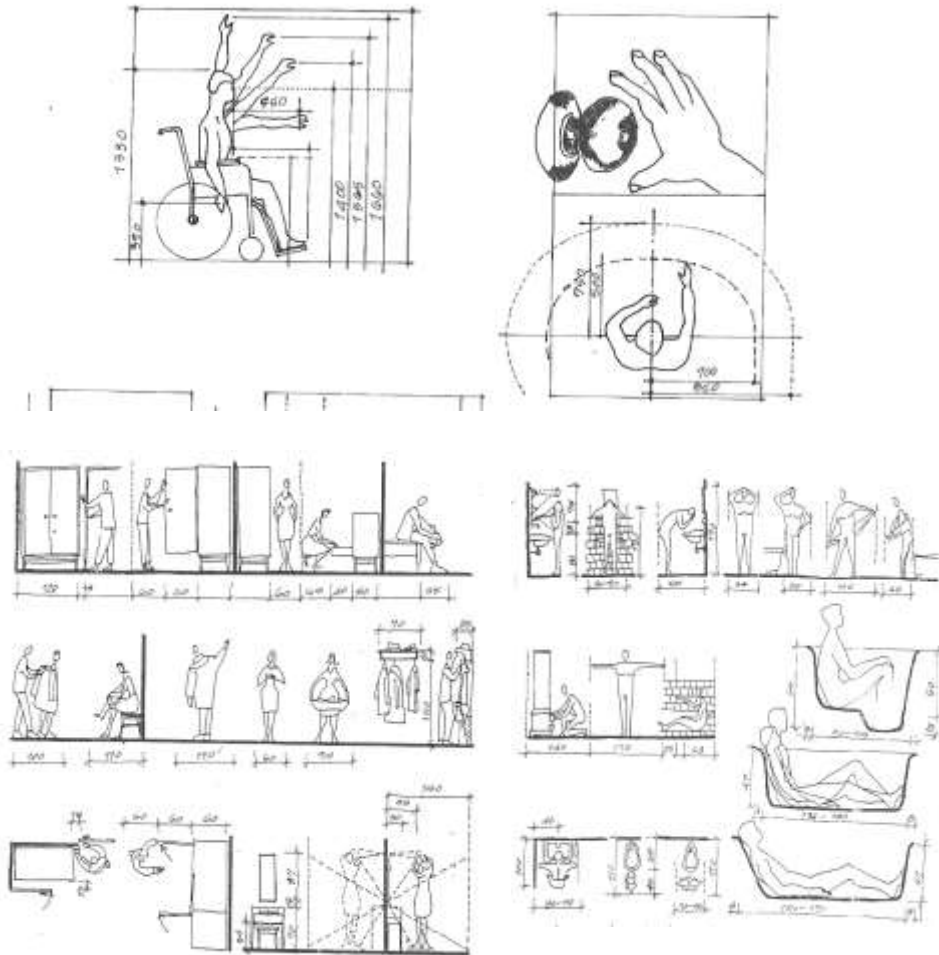


Fig.5 Anthropometric dimensions of human form against components and fittings in the building for persons with normal and special needs (Source:Neufert, 1967)

For architects and designers, proposals for solutions on physical disabilities centre more on the manifest symptoms than the causes. It is the manifest symptoms which could require the use of mobility aids and assistive devices to mitigate locomotive challenges these debilitating conditions present to the sufferer that we are concerned with, with regard to inclusive space design. It is what has prompted the necessity to provide modalities for dealing with the conditions in the most satisfactory manner within the available premises that we are concerned with, for purposes of ensuring space design inclusivity.

For people with no physical challenges, these components and spatial renditions of buildings pose no problem for use. But for persons with physical disabilities such as outlined in the foregone, the challenges can be daunting where not much attention is given to the appropriateness, flexibility and legibility in the provision of these elements with the consideration of the challenged in mind.



Fig. 6 (a) An inclusive landscape design of the front of a public building complex, with the disabled wheel chair users (as below) in mind (source:.. Dunlop & Hawking, 2019).

A well-positioned ramp (of the most appropriate gradient - not more than 5%) meanders its way ingeniously from bottom right, angularly to upper left quadrant of the layout and again moves diagonally rightwards just above the higher right quadrant and back again to the third higher left quadrant, then back again to the upper right till it takes the wheel-chair-bound user right inside the entrance without interrupting or being interrupted by the movement of the users of the variety of steps criss-crossing the ramps



Fig. 6 (b) Ramp design specifications. Showing a variety of gradients appropriate for different ground or floor slopes. (Source: Yilmaz, 2018)

Specific Special Needs: Visual Challenges



People with visual challenges, especially sensitivity to light, for instance, suffer a number of disorientations in, otherwise what looks like a thoughtfully designed space. Some of such disorientations may be caused by glare, emanating from direct bright light trained into the eye of the sufferer. This may cause blinding and blurring of vision, making it difficult to see the face of anyone sitting directly opposite them and backing that source of light (Complete Architecture Package, 2020).

