THE GUILD OF ARCHITECTURAL IRONMONGERS

TECHNICAL update

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IRONMONGERY, VISUALLY IMPAIRED PEOPLE AND LRVs - RESEARCH RESULTS

In *Technical Update 2* we quoted from the latest publication of the FAQs to BS8300. This states:

"*For people with adequate vision, differences in hue (the nature of the colour) or chroma (the intensity of the colour) will provide adequate visual contrast. Unfortunately, this is not so for all people who are visually impaired.*

"The main feature of a surface, which appears to be strongly correlated with the ability of visually impaired people to identify differences in colour, is the amount of light the surface reflects, or its light reflectance value (LRV).

"The LRV scale runs from 0, which is a perfectly absorbing surface that could be assumed to be totally black, up to 100, which is a perfectly reflective surface that could be considered to be the perfect white. Because of practical influences in any application, black is always greater than 0 and white never equals 100.

"The evidence-based research available to date allows a degree of variability concerning the minimum LRV difference that is required to provide adequate visual contrast for people who are visually impaired.

*"**Whilst there is considerable confidence in recommending a difference in LRV of 30 points or more, there is also much anecdotal evidence to suggest that a difference of around 20 points may still be acceptable. Differences less than about 20 points may not give adequate contrast.***

"It is thought that LRV differences are less important between two large areas, e.g. between wall and floor, than between a small object on a larger background surface, e.g. a lever handle on a door.

"In addition, there is very little research-based evidence concerning the influence of surface textures, e.g. differences in gloss levels of surfaces, on the visual contrast required by visually impaired people.

"Further research is needed to address these issues and, where appropriate, provide more definitive recommendations. High gloss finishes should, however, be avoided for large areas, e.g. floor, wall, door and ceiling surfaces."

The paragraphs in bold have raised these key issues for the GAI.

The questions that needed clarifying included: "What should the minimum LRV be for small and three dimensional surfaces? What is the effect of gloss surfaces on recognition?

Consequently, the Guild commissioned a research project with Reading University precisely to provide the further research based evidence.

This bulletin contains a summary of that research.

RESEARCH BACKGROUND

The ability of Visually Impaired People (VIP) to identify a difference between coloured surfaces was the subject of an earlier study. 'Project Rainbow', as it was called, produced design guidance that ensures that when different coloured surfaces are placed next to each other, it is possible to determine, with very high confidence levels, that VIPs will be able to see a difference. This research is now used extensively in good design practice.

However, the work did not address the issues of three-dimensional, surface gloss and specular reflections.

In order to meet the requirements of the Building

Regulations 2000 through the adoption of new recommendations in Approved Document M in 2004 there is a need to examine these issues in relation to the ability of VIPs to identify differences between surfaces and also their ability to distinguish colour contrast in a controlled environment.

The aim of the research was to investigate these issues through a limited, although systematic test procedure.

METHODOLOGY

The GAI provided 8 lever samples and 6 timber door veneer samples. In addition a further 18 samples of material cut to 100mm x 100mm were supplied.

A series of Light Reflective Value (LRV) readings were taken for each sample. Each sample was measured using an XRite SP62 sphere spectrometer, taking an average of three measurements rotating the instrument through 45 degrees between each measurement and taking into account any possible light or dark patches.

Sixteen VIPs were selected as being representative of the VIP population. As a benchmark 2 test subjects with full vision were also tested.

The 16 were spilt as follows:

10 Male

6 Female

of whom

6 were between the ages of 46-55

4 were between the ages of 56-65

6 were between the ages of 66 -75

The eye conditions were as follows:

- Optic atrophy
- Long sighted with restricted field of vision, blind in left eye
- Glaucoma, cataract in right eye
- Retinitis pigmentosa
- Cataract
- Nystagmus
- Blind in left eye, tunnel vision in right eye
- Macular Degeneration (2 participants)
- Diabetic retinopathy
- Glaucoma (2 participants)
- Macular degeneration, no vision in left eye
- Nystagmus, corneal atrophy
- Retinal fybroplasia, cataract
- Pallida

The 16 were first given a vision assessment test. This was divided into three parts.

1) FUNCTIONAL VISION

The VIPs were asked a number of yes/no questions, the results of which enable a researcher to evaluate the VIPs' functional vision. The questions were:

During daylight can you see where the windows are in a room from the light coming through them?

When in a lit room can you see the shapes of the furniture?

Can you recognise a friend's face by looking at them:

-Up close?

-At arms length?

-Across a living room?

-Across a road?

