3.7 Colour and Luminous Contrast

3.7.1 Human Sensory Perception

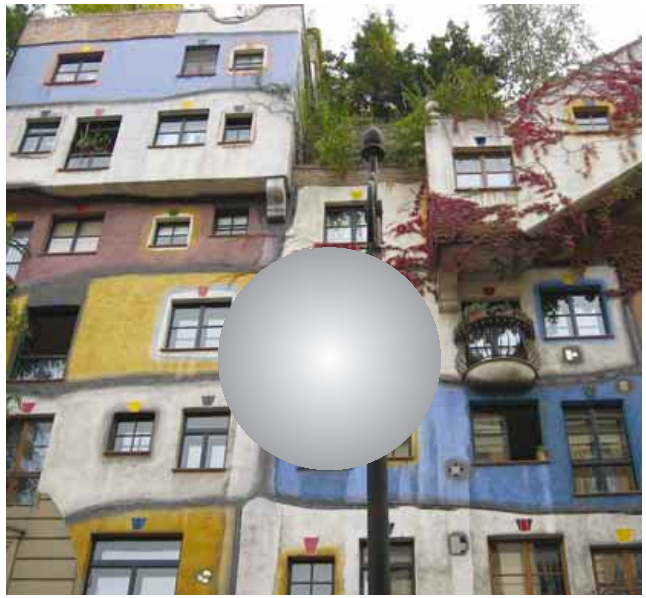
3.7.1.1 Vision

Of all the senses, vision is the one that most people rely on to receive the greatest amount of information (3.7.1.1a). Normally, when the visual ability of a person weakens due to old age, disease or accident, he or she may use adaptive devices such as correctional glasses, or be trained to use other senses to compensate partial or total loss of sight. For people with visual impairment, weakness in the central or peripheral portion of the retina, or structural damage to the eye, the image may result in missing details in the centre or perimeter (3.7.1.1b). Blurring of the whole visual image may also occur. These conditions may lead to difficulties in reading small print and information boards, in distinguishing colours and objects of low contrast, in way finding, and in detecting object heights, features and distance.

Faced with the fact that human eyes are getting more strenuous due to working long hours on the computers and using more artificial lighting working in internal settings, any enhancements that would help to make our environment more accessible would be desirable. Lighting design, size, contrast and colour are all essential factors in enhancing accessibility.

Daylight and artificial lighting are significant factors affecting visual contrast and visual effects. The use of fluorescent or incandescent illumination will also result in different visual effects. Refer to *Section 3.8* for design considerations and best practices on lighting. This section will mainly discuss the main issues affecting visual process as well as colour and luminous contrast.

3.7.1.1a Visual image of the built environment



3.7.1.1b Missing information in the visual image due to weakness of the eye

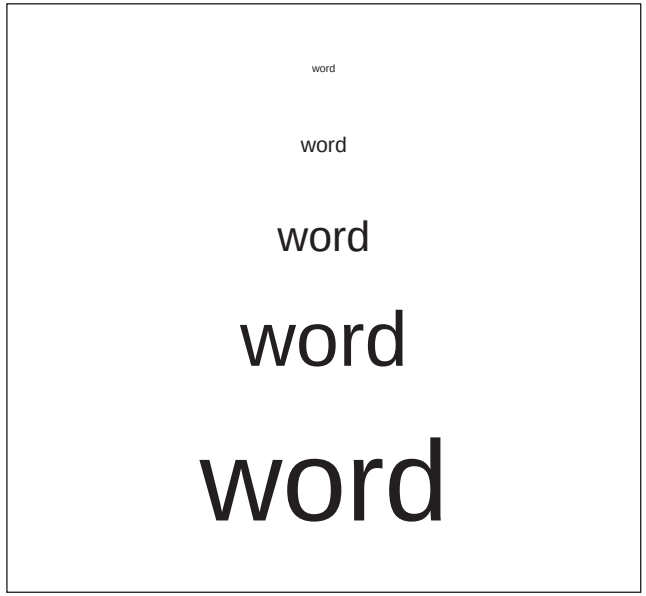
3.7.2 Size

3.7.2.1 Size and Distance

Size is one of the important factors that affect sensory perception and conveyance of information.

The effect of size and distance can be observed with reference to the illustration in 3.7.2.1a. The reader will find that viewing the text at a distance of 500mm or 2000mm will make a significant difference in the clarity of the text in the illustration. Shortening the distance between the eye and the text has the effect of enlarging the text as the text size increases on the retina of the human eye. As the distance increases from the eye, the text becomes less legible as the text size receives by the retina is reduced.

This principle should be borne in mind in communication of information and provision of signage.



3.7.2.1a Visual effect of size

3.7.3 Visual Contrast

3.7.3.1 Colour

In general, colour perception depends on the wavelength reflected by the object, the surrounding surfaces, the light source, the level of illumination on the surface, and the mode of the eye in adapting to the change in light (3.7.3.1a).

Communication of information for people with visual impairment can be improved by considering the choice and combination of the following:

(a) The colour itself which in simple terms is the combination of red, green and blue;
(b) The intensity of the colour which in simple terms is the amount of white in the colour;
(c) The brightness of the colour which in simple terms is the lightness ranging from low visibility to glare.

In considering colour combination, good visual contrast is the key.

3.7.3.1a Colour perception

3.7.3.2 Light Reflectance

The light reflectance is based on a scale of 0 (total light absorption) to 100 (total light reflection), where 0 is black and 100 is white. However, in practice, it is difficult to achieve absolute values for both white and black as there are many factors affecting the resultant figure.