The Senate Chambers of the University of Jos, in Nigeria, for instance, is a great design in its entirety, with well-appointed fenestrations on the side walls, admitting good natural light into the hall for effective lighting and interaction. But, unfortunately, a wide panel of windows spreads across the entire wall at the front of the chambers, directly behind the high table facing the congregants. This creates a huge peal of bright blinding light into the eyes, causing serious discomfort to those with visual challenges such as cataract, eye sensitivity, colour-blindness and other visual disabilities. People with these challenges need to see the faces of those opposite them during interaction and become easily disoriented when this opportunity is not available. The glare emanating from the bright light behind the person opposite them whose body transforms into a silhouette, casts a shade obstructing the clarity of his features from the visually impaired.

For public halls, good design practice characteristically, requires that the walls behind what is supposed to be the stage are usually left blank. The stage may be for accommodation of what is called a 'high table', or for public performances or address, or stage plays, communal entertainment and dance activities. This requirement may primarily be accompanied by the provision of back stage functions like changing rooms, conveniences, storage spaces, offices, meeting rooms for persons who may be vested with superintendence over the hall (see Fig. 7). But a well-designed stage will also have opportunities for windows to be placed on opposite ends of their side walls, without the need for windows being placed directly on the wall behind the stage. As in the case of the multi-purpose hall of the same university, a blank wall directly behind the stage could have a corridor separating the stage from the functions mentioned. This way, people who suffer from glare in the face of bright light in their faces do not suffer such debilitations anymore.

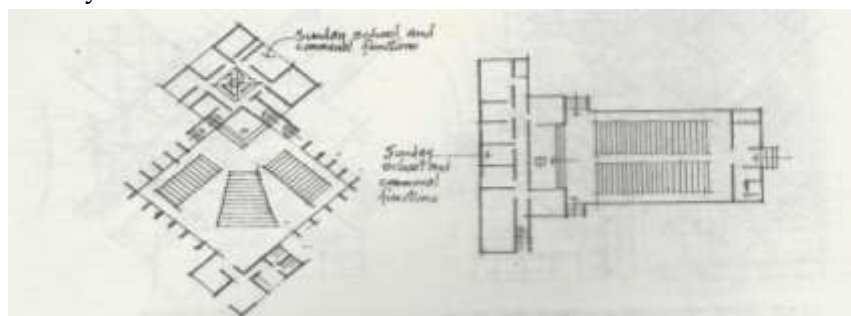


Fig. 7 Conceptual designs of public halls in two different configurations.



Windows are better located on the side walls of the halls. The walls of the front stage in both cases need not have windows that could cast glare on the sight of participants. A variety of functions could even be arranged as shown, behind the stage for the convenience of the halls (*Source: Uji, 2002*).

Auditory Special Needs.

People with hearing impairment in form of auditory processing disorders, nerve deafness, or speech and language delay, depend on watching and cobbling together speech from the lips, facial expressions and other forms of body language of the person opposite them with whom they have interaction. Such facial expressions and body language help the person with hearing challenge to watch the lips of the person before them closely to process and comprehend information from speech, lip movement and bodily expressions.. In a hall, or large meeting arena, where the wrongly placed light sources prevent this arrangement, the victim suffers further disorientation and may feel frustrated and lose interest for, or opportunities of further participation.

More fundamentally, hearing loss and its challenges (such as ringing, hissing and drumming noises in the head) can be exacerbated by choice of faulty room size, orientation, shape and surfaces or the walls as well as poor selection of interior finishing materials. All these could produce background noise, echoes and reverberations, with a variety of sounds, bouncing off hard reflective materials and surfaces and ricocheting back to the listener causing distractions throughout the building, which thus interferes with speech and comprehensibility (NANDA, 2020).

