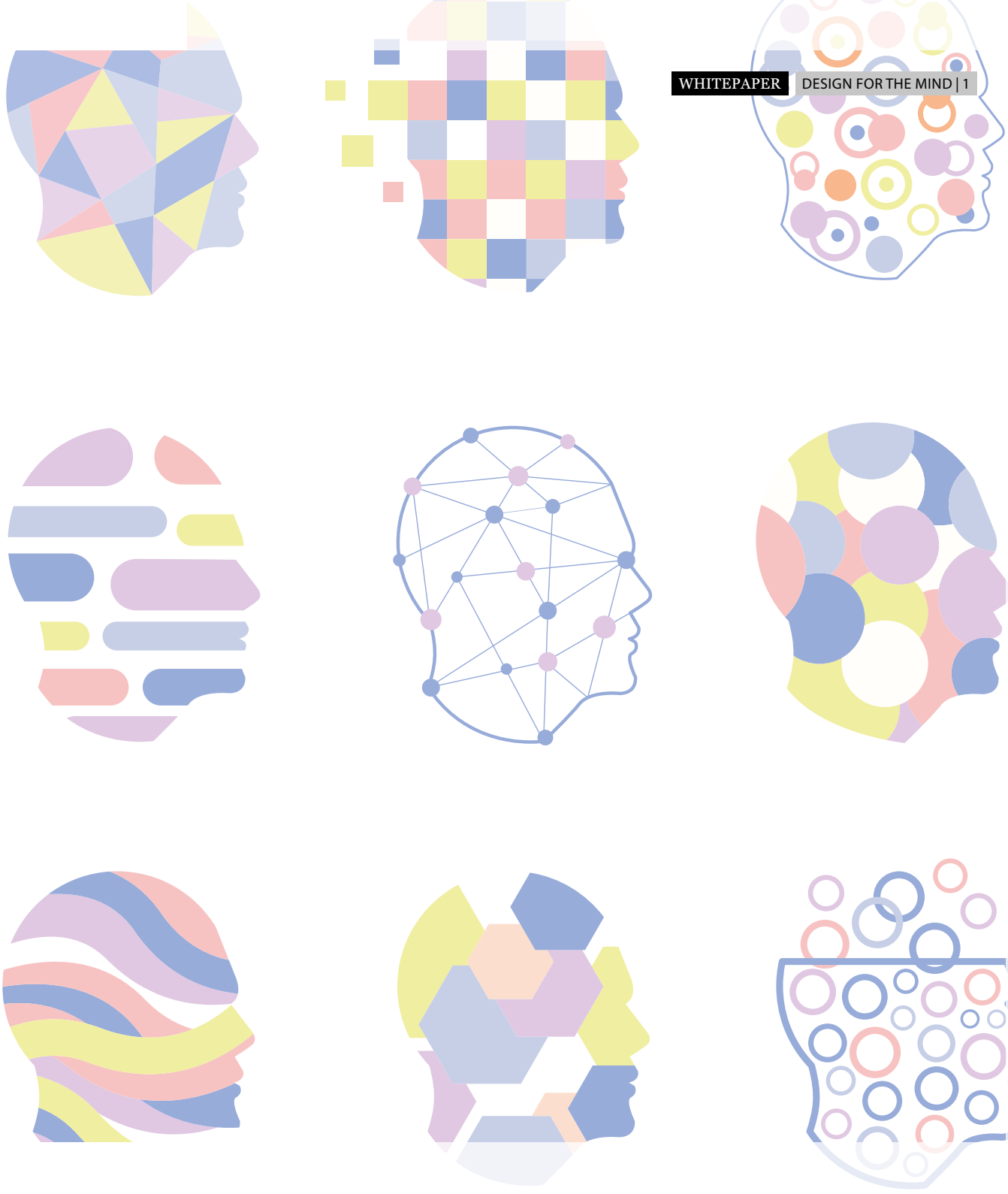

Design for the mind

Neurodiversity in the built environment

Whitepaper

DESIGNING INCLUSIVE ENVIRONMENTS

This whitepaper looks at the needs of people living with neurodiversity and what this means for the design of the built environment.


