Jim Harrison retired recently from 18 years teaching and researching at the Cork Centre for Architectural Education, Ireland. Previously he practiced architecture and taught in England, Zambia and Malawi and went on to become Associate Professor in Architecture at the National University of Singapore, moving in 2004 to Queen's University Belfast. In that year he was awarded a LittD (Doctor of Letters) from his alma mater, the University of Sheffield, for his extensive publications promoting Universal Design and design for ageing, including work as a United Nations Expert in the Asia-Pacific region and consultancy to the Singapore government on access legislation.

As an active octogenarian he now feels qualified to write and advise from first hand experience on matters related to inclusive and age-friendly design in the built environment.

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Re-examining the Seven Principles of Universal Design

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Most people want to live a long life, but few want to grow old. Ageing implies an almost inevitable reduction in our functions, both physical and mental which will, in turn, require adjustment in our lifestyle in many different ways if we are to continue to enjoy the quality of life that we deserve. The built environment, whether in our own home-zone or in public facilities, plays a significant part in determining our safety and comfort, whatever our age or ability; but in later life the effects of poor design can have an increasing impact, leading to the inhibiting of personal independence, exclusion and withdrawal from social connection, but even more significantly, the risk of serious personal accidents.

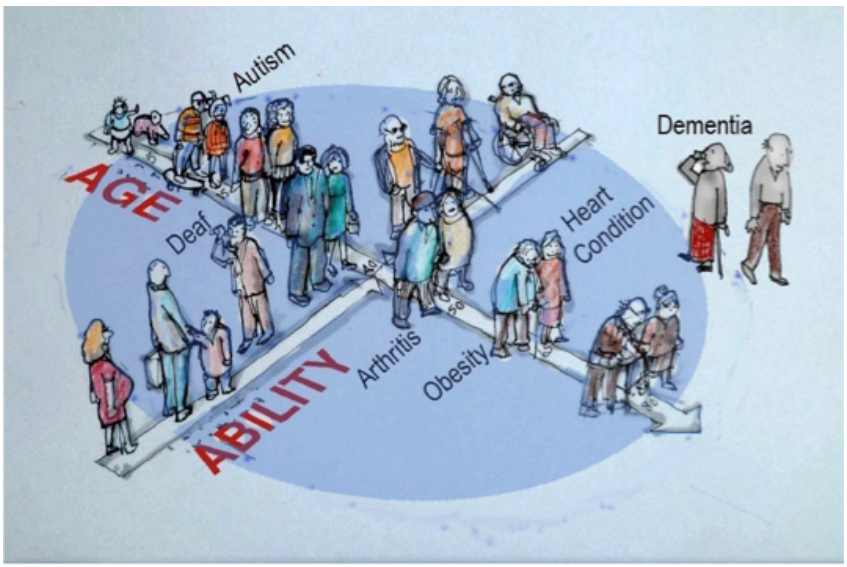

Fig 1. Universal Design benefits not just people with disabilities. The ageing process can bring an accumulation of minor disabilities, requiring adjustments to compensate for physical and mental limitations.

The ageing process brings physical changes with increasing limitations of a person's ability in diverse ways. Collectively, any individual's physical or sensory limitations, whilst not easily described as 'disability', can restrict or potentially endanger their everyday activities. Though injury or medical conditions like arthritis or Irritable Bowel Syndrome may not define a person as having a disability, these may significantly reduce the person's ability to live as they did before. Decline in cognitive, physical, motor and sensory systems are a natural part of ageing but adapting to these changes may be a challenge, depending on how rapidly they occur. Decreased vision, slower reaction times, lack of balance or reduction of feeling in the limbs may increase vulnerability and the risk of falling and with it the fear of an accident and potential hospitalisation. In older age an accidental fall can be far more catastrophic than for a younger person. Osteoporosis, obesity and other weakening conditions can increase the severity of the fall and the risks associated with cross-infection during hospitalisation are significantly higher for older people.

In the light of Universal Design's increased age-related applicability and the continuing raising of standards and expectations, it may be timely to re-examine the well-established Seven Principles [(1)] as below:

1. Equitable Use

2. Flexibility in Use

3. Simple and Intuitive Use

4. Perceptible Information

5. Tolerance for Error

6. Low Physical Effort

7. Size and Space for Approach and Use

For design of the built environment the last three are the most applicable.

Principle 7, 'Size and Space for Approach and Use', is probably the closest one that relates to physical accessibility and suggests definable dimensional terms.