According to the British Building Regulations 2001 Approved Document[1], the definition of "Contrast Visually" is taken as a difference in light reflectance value (LRV) between two surfaces of greater than 30 points (3.7.3.2a).

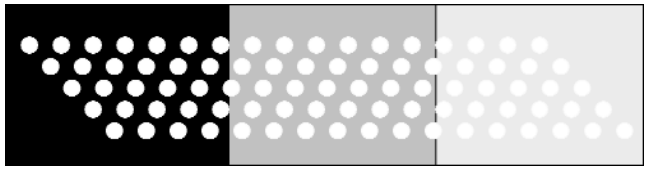
According to the *Americans with Disabilities Act, Accessibility Guidelines and Standards*[2], Luminous Contrast in percent shall be determined by:

Luminous Contrast = [(B1-B2)/B1] x 100, where

B1 = light reflectance value (LRV) of the lighter area, and
B2 = light reflectance value (LRV) of the darker area

Since both white and black is never absolute, B1 is always less than 100 and B2 is always greater than 0.

The measurement of LRV should be carried out using specialist equipment like a spectrophotometer that can accurately measure the LRV of flat and curved surfaces (3.7.3.2b) as well as matt and texture finishes under a controlled environment such as a laboratory.



3.7.3.2a The difference in LRV of black and white is greatest and generally produces better visual contrast (left)

3.7.3.2b LRV of curved surfaces can be accurately measured by a spectrophotometer

[1] Approved Document, British Building Regulations 2001
[2] Accessibility Guidelines and Standards, Americans with Disabilities Act.

3.7.4 Study of Visual Contrast

3.7.4.1 Study Method

Since the measurement of light absorption and reflectance using a spectrophotometer is beyond the scope of this study and light reflectance values seem to be not readily available in technical information sheets of materials commonly used in Hong Kong, a simplified study method using a light meter had been adopted to obtain data readings (3.7.4.1a).

Referring to commonly used materials for paving, tactiles, signs, walls and kerbs in Hong Kong, the study took field readings of about 80 different surfaces in parks, open spaces and external areas between buildings. Readings were taken from material surfaces and signs already installed or from sample boards of the material surface (3.7.4.1b).

3.7.4.1a Using light meter to obtain data readings

3.7.4.2 Three Study Approaches

The study has taken three approaches to examine the visual contrast issue:

(a) Luminous contrast using light reflectance value;
(b) Visual contrast using luminance factor value;
(c) Colour contrast

3.7.4.3 Luminous Contrast using the Light Reflectance Value

Luminous contrast is the amount of light reflected from the surface of an object compared to the amount of light reflected from the surface of its surrounding background. The contrast in percentage can be determined by the *Americans with Disabilities Act, Accessibility Guidelines and Standards* as described in *Section 3.7.3.2*, i.e. Luminous Contrast (L%) of the two surfaces is 100 x (B1-B2)/B1 where B1 is the greater value of light reflectance of the two surfaces.

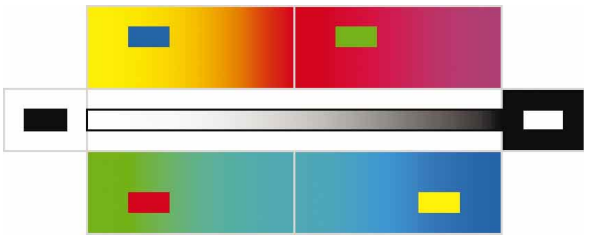
3.7.4.1b Field readings of different surfaces in external areas

3.7.4.4 Visual Contrast using the Luminance Factor Value

Luminance factor is the ratio of the luminance of a surface viewed from a particular position and lit in a specified way to the luminance of a reflecting white surface viewed from the same direction and lit in the same way. The light reflectance value of a surface and a white high reflectance standard surface are measured with the light meter to calculate the luminance of both surfaces under the same lighting conditions. This method is useful for on site measurements and for initial selection of colours for design purposes.

The Luminance Factor (L') in % of the test surface is 100 x L/Ln, where L is the value of the test surface and Ln is the value of the white surface. The L' value for different surfaces can be determined in this way.

The visual contrast of two surfaces can be calculated using L' value of the respective surface, i.e. 100 x (L'1 - L'2)/L'1, where L'1 is the larger of the two luminance factor values.



3.7.4.5a Contrasting colour combinations

3.7.4.5 Colour Contrast

(a) Colour contrast by considering Red, Green and Blue colour values.

According to the International Commission on Illumination (CIE)[3], each colour can be identified by the relative quantities of three primary colours that are necessary to obtain it.

In practice, human appreciation of colours is not represented by a stand-alone colour but in combination with adjacent colours. Colours can be examined using their respective Red (R), Green (G) and Blue (B) values.

The colour contrast of two surfaces can be calculated by considering the distance of RGB values of the two respective surfaces. Maximum colour contrast can be appreciated if the RGB values of the two surfaces are at a maximum distance such as black and white; yellow and blue; orange and green, etc. (3.7.4.5a).

The Colour Contrast (C%) of two surfaces can be determined as follows:

$$100 \times (((R1-R2)^2 + (G1-G2)^2 + (B1-B2)^2)/3)^{0.5}/255,$$

where

R1, G1, B1 are red, green, blue value of colour surface one; and
R2, G2, B2 are red, green, blue value of colour surface two.