Step safety vinyl

Dementia, autism and other learning and neurological differences mean that people with these diverse conditions will have different requirements for the environments in which they occupy. With the right design approach, you can improve the quality of life for these individuals and allow them to use a space with fewer issues.

This whitepaper looks at the needs of people living with these conditions and what this means for the design of the built environment. It also examines the need for evidence based guidelines for 'Designing for the Mind' and provides guidance on the factors to consider with a particular focus on how the correct flooring specification can help. Finally, it illustrates the approaches to meeting the requirements of neurodivergent people with case study examples.

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FLOORING SYSTEMS

NEURODIVERSITY AND **NEURODIVERGENT**

This whitepaper looks at the needs of people living with neurodiversity and what this means for the design of the built environment.

Neurodiversity is the term which is increasingly being used to recognise and describe the range of different types of brains and neurologies. Neurodivergent is used to describe a neurology that is not typical.

Neurodiversity encompasses the differences between all individuals, not just those with a neurological condition. The theory of neurodiversity focuses on the differences in the way people's brains operate and aims to change the paradigm of disability to get people thinking about supporting the needs of different neurologies as opposed to catering to the person's disability. As such, the intention of introducing this new terminology was to move attitudes away from approaching conditions such as autism, dyslexia, dyspraxia and Attention Deficit Hyperactivity Disorder (ADHD) as medical issues and instead simply seeing these people as having differences in the way their brain operates.

DEMENTIA

There is an estimated 850,000 people in the UK living with dementia.

Dementia is an umbrella term that covers a range of conditions that affect the brain. There is an estimated 850,000 people in the UK living with dementia, a number which is predicted to reach more one million by 2025[1] and two million by 2051. Currently 1 in 6 people over the age of 80 have dementia and 70 per cent of people in care homes have dementia or severe memory problems[2].

Dementia damages the nerve cells in the brain and affects how messages are sent to and from the brain. Dementia UK states that there are over 200 subtypes of dementia with the most common being Alzheimer's disease, vascular dementia, dementia with Lewy bodies, frontotemporal dementia and mixed dementia[3].

Each of the different types of dementia has a different set of symptoms and effects. For example, people with Alzheimer's disease, the most common type of dementia in the UK, may experience problems with memory, thinking, reasoning, language or perception - they may have problems seeing things in three dimensions and judging distances[4].

In contrast, with dementia with Lewy bodies, memory is typically less affected than with other forms and it primarily affects movement and motor control[5]. Therefore, a person may be more prone to falls, have tremors similar to Parkinson's disease, shuffle when they walk and have visual and auditory hallucinations due to the damage to nerve cells in the brain. However, each person with dementia will experience the condition in a unique way and as such will have different needs.


Allura LVT


Allura LVT

[1] https://www.dementiauk.org/understanding-dementia/what-is-dementia/

[2] https://www.alzheimers.org.uk/about-us/news-and-media/facts-media

[3] https://www.dementiauk.org/understanding-dementia/types-and-symptoms/

[4] https://www.dementiauk.org/understanding-dementia/types-and-symptoms/alzheimers-disease/

[5] https://www.dementiauk.org/understanding-dementia/types-and-symptoms/dementia-with-lewy-bodies

AUTISM

There are around 700,000 people with autism in the UK – more than 1 in 100.

Autism is defined as a developmental condition that affects the way the brain processes information and impacts how people perceive the world and interact with others[6]. People with autism see, hear and feel their surroundings differently to other people.

Autism is a spectrum condition and presents in a number of different ways and at varying levels of severity. It is a lifelong condition, the cause of which is still being investigated. While autism will affect individuals in many different ways, they share certain characteristics including difficulties with social interaction, verbal and non-verbal communication and sensory sensitivity. They may also have restricted and repetitive patterns of behaviours and highly focused interests.

While autism is not a learning disability, around half of people with autism also have some degree of learning disability. This means that they will have issues understanding new or complex information and may struggle to learn new skills.

There are around 700,000 people with autism in the UK - more than 1 in 100[7] - and although the reason is still unclear, it does appear to affect more men and boys than women and girls. However, a part of this difference is believed to be an under-diagnosis of the condition in women.