Principle 6, 'Low physical effort', is widely applicable, implying that consideration should be given to the user's stamina. In older age, especially where the individual has cardiac or arthritic problems, designers can anticipate potential problems and take simple planning measures, such as reduced distances to amenities, provision of seats and landings on staircases, or by specifying energy-efficient elements, such as door closer devices that that only require a light pull or push.

Whilst one of the most valuable outcomes of UD is that of providing accessibility and inclusion, in practice the need for safety may override this. Principle 5 of the Seven UD Principles states "The design minimises hazards and the adverse consequences of accidental or unintended actions." advising us to "arrange elements to minimise hazards and errors" and "provide fail safe features."

Accessibility and safety are not always synonymous - so where does safety come in? This must surely be given a much higher value than access, particularly for a more vulnerable cohort of users; it is one thing to be unable to enter a building because there are steps or narrow corridors, but quite another if there is a risk of danger, real or imagined, in any daily activity. Although building codes other than those related to accessibility may take many of these aspects into account, their scope is possibly too narrow to protect the user who may be susceptible to falls or being knocked down in traffic. So, if Principle 5. 'Tolerance for Error' is the only one that goes some way towards addressing this gap, does this go far enough? Although an environment may accord with safety standards it may still be inhibiting for the vulnerable user. How do I know that a ramp surface is not slippery or that a horizontal handrail will not be a hazard for an adventurous child?

Fig 2. The same element of a design can present a real hazard if not applied intelligently.

As an example of the need for awareness of potential dangers we might imagine the design of a balustrade at the edge of a steep drop where the balustrade has parallel bars spaced to prevent a child climbing through. To an experienced eye, the one with bars arranged

vertically would be seen to be eminently safer than the one with horizontal bars, even though both may comply with building codes. To a small child, the horizontal bars would inevitably present an exciting climbing opportunity - which any parent would recognise with dread. Thus an element intended to prevent falling may be a deathtrap if the elements are arranged without an appreciation of the perception of all users, young or old.

The use of the term 'error' suggests that the fault lies with the user, rather than laying the real responsibility on the provider, reducing the "adverse consequences of accidental or unintended actions" rather than reducing the chance that these could happen. Is it really an 'error' for an individual to find themselves on a route with a slippery ramp without handrails? Although Principle 3 advises "provide warnings of hazards and errors", if we see a sign saying "Mind Your Step" where a change of floor level presents a hazard, we could justifiably respond: "No; it's YOUR step - YOU are responsible for our safety – with a little bit of thought it might not need to be there at all".

Fig 3. Although the sign provides a warning, it also demonstrates a weakness in the design.

Although the sign may absolve the owner of any legal responsibility, the moral responsibility of risk to the user is not necessarily reduced.

When the 7 Principles were being laid down over a quarter of a century ago, the emphasis was largely on designing for people with a range of disabilities, perhaps not anticipating the huge advantage that UD would present to the increasingly ageing populations worldwide. Recognising this fact and, with due respect to the late Ron Mace and his team at North Carolina, we would like to suggest that an added 8th Principle - 'Design for "Reduction of Fear", might be timely. This proposal was described in detail in a paper prepared by this author and colleagues at UCC / MTU and presented at the UD24 Conference in Oslo. (2). In brief, the paper highlighted the fact that whilst safety can be incorporated into many built environments, the individual's perception of danger or risk in many forms can inhibit independent living and increase anxiety in any sector of society.

Fear is an integral part of many creatures' makeup, usefully providing warning signals for avoidance, but where it becomes an inhibiting factor the individual may become over-cautious and hence find that their normal activities become restricted. This can be aggravated by negative experiences, such as a previous accidental fall, but it is not only the fear of physical danger, such as slipping and falling that should be considered; the generation of fear may be due to the inability to cope with a physical, social or emotional challenge, particularly compounded by the environment's ability to

conceal a threat. Lesser inhibiting factors may range widely, from the perception of danger of being mugged in a badly-lit underpass, or for a person with a weak bladder being scared of being unable to find toilet facilities in time, through to a fear of being unable to read instructions on an ATM screen, losing one's credit card or forgetting a pin number. Such fears stem from previous bad experiences and thus encourage the perception that one's physical, mental or emotional abilities may be inadequate to manage these challenges, whether in real or imagined. As well as fear of real danger, less definable fears, lack of security, loss of dignity or being aware of increasing personal limitations, being clumsy, appearing senile or 'being a burden' to others, can inhibit the individual from continuing to lead the full and active life that they should be enjoying.