[3] International Commission on Illumination (CIE).

(b) Colour contrast by considering colour brightness and colour difference

Reference is made to studies based on a suggested algorithm from "W3C Working Draft, Techniques For Accessibility Evaluation and Repair Tools, April 2000" (W3C)[4] from webpage

http://www.w3.org/TR/AERT#color-contrast

Referring to W3C, two colours provide good colour visibility if the brightness difference and the colour difference between the two colours are greater than a set range as indicated below.

According to W3C, colour brightness is determined by the following formula:

((Red value x 299) + (Green value x 587) + (Blue value x 114)) /1000

The algorithm is taken from a formula for converting RGB values. The brightness value gives a perceived brightness for a colour. The set range is 125.

According to W3C, colour difference is determined by the following formula:

(Maximum (Red value 1, Red value 2) – Minimum (Red value 1, Red value 2)) + Maximum (Green value 1, Green value 2) – Minimum (Green value 1, Green value 2)) + Maximum (Blue value 1, Blue value 2) – Minimum (Blue value 1, Blue value 2)). The set range is 500.

[4] W3C Working Draft, Techniques For Accessibility Evaluation and Repair Tools, April 2000.

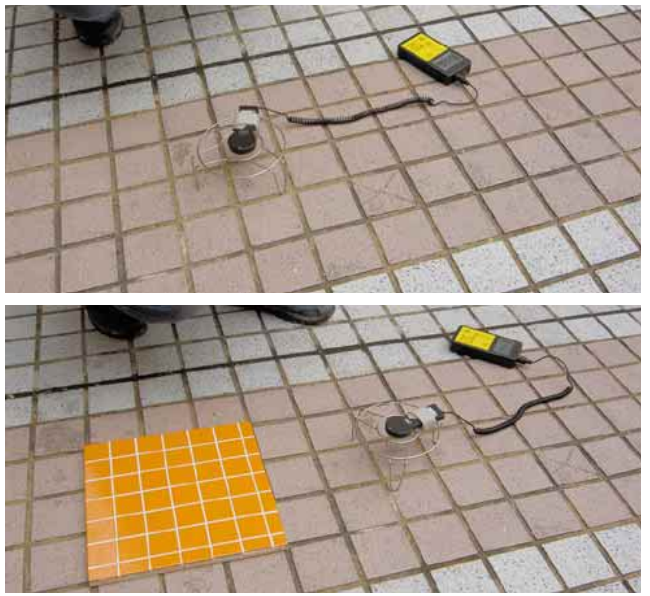
3.7.5 Data Collection

3.7.5.1 Luminous Contrast using the Light Reflectance Value

This method involves taking light reflectance readings of two adjacent test surfaces at selected areas, mainly in the open area using a light meter. The area of the standard test surface is 150mm by 150mm.

The sensor of the light meter is placed at a distance of 70mm on top of the test surface. The meter reading (L lux) is taken when a stable reading is recorded for each test surface (3.7.5.1a).

The light meter is very sensitive to the rapid change of daylight as well as any nearby traffic. Similar lighting condition is maintained as far as possible for the measurement of both surfaces.



3.7.5.1a Readings of the light meter taken on two adjacent test surfaces

3.7.5.2 Visual Contrast using the Luminance Factor Value

This method involves taking a test surface at selected area and a second test surface of a standard A3 size white paper, mainly in the open area using a light meter. The area of the test surface is minimum 150mm by 150mm.

The sensor of the light meter is placed at a distance of 70mm on top of the test surface. The meter reading is taken when a stable reading is recorded for the test surface (L lux) (3.7.5.2a).

The standard white paper is placed at the same position of the first test surface to maintain same lighting condition as far as possible. The meter reading is taken on the standard white paper (Ln lux). The time taken to measure the two readings is kept as short as possible.

As compared with taking readings of two adjacent surfaces as described in *Section 3.7.5.1*, stable readings were easier to obtain with this method.

3.7.5.2a White paper is used to obtain data (Ln lux), which is compared with the readings (L lux) taken on the test surface

3.7.5.3 Colour Contrast by taking Red (R), Green (G) and Blue (B) Values

This method involves taking a test surface at a selected area, mainly in the open area under white daylight. The colour of the test surface is photographed using a digital camera (3.7.5.3a).

The colour of the test surface is then compared on the computer monitor without colour calibration with a comprehensive colour list showing the Red (R), Green (G) and Blue (B) colour values from the "Wikipedia List of Colours" websites[5]:

http://en.wikipedia.org/wiki/List_of_colors
http://en.wikipedia.org/wiki/X11_color_names

A matching colour from the list is selected and its corresponding RGB values are noted. The indicative values of different colours can be determined in this way. This method may be used as a quick check on colour contrast. However, it is not able to accurately assess the colours by viewing the colours on screen and there are limitations in choosing a matching colour for composite material surfaces such as granite.