[6] https://www.autism.org.uk/about/what-is/asd.aspx

[7] https://www.autism.org.uk/about/what-is/myths-facts-stats.aspx

OTHER **NEURODIVERSITIES**

There is a difference between a learning disability and a learning difficulty. A learning disability will have an impact on intellect whereas a learning difficulty will not.

There are also conditions such as dyslexia and dyspraxia as well as some mental health conditions that may require a considered approach to the design of spaces. There is a difference between a learning disability and a learning difficulty. A learning disability will have an impact on intellect whereas a learning difficulty will not.

Developmental Co-ordination Disorder (DCD)[8], often referred to as dyspraxia, can affect a person's co-ordination skills and balance or fine motor skills that may make writing or using small objects more challenging. Dyspraxia can also refer to the movement difficulties that develop as a result of damage to the brain, such as from a stroke or head injury. DCD refers specifically to the difficulties with movement and co-ordination that first develop in young children.

Dyslexia is a common learning difficulty that can cause problems with reading, writing and spelling. It is estimated as many as 1 in every 10 people in the UK has some degree of dyslexia[9].

[8] https://www.nhs.uk/conditions/developmental-coordination-disorder-dyspraxia/

[9] https://www.nhs.uk/conditions/dyslexia/

Marmoleum

Flotex

THE DESIGN ISSUES OF **ENVIRONMENTS FOR NEURODIVERSITIES**

Unsuitable building design can make it difficult for people with mental health conditions and can exacerbate their condition.

Understanding the issues faced by people with conditions such as autism and dementia is the first step towards creating environments that support their needs.

People with dementia can experience a range of changes, including sensory, mobility or cognitive difficulties. This can affect functioning, behaviour and independence which can in turn make it difficult for them to understand and navigate the built environment. They may struggle with wayfinding and experience spatial disorientation, memory failure that makes them forget where they are going; as well as problems with spatial and depth perception. These challenges are deepened when combined with age related conditions such as sight and hearing loss. A common problem for people with dementia is the risk of falls caused by hazards in the environment. Falls not only cause serious injuries, but the repercussions can affect their physical and mental confidence. This can discourage movement within a space and limit their ability to interact with others.

One of the biggest challenges for people with autism is sensory sensitivity and the potential for sensory overload or information overload. This can cause stress, anxiety and even physical pain. People with autism can experience both over and under sensitivity – each of which has specific challenges.

Where their sense of sight is under-sensitive, objects may appear quite dark or lose some of their features. There may be a difference between their central and peripheral vision; at times the centre may be blurred while the periphery is sharp, or where a central object is magnified, things on the periphery may be blurred. Under-sensitivity may also cause poor depth perception. Over-sensitivity can cause distortion in their vision - objects and bright lights can appear to jump around or images may fragment. Over-sensitivity may also mean that they find it easier or more comfortable to focus on a detail rather than the whole object.

Similarly, over sensitivity to sound can mean that noises are magnified, and sounds become distorted and muddled. This is not only distressing but can present issues with communication.

Unsuitable building design can also make it difficult for people with mental health conditions, as factors such as poor choices of colour and lighting as well as inappropriate interior layouts can exacerbate their condition.

DESIGNING FOR **THE MIND**

Standards such as BS 8300 provide a code of practice for design to make buildings more inclusive, but focuses predominantly on physical impairments.

The concept of designing for the mind is about implementing design principles that positively impact people with specific requirements, which means that they may experience the world differently. Standards such as BS 8300, published in 2009 and updated in 2018, provides a code of practice for design to make buildings more inclusive, but focuses predominantly on physical impairments.

There is little research available in this field for specifiers to draw on and this is why new guidelines are being developed that will provide guidance for design with regard to people with neurodiverse conditions. The first step will be the creation of a new BSI Publicly Available Specification (PAS) on the topic. A PAS is a British Standards Institution (BSI) pioneered fast-track standardisation document.