A thoughtful design that takes these auditory challenges into consideration will, first of all, take care of shape and layout of the enclosed space including furnishings and orientation of external walls to reduce noise distractions, background noise, reverberations, sound transfer through the building. There are several acoustic finishing and filtering materials that can be used on walls and ceilings to control and filter out undesirable distraction noises to enable listeners (especially the acoustically-challenged) to concentrate on the sound of interest without much stress. Some of the most common materials and their technology of deployment, in that regard, are illustrated in Fig. 7

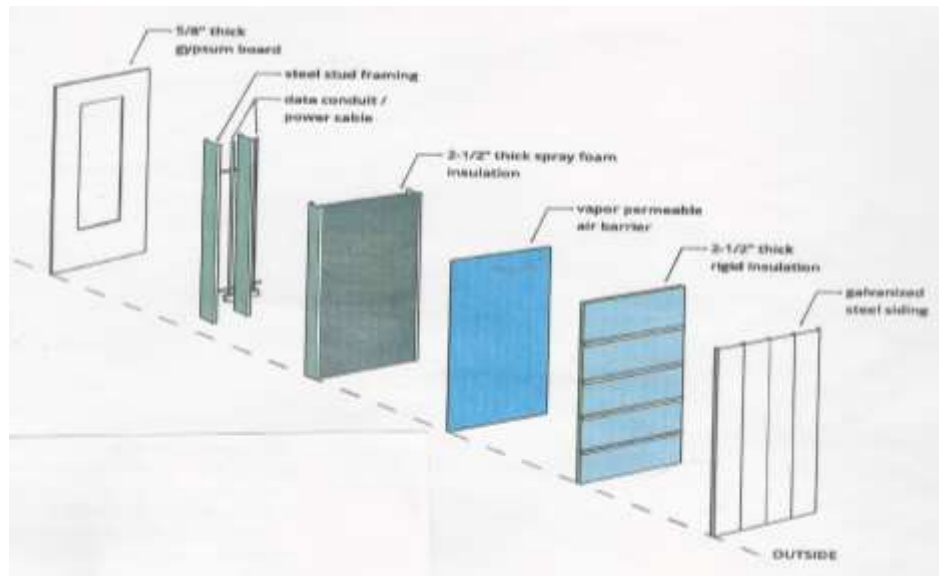


Fig. 8 Screening materials and devices for insulation on walls and fenestrations against background noise in halls (Source: Riedel and Mahoe, 2020)

It is not usually difficult to control the noise outside of the building, that might cause disturbance and distractions.. The route of penetration of noise into the building is primarily through fenestrations, openings, windows, screen walls and doors. A good designer would usually identify or anticipate the location of noise sources from the outside, like exterior equipment such as heat pumps for air conditioning systems, generating sets, plying traffic on nearby roads, nearby public gatherings, playfields, industrial machinery noise, commercial activities and various forms of entertainment engagements and merriments. Some natural occurrences like whirl wind blasts, coursing waterbodies and mining activities etc, may also constitute external noise the existence of whose nearby presence, could be easily taken care of by excluding their effect through careful choice of location of buildings. The pathway of entry of all these noises into buildings is primarily through windows and other fenestration locations. As long as these paths are located meaningfully external noise penetration is minimized, if not entirely excluded.

For people without any special auditory challenges, their hearing 'engine' usually has an inbuilt filtering mechanism that substantially excludes these unwanted noises. However, for people with hearing deficiencies, the interference of unwanted noise can be so debilitating that it leaves them frustrated when they have to fight the stress of continually fending off the unwanted noise, in order to concentrate on the sound of interest, quite often, unsuccessfully. It is for people with such challenges that special care must be taken in the design location and placement of functions to minimize the effect of these noises on their interaction within the designed space.



Just as assistive devices have been defined as aids in the management of physical challenges in designed spaces, it is important to note the corresponding visual, auditory, olfactory and tactile aids to assist in the mitigation of challenges associated with vision, hearing and other sensory stimulation factors. In addition to these, there are other important devices possessed by the human body itself, collectively known as 'body language' which greatly supplement the already known devices in all the areas in accordance with the specific role accruable to their needs.

A quick glance at these challenges shows that all have their roots in the employment and utilization of one, or another, of the five senses of man (vision, hearing, smell, touch and taste). The high point of the recognition of different types of spaces as defined from the perspective of sensory stimulation is the collaboration of these senses with non-verbal communication, generally known as 'body language' in the facilitation they offer to spatial interaction.