2) CONTRAST SENSITIVITY

Participants' contrast sensitivity was assessed using a Vitech vision contrast test system chart. They were required to identify which way progressively lightening lines are tilted within a series of grey circles.

3) VISUAL ACUITY

The third test was assessed using a half size Snellen chart. This is commonly used by opticians. The user stands 1.5m away and is asked to read a line of letters of decreasing size.

THE TESTS

The participants had two main tests. In both tests the samples were viewed under standard viewing conditions in a VeriVide colour comparator cabinet. There was, at all times, 200lux on the lever handle and 100mm x 100mm samples. This amount of light and direction of light are typical of that found in commercial and public access buildings.

I) Lever assessment

The first stage was to view various combinations of lever handle and door surfaces. The participant stood at a similar distance from the lever handle as they would when operating a real door.

They were then asked a series of questions to determine their ability to distinguish between the two. The questions were:

Is there a difference between the door handle and background? (Yes/No)

How confident are you in that difference?
(1 = very uncertain
5 = very confident)

How comfortable is it for you to look at the door handle on that background
(1= very uncomfortable
5 = very comfortable)

This was repeated for 48 combinations.

II) 100mm x 100mm sample assessment

The participant was then seated at the viewing box and asked to look at two samples placed side by side at a set angle. Again the participant was asked three questions to determine their ability to distinguish a difference between the two. The questions were:

Is there a difference between the two adjacent surfaces of the test samples?
(Yes/No)

How confident are you in that difference?
(1 = very uncertain
5 = very confident)

How comfortable is it for you to look at the two adjacent surfaces of the test samples
(1= very uncomfortable
5 = very comfortable)

This was repeated for the 80 combinations of 100 x 100 mm samples of door finish and door ironmongery.

RESULTS

Full results are available from sponsoring companies (see list on back page) but the key findings were as follows:

LRV Difference	Confidence in Detecting a Difference
Greater than 30	78.3%
Greater than 20	74.6%
Greater than 10	72.7%

Fig 1: Confidence level greater than 4 in detecting a difference between the lever on door sample.

The results demonstrate that even with an LRV of just 10 it is possible to detect the lever.

This is a very interesting finding that has not been identified previously.

The research team believe that this is because previous research was conducted on matt samples with a lower light level of 100lux, which is the level of light at floor level in a typical commercial or public access building.

The 3D nature of the lever on the door creates all sorts of shadows and reflections. This means that their location is discovered not just by its contrast but by its overall design in combination with the door surface and lighting.

This is further demonstrated when flat samples were tested.

LRV Difference	Confidence in Detecting a Difference
Greater than 30	83.2%
Greater than 20	82.9%

Fig 2: Confidence level greater than 4 in detecting a difference between the two flat samples.

Although the flat samples have no 3D effect, the relatively large size of the surfaces and the subtle differences in the gloss of the surfaces make it possible for VIPs to distinguish a variation. This has important implications for ironmongery, particularly with regard to flat items such as push plates and signs.

GLOSS vs SATIN

The table on the previous page reflects results from a wide combination of products and types of finish. Therefore the nature of the material (gloss or satin) does not appear to have a significant effect on the visually impaired person's ability to detect the lever.

CONCLUSION

The results show that on a three dimensional object such as a lever handle the LRV difference between it and its mounting surface is not as important as first thought. This is also the case for flat surfaces. However, when linked with findings from previous research, it is apparent that the general light level will also play a part in a VIP's ability to differentiate different items in the environment.

As an industry we will encourage the manufacturers and suppliers to identify the LRVs of their products so that architects and members can make informed choices on product selection.

It should also be remembered that Part M is about access. As the results show there is a reduction in a VIP's ability to locate levers as contrast falls so it is inevitable that the greater contrast we can provide the more inclusive the built environment will be.

Consequently, the Guild believes that, in order to ensure consistency of product selection (e.g. levers and push plates), the minimum LRV difference for small items should be set at 20 points.

The Guild will therefore be recommending that BS8300 and Doc M are further revised citing this research in evidence. Until these changes are made we believe this research allows us to use the 20 point level, and the research should be quoted in your clients' access statements, perhaps using the following text:

"The Research Group for Inclusive Environments, Reading University – in conjunction with the Guild of Architectural Ironmongers (GAI) undertook a study of a representative group of visually impaired people and their ability to identify levers. This research-based evidence shows that an LRV difference of 20 points is acceptable in identifying the lever handles and flat samples of typical Ironmongery material on doors."

THANK YOU SPONSORS

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