Causes of fear and inhibition may occur at both macro and micro scale. Urban townscapes with picturesque alleys or luxurious landscaping may be desirable during daylight but, after dark, could suggest the menace of a dark downtown underpass, unless well-lit and overlooked. Places such as pedestrian short-cuts or bus shelters where teenagers may 'hang out' can be inhibiting for anyone to approach alone. The fault may be due to a lack provision by city authorities of anywhere more suitable where young people can meet, just as much as the need for design for 'Defensible Space', outlined in Oscar Newman's book of that title [(3)].

Fig 4. Unfamiliar public spaces can be intimidating

Any element in the built environment should not only provide safety but also reassure users without the stigma of suggesting that this is only for old or disabled users. Handrails are the most obvious example, having the advantage that, being commonplace, do not mark anyone who uses them as being old or incapable. Specifying materials for floor surfaces is also crucial; highly polished floors, where reflection can make even a dry surface appear wet and slippery, can be intimidating. Changes in floor material, where two different tones or degrees of reflectivity occur, can confuse even a person with good vision. In such cases the Fourth Principle: 'Perceptible Information' could be invoked, since it is not only the printed word or recognisable icon that we interpret, but also our 'reading' of any parts of the building that suggest potential danger.

Fig 5.The change of surface and reflectivity in this circulation space causes most users to hesitate; "Is there a step here?"- in fact it is level.

Inhibition can significantly impact how people live their lives. In particular the fear of falling can lead to a person's activity restriction and withdrawal from society. In Graham Rowles' book *Prisoners of Space*[4] cites one individual's fear of falling: "*During the recent bad weather, I didn't move out of the house for three days, as I was afraid of falling".* People with a fear of falling may walk more cautiously, taking shorter steps for increased stability. Such changes in how a person walks may actually increase the risk of falling. Various research studies show that the gait pattern and visual scanning patterns of timid people are significantly different from people without such fear and these walking patterns may actually increase the risk of falling. Additionally, when people experience anxiety, their ability to process the threats cognitively is also reduced, affecting their ability to identify and avoid a hazard. Individuals with such fears may avoid certain activities, particularly away from home, increasing social isolation and decreasing meaningful engagement with others, as well as reducing their physical endurance and muscle strength.

Although there are useful research studies on falls and other inhibiting and damaging hazards, many of the design features that can be applied to reduce such risks are very straightforward if UD principles and code requirements are applied, at both strategic and detail scales. However, although some people may have a fear of falling there are also those who are unaware of potential hazards, particularly in the familiarity of their own home and they may innocently continue to carry out the same activities as they did when younger and more stable. A large proportion of accidents occur in the home, where access and safety codes are not mandatory nor would they be able to pinpoint danger areas. For example, many home maintenance tasks, such as changing light bulbs or cleaning windows, entail climbing on stepladders or even on unsuitable pieces of furniture. We may ask how many people have the foresight to adapt their homes as they age, in anticipation of the risks of falls or inaccessibility?

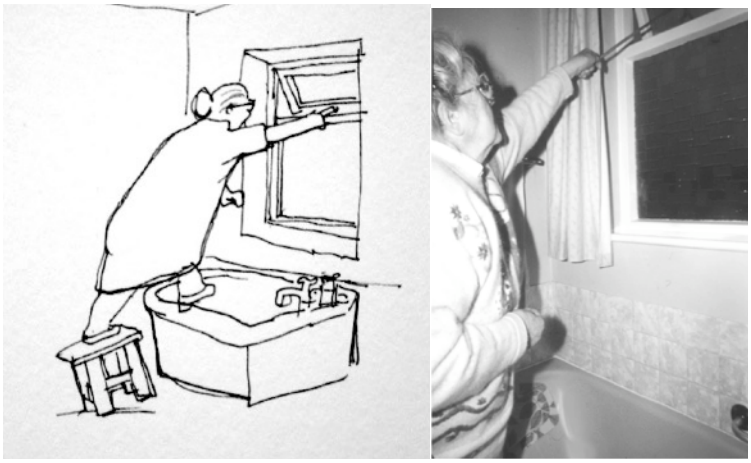

Fig 6. This older occupant habitually risked a fall by climbing on a stool to close a window. Replacing the catch with a stay that could be operated by a short rod eliminated this risk.

Safety measures beyond basic compliance with relevant building codes are appropriate for people of any age or ability, including carers or parents with small children, who need to be particularly aware of the limitations and vulnerability of those in their charge.