3.7.5.3a External flooring materials with colourful hand-prints in colour contrasting colours

[5] Wikipedia List of Colours

3.7.6 Observations

3.7.6.1 Visual Perception

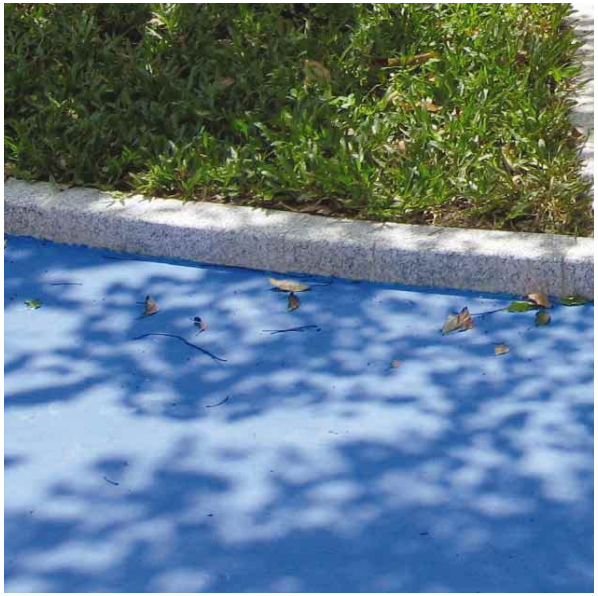
The visual perception in open spaces and semi-covered areas is much affected by external elements, such as wind and cloud movement, light and shadow, as well as people's movements (3.7.6.1a). Where there is a change of condition from internal to external environment, the eyes take a longer period to adapt to the strong light. Thus it is better to create an interim space to allow the eyes to "switch" to the external environment. Where there are stairs, steps and signs located in these areas, the selection of colour and positioning of such provisions are important in order to avoid glaring and unsafe conditions.

3.7.6.2 Safety Colours

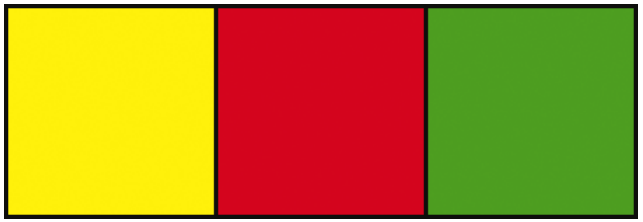
It is also found that though some safety colours, such as yellow, orange, red, green may not achieve high luminous contrast results, in practice, people including the visually impaired, found these colours very effective as warning colours (3.7.6.2a).

For example, in one test, orange ceramic tiles are used as corner tiles to contrast white artificial granite wall tiles (3.7.6.2b). When light reflectance values of the white artificial granite tile and orange ceramic tiles are taken by the light meter, the luminous contrast is noted to be 13.2. The contrast using luminance factor values is noted to be 13.6. Allowing for tolerance in the tests, the results indicate a low value.

However, the visually impaired users appreciate the orange tiles as warning signal and the operators find the orange corner tiles to be a very effective warning colour. Other safety colours such as yellow and red are also considered to be good warning colours. On the other hand, green seems to be a good colour for safety and environmental friendliness. The safety colours are highly appreciated by the human eye and mind. It is worth considering the psychological effects of certain colours when making colour selection.



3.7.6.1a External finishes materials with effective visual and colour contrast



3.7.6.2a Safety colours

3.7.6.2b Orange colour tiles used as corner warning tiles

3.7.6.3 Colour Contrast

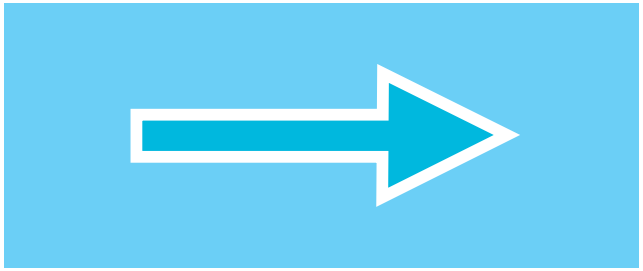
It is noted that the RGB values have certain effect on colour contrast. For a simple colour surface, each colour can be quite accurately represented by a unique RGB value. However, for natural paving materials and surfaces that are composed of a mix of colours such as granite and bricks, it is not easy to find a good match for colour to establish their corresponding RGB values. It is useful to check colour combinations for signs that tend to use a single colour surface.

Hence, colour contrast should be an important aspect in determining the colour combinations for signage. Effective colour combinations will draw people's attention and will provide the necessary information to the viewer as intended (3.7.6.3a). It is also recommended to use a dark colour for the background and a light colour text/graphic as contrast to ensure the signage can be read (3.7.6.3b).

If the colour of a required signboard is similar to that of the background and both colours cannot be changed due to special circumstances, then a visually contrasting border should be placed around the sign (3.7.6.3c). The width of the border should be equal to at least half of the height of the text used for the sign.

3.7.6.3a Effective colour combinations for signage can draw people's attention easily

3.7.6.3b Signage with light colour text on dark colour background



3.7.6.3c Visual contrast border around the sign

3.7.6.4 Size of Surface and Colour

Visual contrast of a large surface against a very small surface tends to give wider variance of results indicating that size of a colour surface has an effect on the visual perception. Based on the field observations, it is found that light reflectance values vary as the small area colour surface is easily affected by surrounding environment. Hence, it is necessary to provide a reasonable area to contrast with the adjoining area and thin lines and small colour surface will not give the desirable contrasting effect that is intended by the designer (3.7.6.4a).

3.7.6.5 Summary Tables

A table listing the luminance factor value of a list of materials under different categories and in descending order of luminance factor (LF) values is shown in Figure 3.7.6.5a.

The materials are categorised into painting on concrete/cement surface; glazed ceramic tiles; artificial granite tiles; granite; concrete; clay paver; terrazzo/ washed grano surfaces; rubber mat; and miscellaneous surfaces. The results range from high LF value of painted concrete surface (more reflective) to low LF value of rubber mat (more absorptive).