The aim of the PAS is to create the first set of guidelines for 'Designing for the Mind' to be made available to an international audience. The focus will be on helping architects, designers and planners to consider neurodiversity in design. The guidelines will include specific assistance in designing for dementia, autism and learning difficulties, as well as other neurodiverse conditions in both mainstream and specialist environments.

However, for the new standard to have the strongest impact the recommendations must be based on research with people living with a range of neurodiversities. The basis of the new PAS is an in-depth research project carried out by the Helen Hamlyn Centre for Design Centre at the Royal College of Art, in collaboration with The British Standards Institution (BSI) in 2016. The qualitative research study examined how neurodivergent people experience the built environment.

The study included participation from people with neurodivergent conditions alongside professionals working in the area, family members and carers. It identified 11 themes that will form the structure of the guidance:

1. Lighting

Lighting is an important consideration when designing for the mind. When implemented correctly it can help people relax and focus their attention, as well as navigate and orientate themselves throughout the day. Lighting needs to be controllable and adaptable to the needs of the people using the space.

2. Preview

Preview concerns the transitions and thresholds between spaces. The design should allow a person to know and understand what is beyond and what is happening there before entering. This can ease anxiety and uncertainty of someone in that space. This might include windows in doors that allow people to make decisions before they enter the space. Designing a space so that people can sit at an edge facing in can also help them feel more comfortable.

3. Safety

It is crucial to understand what makes an environment feel unsafe as this will affect a person's sense of wellbeing and comfort in a space. Designing in a way that allows people to manage their stress levels is important. The presence of neutral spaces where people can get away from overwhelming stimuli is important for a feeling of safety. Designers should also be mindful of how safety elements such as alarms can be distressing for some people with neurodiverse conditions.

DESIGNING FOR **THE MIND**

4. Familiarity

The aim should be to create familiar and predictable environments with as few surprises as possible. This will allow the person to quickly understand and learn the layout and make them feel more comfortable on subsequent visits. Moving furniture around frequently or changing the location of something will make the space feel unfamiliar. Triangulation can help enhance familiarity, so ensuring the sight, sound and smell of an area is coordinated is important.

5. Signage

Signage needs to be clear and easy to interpret without an over reliance on text or use of abstract imagery. The amount and placement of the signage also needs to be carefully considered. For example, signs should lead people in and out, as many people with autism struggle with reversing a sequence. Ensuring a colour contrast between the sign and its background is important. It may also be helpful to design signage that is easy to read and understand from different distances, perhaps replicating larger high level signs at eye-level closer to the destination.

6. Decoration

If not done correctly, the decoration intended to improve the environment can become confusing for someone who cannot easily distinguish what it is. Especially if it creates a false sense of reality, such as indoor murals that suggest an outdoor environment.

Tessera carpet tiles

7. Flooring

Sudden changes in colour, contrast and material can become a barrier to a person as a change in the flooring can be perceived as an edge, step or area of danger. Using colour, contrast and pattern correctly can help overcome these cognitive challenges.

8. Layout

Finding the correct balance of space for the environment is vital. There must be enough space for people to move comfortably but open areas can create poor acoustics and become overwhelming. One approach may to be create smaller spaces within a larger one.

DESIGNING FOR **THE MIND**

9. Sensory

As people will experience sensations differently, it is essential that the visual, acoustic, olfactory and tactile qualities of an environment can be adjusted to suit a person's preferences. This could mean ensuring that the design includes soundproofing to exclude unwanted sound or preventing odours moving through the spaces – including those intended to be pleasant such as air fresheners. For shared areas it is important to create low arousal spaces that are flexible, where stimulation can be added or removed as required.

10. Clarity

It is important that the information presented within an environment, including signage is clear and avoids any vagueness; clear and simple pictograms can help with wayfinding. Clarity also requires all elements of the design to perform in a way that that is transparent. For example, avoiding over-use of technology that takes away human control, such as movement controlled lights, as this can be confusing.

11. Acoustics

Acoustics can greatly affect a person's level of comfort and concentration. Minimising background noise, echo and reverberation is important. For example, soft surfaces and furnishings will absorb sound to prevent echo and contain sound. Lowered, sound absorbing ceilings will also help shorten the reverberation time of sound to make speech easier to understand. The provision of quiet spaces within the building is also an important consideration.