Body Language

Body language has common cues which manifest through facial expressions and various forms of gestures. Agnus (2012), argues that when our communication is supplemented by the body language aspect of non-verbal communication, the message, paired with the lexical content makes the interpretation of the sender's meaning more complete. Introducing some mathematical computations for further concretization of this thesis, Mehrabian (1971), had established that: total impact (on the listener) = (0.07 verbal + 0.38 vocal + 0.55 non-verbal) of the speaker. The combined effect which firmly enunciates the essence of 'body language' is categorized in Table 1

Table 1 Categories of Body Language

Environmental factor	Consists of elements such as furniture, architectural styles, lighting, smells, colours and temperature
Proxemics	The use, or perception, of one's social and personal space such as in seating and spatial arrangements
Kinesics	Body motions that include gestures, body movements, postures, facial and eye behaviours
Touching behaviour	The touching behaviour of an individual
Physical characteristics	Personal characteristics, such as physique, breath odour, height, weight, hair and skin colour
Paralanguage	Non-verbal cues surrounding pitch, volume, tempo and intensity of the voice



Artefacts	The manipulated objects that are in contact with the interacting persons, such as perfumes, clothes, lipstick, hair pieces, eye glasses, and miscellaneous beauty aids
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Source: Agnus, 2012

Body language is usually recognized more easily when accompanied and underscored by facial expressions of emotions. The understanding, recognition and application of these emotions, is said to be inherited rather than socially conditioned or learned. Six emotions have been identified as part of universally acknowledged humankind genetic character, namely: happiness, sadness, fear, disgust, surprise and anger. Minor variations are inevitable, among certain groups of people, with some of such variations being merely lexical, or just symbolic.

For a person with a special need in hearing deficiency, for instance, who depends on watching the body gestures, including the moving lips, of a speaker, within social distance, or public distance, the designed space must be the type that facilitates this transference of sensorial interactive compensation. Research has indeed shown (see for eg. Joseph, 2019) that total or partial loss of the performance of one sense induces a higher performance in one, or more of the senses, especially if the loss of the first sense occurred early in life. Thus, blind people may hear better and the deaf can have a type of enhanced vision. It is suggested that “these ‘super senses’ are not just learned behaviour – the brain actually remodels itself, giving more real estate to other senses, when one is missing (or, otherwise deprived of better performance)” (Joseph, 2019).

The implication of this finding is that space designed for inclusivity that recognizes these transferences in augmentation of performance of senses will be more sensitive to all persons with any kinds of special needs. Appropriate design of space for people with special needs therefore hinges, to a large extent, on a clear understanding of the way man perceives space generally, but even more specifically, on how people with special needs can be said to have been factored into the designed space, *ab initio*.

Summary, Suggestions and Conclusion

This paper has observed that a lot of the facilities like parks gardens, public halls, market places, walkways shopping arcades in contemporary communities were designed without considerations for persons with special needs like wheelchair users, the visually challenged and others. Most of these spaces appear attuned mainly to the needs of only able-bodied persons. For facilities requiring vertical movement, only steps appear to dominate the challenge of transiting from one lower plane to the higher one. Even corridors appear too narrow to carry wheelchairs of the physically challenged, or those that need to carry other



assistive means of transportation. Designers appear to be impatient with including alternatives for persons with special needs to enable them enjoy inclusivity in participatory interaction with persons who suffer no apparent impairment. The paper holds that, this type of space design is inappropriate, to the extent of the exclusion of persons with special needs.

As people steeped in the art of creativity, architects are rather overtly enamoured of spatial renditions and form evolution that seek to proclaim, glorify and exult their power of creative novelty over and above the effect such designs could have on the users generally, but even more so, on those considered to be afflicted with special needs. Conventionally, when designers are faced with the necessity of designing to include people of all needs including those with special needs, they view such requirement for inclusive spaces as something that often oppresses and throttles their conceptual innovativeness and stifles their creative instincts. The reluctance shown by designers in this regard often appears as if they are involuntarily being rail-roaded into incorporating inclusive designs for people with special needs only after the designs have already been concluded, or even after the buildings have already erected with shortcomings showing in the self same regard.

For a design to be considered effective for all persons, inclusivity needs to be factored into the conception right at the embryonic stage of conceptualization. When this is not done and certain persons are thereby marginalized, the designed space stands the likelihood of missing the contribution of such persons with special needs, who might have felt so excluded as to have taken the need for their contribution as potentially side lined. Yet, it must be remembered that no matter how many participants are in a large hall of say 500, only one person may be imbued with the propulsive instincts towards invention or discovery. That one person could be challenged by visual, auditory, or any other impairment. A design that overlooks their needs as though such people do not exist, or that if they do, their number is too insignificant to bother about their inclusion, effectively shuts them out of participation.

Designers may think just one person out of 500 is too insignificant as a sample of a group whose needs require inclusion. However, 500 may all be able-bodied today, but some out of that population, sooner or later, could become sick, or have accidents, or grow old and become challenged thereby. The essence of inclusivity in architectural design is to enable everyone regardless of conditions or disability to access all environment, buildings, offices, classes, libraries or rooms without restrictions or ordeals so they can function effectively and have sense of belonging in their communities.



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