A table listing colour contrast values in descending order of colour combinations commonly used for signage and with reference to colour brightness and colour difference values is shown in Figure 3.7.6.5b. The pairing of colours shows high colour contrast values for colours that are further apart in their respective RGB values as described in *Section 3.7.4.5*.

3.7.6.4a Floor markings in contrasting colours with the adjoining floor surface

Item	A	B	C	D	E	F	G	H	I	J
Material	**Painting/ Ceramic Tile**	**Signage**	**Artificial Granite Tile**	**Granite/ Marble**	**Tactile**	**Concrete**	**Clay Paver**	**Terrazzo/ Wash Grano**	**Synthetic Rubber Mat**	**Miscellaneous**
Photo										
Colour/ LF value	White Painted Concrete/68.9	White Glazed Ceramic Tile/45.4	White/44.1	Grey (light) Granite 43.4	Yellow Ceramic Tactile/42.2	Grey Concrete/39.5	Yellow Clay Paver/38.1	Greenish Grey Washed Grano/28.1	Orange Rubber Mat/23.2	Yellow Wood Handrail/37.9
Photo										
Colour/ LF value	Orange Glazed Ceramic Tile/51	Green PVC Sheeting/44.3	White (Pinkish)/35.6	Grey (light) Granite/32.8	Yellow Ceramic Tactile/31.3	Grey Plain Concrete/33.1	Yellow Clay Paver/24.4	Yellow Washed Grano/25.2	Green Rubber Mat/4.2	Stainless steel Handrail/36.4
Photo										
Colour/ LF value	Purple Glazed Ceramic Tile/37.5	White Painted Metal Plate/35.6	Pink (Light)/31.4	Greyish Brown Granite/29.9	Grey Ceramic Tactile/27.5	Grey Concrete Paver/25.3	Brown Clay Paver/19.8	Grey Washed Grano/25	Red Rubber Mat/3.5	Orange Warning Tape/ 34.7
Photo										
Colour/ LF value	Blue Painted Sportsground/26	Blue Painted Metal Plate/28.7	Blue (Greenish)/ 21.6	Greyish Brown Marble/24.3	Yellow Ceramic Tactile/24.2	Red Concrete Paver/23.7	Brown Clay Paver/16.1	Grey Washed Grano/19.2	Black Rubber Mat/2.8	Timber Plank/33.7
Photo										
Colour/ LF value	Green Painted Sportsground/15.6	Yellow Marking on Asphalt/27.9	Grey/20.5	Dark Grey Granite/21.7	Brown Ceramic Tactile/18.7	Plain Concrete/15.6	Red Clay Paver/13.4	Grey Washed Grano/17.9		Brown Timber Plank/16.5
Photo										
Colour/ LF value	Red Painted Sportsground/14.9	Blue Glazed Ceramic Tile/20.5	Brown/20.4	Grey Granite/17.2	Grey Ceramic Tactile/17.0	Plain Concrete Paver /13.9	Brown Clay Paver/8	Green Terrazzo/15.8		Green Artificial Grass/8.6
Photo										
Colour/ LF value	Glazed Ceramic Nosing Tile/13.8		Green/17.3	Grey Granite/16.4	Black Plastic Tactile/11.8					Asphalt Paving/6.4
Photo										
Colour/ LF value			Dark Grey/16.5	Green Marble/11.7						

Legend LF Luminance Factor Value of the materials

3.7.6.5a Table of Luminance Factor Value of Different Types of Material

Example	A	B	C	D	E	F	G	H	I	J	K	L	M
Photo													
Colour 1 in contrast with Colour 2													
Colour 1	Black	White	Black	Yellow	White	Blue	Red	White	White	Green	Red	Green	Red
R/G/B Value	0/0/0	255/255/255	0/0/0	255/255/0	255/255/255	0/0/255	255/0/0	255/255/255	255/2555/255	0/255/0	255/0/0	0/255/0	255/0/0
Colour 2	White	Black	Yellow	Black	Blue	White	White	Red	Green	White	Green	Red	Yellow
R/G/B Value	255/255/255	0/0/0	255/255/0	0/0/0	0/0/255	255/255/255	255/255/255	255/0/0	0/255/0	255/255/255	0/255/0	255/0/0	255/255/0
C Value	100	100	81.6	81.6	81.6	81.6	81.6	81.6	81.6	81.6	81.6	81.6	57.7
Colour Difference	765	765	510	510	510	510	510	510	510	510	510	510	**255 (<500)**
Brightness Difference	255	255	225.9	225.9	225.9	225.9	178.8	178.8	**105.3 (<125)**	**105.3 (<125)**	**73.4 (<125)**	**73.4 (<125)**	149.7

Remarks:

1. The list above shows generally good colour contrast and appreciation of colours.
   Name of colours and Red/Green/Blue values extracted from: http://en.wikipedia.org/wiki/List_of_colours
2. Colour contrast value "C" is based on formula: $100 \times (((R1-R2)^2 + (G1-G2)^2 + (B1-B2)^2)/3)^{0.5}/255$
3. Colour brightness and colour difference according to a suggested algorithm extracted from: http://www.w3.org/TR/AERT#color-contrast
4. Colour 1 denotes colour on the front
5. Colour 2 denotes colour on the background
6. R/G/B denotes Red/Green/Blue
7. Colour difference is considered acceptable if the value is greater than 500
8. Brightness difference is considered acceptable if the value is greater than 125
9. Values in bold are below the acceptable value

3.7.6.5b Summary of Colour Contrast for Pairs of Colour

3.7.7 Design Considerations and Best Practices

3.7.7.1 Design Considerations

Design Requirements in *Design Manual: Barrier Free Access* issued by the Buildings Department can be referred to for building works in the external areas. The guidelines described in Transport Department's *Transport Planning & Design Manual* can also be referred to for streets, pedestrian crossings, drop kerbs etc.