Sarlon acoustic vinyl

WHAT IS A PAS?

A Publicly Available Specification or PAS[10] is a set of guidelines on best practice in a specific area. It is developed by a dedicated steering group of stakeholders, selected from relevant fields and led by the British Standards Institution (BSI).

All PASs undergo targeted and public consultation with the Review Panel including industry, government, trade associations, formal standards committees, independent experts and consumer groups.

Following its development, a PAS can be developed further and be incorporated into future national and international formal standards.

[10] https://www.bsigroup.com/en-GB/our-services/developing-new-standards/Develop-a-PAS/

BEST PRACTICE GUIDELINES FOR THE DESIGN AND SPECIFICATION OF FLOORING

Strong colours and patterns can provoke a variety of cognitive and emotional responses which can cause overstimulation and can negatively affect behaviour and coping mechanisms.

As one of the biggest surfaces in any building, the choice of flooring is a key consideration. This is particularly important when designing environments for neurodivergent people. There are a number of general guidelines that can make a building easier to use for people with these conditions.

Tonal contrast

When designing environments for people with dementia one of the most important considerations is how tonal contrast between interior elements is used. Greater tonal contrast should be used to aid visual recognition and allow furnishings and finishes to be seen against each other. It is recommended that a difference of 30 degrees of light reflectance value (LRV) is achieved between critical surfaces, such as floors to walls and doors to walls. This will help people with dementia to see spaces three-dimensionally and enable them to easily navigate through the building.

In adjacent areas, floor finishes should be tonally similar to prevent the perception of a change in level that is not really there and so reduce the risk of falls. Therefore, the LRVs of the adjoining floors should ideally be within eight degrees of each other (less is better) and no more than 10 degrees. Designers should aim to develop one tonally continuous flooring surface, as a sharp contrast may confuse and agitate people with dementia.

LIGHT REFLECTANCE VALUES (LRV)

Light Reflectance Values (LRV)[11] are a measure of the percentage of visible and usable light that is reflected from a surface when illuminated by a light source. The numerical value in LRVs represents tone and does not represent hue or saturation values of a colour, therefore when considering contrast, it is the tone which is relevant.

Colours, patterns and finishes

For dementia-inclusive environments it is recommended that flecked, striped or patterned effects or flooring that incorporates a logo are avoided. These types of designs can be attributed to increasing visual stimulus and could cause illusions or hallucinations which again may lead to confusion and increased aggravation.

Furthermore, excessively sparkly or shiny finishes need to be avoided, as highly reflective or glossy surfaces might be perceived as a wet floor and will therefore suggest a slip risk that is not there and in fact increase the chances of a real fall. Therefore, it is recommended that floors with a matt appearance are used throughout.

[11] https://blog.1000bulbs.com/home/what-are-light-reflectance-values

BEST PRACTICE GUIDELINES FOR THE DESIGN AND SPECIFICATION OF FLOORING

Dementia Services Development Centre (DSDC) at the University of Stirling[12] has developed an accreditation scheme that assesses and rates products in accordance with its dementia design principles. For ease of identification, the suitability of a product is classified by a number - based on the tonal contrast and pattern of products. For example, 1a has a plain aesthetic and 1b has a semi-plain design, both of which are suitable for broad use within a dementia care facility, while floor coverings that are classified as category 2 have a patterned surfaced and should be used with more caution.

However, consideration needs to be paid to the contrast between the flooring and other critical surfaces such as walls, skirtings, doors and frames, furniture and sanitary-ware and achieving the recommended minimum 30 degrees of LRV should always be the focus. To create a 'dementia-inclusive' or 'dementia-friendly' environment, the flooring must not be viewed in isolation and instead considered in the context of the entire specification.

Similarly, for people with autism it is important to keep patterns simple and restrained. Autism can mean that people have problems differentiating background and foreground information. They may also see details that go unnoticed by others. As a result, complex or repetitive patterns can be distracting and even distressing.