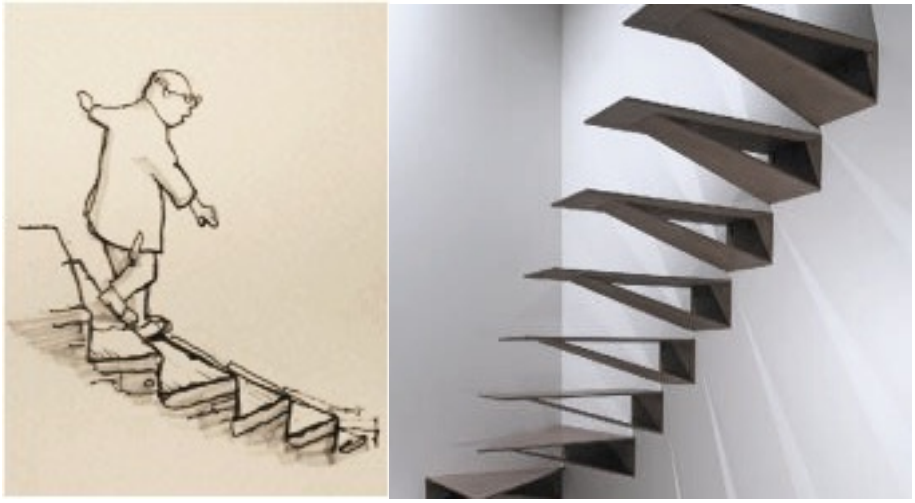

Fig 7. Minimalist staircases can be frightening experiences, as well as being potentially dangerous for people of any age.

One reason often cited as to why building designs are not user-friendly to disabled or less able older people is that they are designed by architects who are young and fit, perhaps with little or no experience of living with grandparents or less able neighbours. As students they may have been presented with exemplary buildings as icons of great design, but in fact may similarly lack empathy for the less able. Glossy coffee table architecture books show seductive interiors with minimalist staircases, often in polished wood with open risers and no handrail. Significantly, human occupants of any age rarely appear in such publications. Many of the precedents designs still held up as being iconic contain classic examples of how NOT to provide safe and accessible environments. These often come from an earlier era when expectations would not have considered

accessibility; for example, several of le Corbusier's famous villas contain impossibly steep ramps, without handrails and with polished concrete surfaces, whilst his iconic Carpenter Center at Harvard has a long and forbidding outdoor ramp. Other classic examples of buildings where a ramp is central to the concept include Frank Lloyd Wright's New York Guggenheim Gallery and Raphael Vignoly's impressive Tokyo Forum, where signs (in English as well as Japanese) actively discourage use of the ramps by wheelchair users!

Fig 8.Ramps in Raphael Vignoly's Tokyo Forum are obviously not there for inclusive accessibility.

Fig 9. As an example of a more recent project that successfully incorporates a ramp compliant with current codes, the Berlin Reichstag renovation by Sir Norman Foster shows that aesthetic quality need not be compromised in the design of an exciting interior. The gradient is gentle and landings are provided at regular intervals.

Conclusion

While the necessity to improve the built environment through the application of UD principles is clear, it is important that this not limited to providing access for people with disability, but that it also encompasses the widest range of ages and abilities. Consultation with the real users and specialists – older people, carers and occupational therapists is fundamental to Universal Design, particularly as ageing populations increase the need for optimally designed built environments. While it is important to demonstrate the advantages of safety through inclusive design, it is also

necessary to point out the latent high cost of not doing the right thing at the right time, both in monetary and social terms. Good design can significantly reduce accidents and consequent hospitalisation and so is a smart investment.

Encouraging greater attention to designing for safety into the UD remit will widen the circle of beneficiaries, with consequent reduction in fear, in all sectors of the population. The greater number of people who are seen to benefit from UD, the stronger the argument for its continuing promotion and the more value it will gain worldwide. Universal Design seeks to include the widest spectrum of users, not just people with a disability or the ageing population. If we acknowledge that fear and anxiety can result from poor design, impacting negatively an individual's life choices, the challenge is how to design to reduce these fears and improving the quality of life for an individual of any age or ability. Experienced designers can identify elements in the built environment that exhibit poor design or have occurred by default, through ignorance or false economy. One hidden quality of UD is that where good design has been seamlessly integrated into the environment it is, to an untrained eye, not easily recognisable and therefore non-stigmatising. Only a designer's informed eye may be able to perceive the inclusive qualities, bearing out an old proverb that says*"the good shoes are the ones you don't know you are wearing".* Achieving this level of expertise requires awareness through experiential exercises, directed observation and dissemination into professional education curricula.

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