Visual contrast is recommended for the following elements in the environment:

- The floor and wall along ramps
- Tactile warning strips and the adjoining surfaces at the head, foot and landing of ramps
- Tactile warning strips and the surrounding surfaces at dropped kerbs
- Non-slip nosing and the adjacent surface of a staircase
- Treads and walls of a staircase
- Handrails and the surrounding wall surface
- Wall, floor, gate and adjacent surfaces
- Signs, Braille and directory boards
- The international symbol for accessibility and the background

3.7.7.2 Matrix Summary Tables

Based on studies that involved user feedback and observations made under *Section 3.7.6*, recommendations of acceptable contrast and colour combinations are indicated in three matrix summary tables. The list of materials is not exhaustive and is only intended to provide indicative values for material and colour combinations.

A matrix summary table of floor and tactile surface contrast value is listed in Figure 3.7.7.2a. The contrast value of floor and tactile materials with a value greater than or equal to 50 is highlighted.

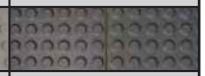
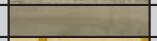
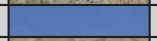
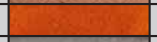
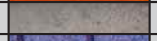
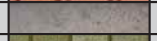
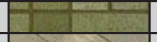
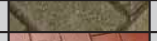
A matrix summary table of the floor and wall surface contrast value is listed in Figure 3.7.7.2b. The contrast value of floor and wall materials of a value greater than or equal to 30 is highlighted.

A matrix summary table of different surfaces with signage is listed in Figure 3.7.7.2c. The contrast value of combinations of a value greater than or equal to 60 is highlighted.

A summary of recommendations is indicated in Figure 3.7.7.2d.

Surface Materials	Contrast between floor and tactile surfaces	Contrast between floor and wall	Contrast between different surfaces with signage
Recommended Value	Greater or equal to 50	Greater or equal to 30	Greater or equal to 60
Summary Table	Figure 3.7.7.2a	Figure 3.7.7.2b	Figure 3.7.7.2c

3.7.7.2d Summary of recommendation of acceptable visual contrast and colour contrast

Floor \ Tactile				Item	A	B	C	D	E	F	G	H
				Material	Ceramic (Yellow 1)	Ceramic (Yellow 1)	Concrete (Yellow 1)	Ceramic (Grey)	Ceramic (Yellow 1)	Ceramic (Brown)	Ceramic (Grey 1)	Ceramic (Black)
				Photo								
Item	Mat.	Colour	Photo	LF	42.2	31.3	29.2	27.5	24.2	18.7	17.0	11.8
1	AGT	White		44.1	4	29	34	38	45	58	61	73
2	GS	Grey 1		43.4	3	28	33	37	44	57	61	73
3	CP	Yellow 1		38.1	10	28	23	28	36	51	55	69
4	PCo	Grey 1		33.1	22	5	12	17	27	44	49	64
5	GS	Grey 1		32.8	22	5	11	16	26	43	48	64
6	AGT	Pink 1		31.4	26	0	7	12	23	40	46	62
7	GS	Brown 2		29.9	29	4	2	8	19	37	41	61
8	WG	Grey		28.1	33	10	4	2	16	41	40	59
9	SPa	Blue		26.0	38	17	11	5	7	28	35	55
10	CoP	Grey 1		25.3	40	19	13	8	4	26	33	53
11	TT	Yellow 2		25.2	40	19	14	8	4	56	33	53
12	WG	Grey		25.0	41	20	14	9	3	25	32	53
13	CP	Yellow		24.4	42	22	16	11	1	23	30	52
14	MS	Brown 2		24.3	42	22	17	12	0	23	30	51
15	CoP	Red		23.7	44	24	19	14	2	21	28	50
16	SS	Orange		23.2	45	26	21	16	4	19	27	49
17	GS	Grey 4		21.7	49	31	26	21	10	14	22	46
18	AGT	Blue		21.6	49	31	26	21	11	13	21	45
19	AGT	Grey		20.5	51	35	30	25	15	9	17	42
20	AGT	Brown 3		20.4	52	35	30	26	16	8	17	42
21	CP	Brown		19.8	53	37	32	28	18	6	14	40
22	WG	Grey		19.2	55	39	34	30	21	3	11	39
23	AGT	Green		17.3	59	45	41	37	29	7	2	32
24	TP	Brown 4		16.5	61	47	43	40	32	12	3	32
25	TT	Green 4		15.8	63	50	46	43	35	16	8	25
26	PCo	Grey		15.6	63	50	47	43	36	17	9	24
27	SPa	Red		14.9	65	52	49	46	38	20	14	21
28	CoP	Grey		13.9	67	56	52	49	43	26	18	15
29	CP	Red 4		13.4	68	57	54	51	45	28	21	12
30	MS	Green 4		11.7	72	63	60	57	52	37	31	1
31	CP	Brown 4		8.0	81	74	73	71	67	57	53	32
32	AP	Black		6.4	85	80	78	77	74	66	62	46