Furthermore, recent research suggests that people with autism will naturally focus on areas of a scene with high-contrast or that are highly colourful. Therefore, the choice of colours and where they are placed can be used to help draw attention to key elements of the building.

Also, for mental health facilities, colours and patterns can provoke a variety of cognitive and emotional responses in patients and the effects of overstimulation can negatively affect their behaviour and coping mechanisms. For example, intense colours or patterns may increase feelings of stress. Also, as different colours can evoke different emotional responses, this should be considered. For example, orange is associated with increased optimism and self-esteem while purple can foster creativity.[13] Therefore, the correct choice of flooring can help create a tranquil and calming environment or promote positive emotions that will assist with the treatment of patients.

Avoiding trip hazards

People with dementia will often have issues with mobility and movement so creating an environment that can be navigated easily and safely is essential. It is recommended that different floorings of the same thickness are abutted without the use of a transitional strip, avoiding a potential trip hazard. However, if transition strips are used, this should match the tones of both flooring surfaces, with an ideal difference of no more than three degrees of LRV between the transition strip and the adjoining floor. This is because if the transition strip contrasts too much or is highly reflective this could lead to it being perceived as a step, resulting in high-stepping and potentially a fall.

[12] https://dementia.stir.ac.uk/design

[13] https://www.urbandesignmentalhealth.com/blog/the-links-between-colour-architecture-and-mental-health

CASE STUDIES

Caudwell International Children's Centre (CICC)

CICC is the UK's first independent purpose-built facility dedicated to autism diagnosis, intervention and research. Launched by national charity Caudwell Children, the 60,000 sq ft building at Keele University Science and Innovation Park was meticulously designed through a close working partnership between the charity's CEO, Trudi Beswick, and Cheshire-based architects C4 Consulting Ltd. It was crucial that the design of each aspect of the building considered the needs of people with autism.

James Pass, Director and Architect at C4 Consulting explained: "In the design we had to take into consideration that colours and patterns can be a significant source of overstimulation, and even anxiety, for children with Autism Spectrum Disorders. Overtly patterned floors can be distracting to walk over and can lead to fixation or even confusion, therefore we had to ensure that any patterns present in the floor coverings at the CICC were minimal and that any repetition in the pattern was not discernible."

Forbo's flocked flooring, Flotex Penang in Grey, was installed throughout the public area, in each of the assessment suites, meeting rooms and family areas of the CICC. The semi-plain Penang design from the Flotex Colour range offers a subtle linear effect with no pattern repeats. Forbo's Allura Wood Luxury Vinyl Tile (LVT) was selected for the main corridors of the public area. The assessment suites and breakout spaces lead off from the corridors, so the variation of flooring would allow the children to differentiate each space and identify their direction of travel.

www.forbo-flooring.co.uk/caudwell


Allura LVT

Allura LVT


Flotex

CASE STUDIES

Hillingdon Hospitals NHS Foundation Trust

The Hillingdon Hospitals NHS Foundation Trust refurbished the Beaconsfield East Ward to create a rehabilitation ward for older adults, many of whom have dementia. The 20 bed ward was organised into four by four bed bays and four single rooms, with additional reception, sensory areas and utility service areas.

The design concept was to create a space that did not reflect the typical clinical aesthetic often found in healthcare environments as this can sometimes have an upsetting effect on patients and their families.

Georgia Burt, Architect from GBS Architects, commented on the project: "We wanted to create a dementia-friendly and physical environment that would enhance the healing experience of patients and their carers. We therefore worked closely with the staff at Beaconsfield East Ward and patient families to achieve this. When it came to choosing a suitable floor covering, the selection was made by a number of design team members, therapists, cleaners and patients to really meet the individual's requirements.

"Forbo's Surestep Wood Decibel in Natural Oak was specified for its non-reflective and slip resistant properties – criteria needed in flooring for people with a visual impairment and a high risk of falling, but also for the natural warmth of a wood finish."