Legend

AGT	Artificial Granite Tile	GS	Granite Slab	SS	Sportsground Surface
AP	Asphalt Paving	MS	Marble Slab	TP	Timber Plank
CP	Clay Paver	PCo	Plain Concrete	TT	Terrazzo Tile
CoP	Concrete Paver	SPa	Synthetic Painting	WG	Washed Grano

Cell of value greater than or equal to the acceptable Luminous Contrast Value (50%) using Luminous Factor Value

Cell of value below the acceptable Luminous Contrast Value (50%)

LF Luminance Factor Value of the material

Mat. Material

Colour

1 Light
2 Greyish
3 Pinkish
4 Dark

3.7.7.2a Table of Luminous Contrast of Different Floor and Tactile Surfaces

Floor \ Wall	Item	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
	Material	SP	GCrT	GCrT	AGT	GS	PCo	GCrT	AGT	AGT	GS	WG	MS	AGT	AGT	WG	AGT	GS	AGT	CrT	MS
	Colour	White	Orange	Beige	White	Grey 1	Grey1	Purple	White 3	Pink 1	Brown	Grey	Brown	Blue	Brown	Grey	Green	Grey	Grey 4	Red 4	Green 4
	Photo																				
Item	Mat.	Colour	Photo	LF	68.9	51	47.9	44.1	43.4	39.5	37.5	35.6	31.4	29.9	25	24.3	21.6	20.4	17.9	17.3	17.2	16.5	13.8	11.7
1	AGT	White		44.1	36	14	8	0	2	10	15	19	29	32	43	45	51	54	59	61	61	63	69	73
2	GS	Grey 1		43.4	37	15	9	2	0	9	14	18	28	31	42	44	50	53	59	60	60	62	NA	73
3	CP	Yellow		38.1	45	25	20	14	12	4	2	7	18	22	34	36	43	46	53	55	55	57	NA	69
4	PCo	Grey 1		33.1	52	35	31	25	24	16	12	7	5	10	24	27	35	38	46	48	48	50	58	65
5	GS	Grey 1		32.8	52	36	32	26	24	17	13	8	4	9	23	26	34	38	45	47	48	50	NA	64
6	AGT	Pink 1		31.4	54	38	34	29	28	21	16	12	0	5	20	23	31	35	43	45	45	47	56	63
7	GS	Brown 2		29.9	57	41	38	32	31	24	20	16	5	0	16	19	28	32	40	42	42	45	NA	61
8	SPa	Blue		26.0	62	49	46	41	40	34	31	27	17	13	4	7	17	22	31	33	34	37	47	55
9	CoP	Grey 1		25.3	63	50	47	43	42	36	33	29	19	15	1	4	15	19	29	32	32	35	NA	54
10	TT	Yellow 5		25.2	63	51	47	43	42	36	33	29	20	16	1	4	14	19	29	31	32	35	NA	54
11	WG	Grey		25.0	64	51	48	43	42	37	33	30	20	16	0	3	14	18	28	31	31	34	45	53
12	CP	Yellow		24.4	65	52	49	45	44	38	35	31	22	18	2	0	11	16	27	29	30	32	NA	52
13	MS	Brown 2		24.3	65	52	49	45	44	38	35	32	23	19	3	0	11	16	26	29	29	32	NA	52
14	CP	Red		23.7	66	54	51	46	45	40	37	33	25	21	5	2	9	14	24	27	27	30	NA	51
15	SS	Orange		23.2	66	55	52	47	47	41	38	35	26	22	7	5	7	12	23	25	26	29	41	50
16	AGT	Blue		21.6	69	58	55	51	50	45	42	39	31	28	14	11	0	6	17	20	20	24	36	46
17	AGT	Grey		20.5	70	60	57	54	53	48	45	42	35	31	18	16	5	0	13	16	16	20	33	43
18	AGT	Brown 3		20.4	70	60	57	54	53	48	46	43	35	32	18	16	6	0	12	15	16	19	32	43
19	CP	Brown		19.8	71	61	59	55	54	50	47	44	37	34	21	19	8	3	10	13	13	17	NA	41
20	WG	Grey		19.2	72	62	60	56	56	51	49	46	39	36	23	21	11	6	7	10	10	14	28	39
21	AGT	Green		17.3	75	66	64	61	60	56	54	51	45	42	30	29	20	15	3	0	1	5	20	32
22	TP	Brown 4		16.5	76	68	66	63	62	58	56	54	47	45	34	32	24	19	8	5	4	0	NA	29
23	GT	Grey		16.4	76	68	66	63	62	58	56	54	48	45	34	33	24	20	8	5	5	1	16	29
24	CP	Brown 4		16.1	77	68	66	63	63	59	57	55	49	46	36	34	25	21	10	7	6	2	NA	27
25	TT	Green 4		15.8	77	69	67	64	64	60	58	56	50	47	37	35	27	23	12	9	8	4	13	26
26	SPa	Green		15.6	77	69	67	65	64	61	58	56	50	48	38	36	28	24	13	10	9	5	NA	25
27	CoP	Grey		15.6	77	69	67	65	64	61	58	56	50	48	38	36	28	24	13	10	9	5	12	25
28	SPa	Red		14.9	78	71	69	66	66	62	60	58	53	50	40	39	31	27	17	14	13	10	NA	21
29	CoP	Grey		13.9	80	73	71	68	68	65	63	61	56	54	44	43	36	32	22	20	19	16	NA	16
30	CP	Red 4		13.4	81	74	72	70	69	66	64	62	57	55	46	45	38	34	25	23	22	19	NA	13
31	MS	Green 4		11.7	83	77	76	73	73	70	69	67	63	61	53	52	46	43	35	32	32	29	NA	0
32	AG	Green		8.6	88	83	82	80	80	78	77	76	73	71	66	65	60	58	52	50	50	48	NA	26
33	CP	Brown 4		8.0	88	84	83	82	82	80	79	78	75	73	68	68	63	61	55	54	53	52	NA	32
34	AP	Black		6.4	91	87	87	85	85	84	83	82	80	79	74	74	70	69	64	63	63	61	NA	45
35	RM	Green 4		4.2	94	92	91	90	90	89	89	88	87	86	83	83	81	79	77	76	76	75	NA	64
36	RM	Red 4		3.5	95	93	93	92	92	91	91	90	89	88	86	86	84	83	80	80	80	79	NA	70

Legend

AG	Artificial Grass	CrT	Ceramic Tile	PCo	Plain Concrete	TT	Terrazzo Tile
AGT	Artificial Granite Tile	GCrT	Glazed Ceramic Tile	SPa	Synthetic Painting	WG	Washed Grano
AP	Asphalt Paving	GT	Granite Tile	RM	Rubber Matt	LF	Luminance Factor Value of the material
CP	Clay Paver	GS	Granite Slab	SS	Sportsground Surface	NA	Cell is “not applicable”
CoP	Concrete Paver	MS	Marble Slab	TP	Timber Plank	Mat.	Material

Cell of value greater than or equal to the acceptable Visual Contrast Value (30%) using Luminous Factor Value

Cell of value below the acceptable Visual Contrast Value (30%) or not applicable

Colour

1	Light
2	Greyish
3	Pinkish
4	Dark
5	Brownish

3.7.7.2b Table of Visual Contrast of Different Floor and Wall Surfaces

Front \ Background						Item	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
						Mat.	Sign	Sign	Sign	Sign	Sign	Sign	Sign	AGT	AGT	AGT	GCrT	GCrT	PTa	VF	CrTa	GS	SPa
						Colour	White	Yellow	Amber	Green	Red	Blue	Black	White	Pink	Dark	Orange	Purple	Yellow	Beige	Yellow	Grey	Blue
Item	Mat.	Colour	R	G	B	CV																	
1	Sign	White	255	255	255	255	0	58	60	82	82	82	100	17	41	50	62	37	NA	17	NA	NA	57
2	Sign	Yellow	255	255	0	226	58	0	14	58	58	100	82	50	47	50	23	45	NA	50	NA	NA	81
3	Sign	Amber	255	191	0	188	60	14	0	60	58	92	72	49	39	43	9	39	NA	49	NA	NA	78
4	Sign	Green	0	255	0	150	82	58	60	0	NA	NA	NA	68	68	50	62	64	NA	68	NA	NA	63
5	Sign	Red	255	0	0	76	82	58	43	82	0	82	58	68	43	50	35	48	NA	68	NA	NA	84
6	Sign	Blue	0	0	255	29	82	100	92	82	82	0	58	68	61	50	89	60	NA	68	NA	NA	33
7	Sign	Black	0	0	0	0	100	82	72	NA	67	58	0	83	65	50	67	65	NA	83	NA	NA	NA
8	AGT	White	211	211	211	211	17	50	49	68	68	68	83	0	27	33	52	22	45	0	11	7	45
9	AGT	Pink	218	112	147	148	41	47	39	68	61	61	65	27	0	18	36	7	41	27	27	22	NA
10	AGT	Dark	128	128	128	128	50	50	43	50	43	50	50	45	21	0	41	18	45	45	36	25	37
11	GCrT	Orange	255	153	0	166	62	23	9	62	43	89	67	51	36	41	0	37	NA	51	NA	NA	77
12	GCrT	Purple	204	136	153	158	37	45	39	64	46	60	65	22	7	25	37	0	NA	22	NA	NA	NA
13	PTa	Yellow	253	233	16	214	NA	NA	NA	NA	NA	NA	NA	45	41	45	NA	NA	0	45	37	NA	77
14	VF	Beige	211	211	211	211	17	50	49	68	68	68	83	0	27	33	NA	NA	45	0	NA	NA	45
15	CrTa	Brown	245	222	179	224	NA	NA	NA	NA	NA	NA	NA	11	27	36	NA	NA	37	11	0	NA	55
16	GS	Grey	192	192	192	192	NA	NA	NA	NA	NA	NA	NA	NA	22	25	NA	NA	NA	NA	NA	0	41
17	SPa	Blue	30	144	255	123	57	81	78	63	84	33	67	45	50	37	41	NA	77	45	55	41	0

Legend

AGT	Artificial Granite Tile	PTa	Plastic Tactile	Sign	Signage
CrTa	Ceramic Tactile	SPa	Synthetic Painting	CV	Colour Value
GCrT	Glazed Ceramic Tile	VF	Vinyl Flooring	R/G/B	Red/Green/Blue Value
GS	Granite Slab				

Cell of value greater than or equal to the acceptable Colour Contrast Value (60%)

Cell of value below the acceptable Colour Contrast Value (60%) or not applicable

NA Cell is “not applicable”

Mat. Material

3.7.7.2c Table of Colour Contrast (using Red/Green/Blue Value) for Different Pairs of Material