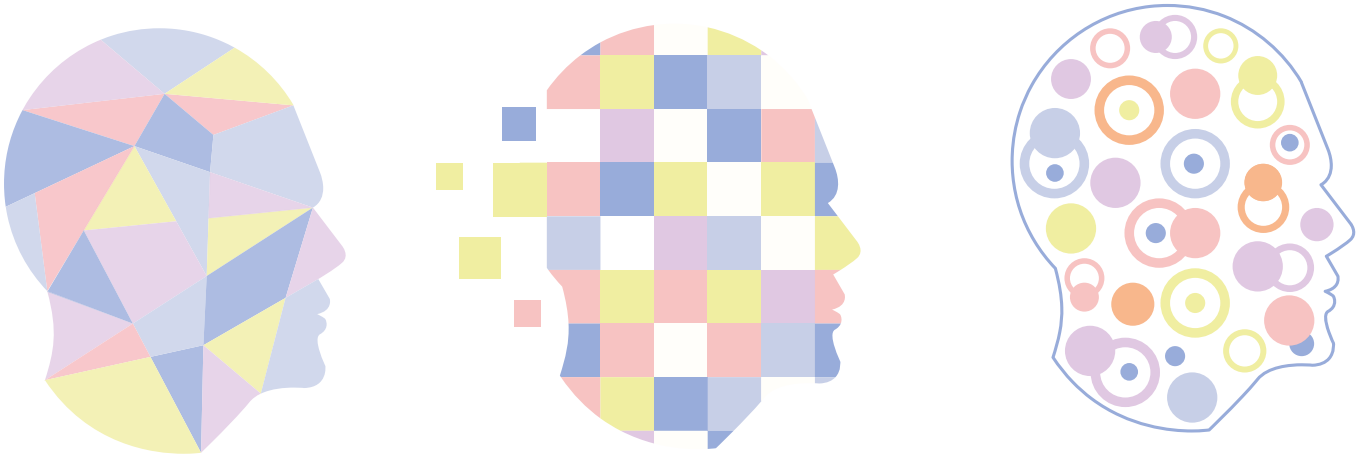
Surestep safety & acoustic vinyl

Surestep safety & acoustic vinyl

Forbo's Surestep Wood Decibel range has been specifically designed to provide R10 slip resistance underfoot while at the same time offering a 17 dB impact sound reduction. Using aluminium oxide particles in the wear layer to provide sustainable slip resistance and maintain the clarity of design, Surestep Wood Decibel meets both the Health and safety Executive (HSE) and UK Slip Resistance Group (UKSRG) requirements.

The Beaconsfield East Ward won the Best Internal Environment Award at the Building Better Healthcare Awards in 2014.

www.forbo-flooring.co.uk/hillingdon



CONCLUSION

'Designing for the mind' has the potential to significantly improve the lives of people with neurodiversities such as dementia, autism and mental health conditions.

While inclusive design has become more commonplace in the last decade, there has been an emphasis on physical disabilities. This is reflected in the focus of current standards and makes the development of the new PAS, leading to revised formal standards, a crucial step forward. 'Designing for the mind' has the potential to significantly improve the lives of people with neurodiversities such as dementia, autism and mental health conditions. If, as intended the PAS develops to become part of the guidance for all buildings, these principles will need to be factored into the design of offices, public spaces, retail locations, hospitality venues and even facilities such as prisons. The focus will then be on developing best practice to help designers incorporate these considerations, while still meeting the needs of all users of a building.

For more information on autism visit the National Autistic Society website - **www.autism.org.uk/**

For more information about dementia can be obtained from Dementia UK - **www.dementiauk.org** and the Alzheimer's Society - **www.alzheimers.org.uk/**

For more information on designing dementia friendly schemes: **http://www.forbo-flooring.co.uk/dementia**

Our easy to use product finder can help you choose from our DSDC accredited flooring collection, visit **www.forbo-flooring.co.uk/productfinder** to learn more.

To find out about the progress of the PAS visit: **www.forbo-flooring.co.uk/mind** or contact Elaine Shine at BSI Group on **elaine.shine@bsigroup.com**

We also have a number of articles on our blog on the topics of 'Designing for the Mind', including the summary of our roundtable discussion, autism-friendly design, dementia care and creating sensory experiences. All of our blogs can be found here: **http://www.forbo-flooring.co.uk/blog**

Coral entrance systems

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