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Why most Brand Manuals fail when it comes to defining Brand Colors; And how to determine acceptable Color Deviations for specific Brand Colors

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Short Abstract

From top class Universities and governmental organizations to high-end global brands and well-known local brands, a surprising consistency of inattentiveness has been published in these companies' prestigious Brand Manuals and Brand Guides. When it comes to providing technical guidance, defining and describing their Brand Colors, they all fail. By examining and analyzing more than 300 different Brand Colors from 156 Brand Manuals by reputable local and Global Brands including 28 of the 100 Best Global Brands (Interbrand 2015) (see Appendix) and by numerous of visits and interviews with responsible professionals from both sides throughout the years it is obvious that there is an alarming lack of communication between technical experts and design experts. 91 % of the Brand Manuals specifies their Brand Colors as either PANTONE or PANTONE C. 90.4 % of the Brand Manuals also specifies their Brand Colors with supplementary CMYK-values even though only 45.8 % of those Brand Colors are achievable by using the process colors CMYK. This will result in unpredicted color differences of up to 35 ΔE_{ab} or 8.3 ΔE_{2000} when some of those Brand Colors are reproduced. Nevertheless, none of the Brand Manuals has neither any remarks, comments or warnings of color deviations nor indications of acceptable color tolerances. Only 1.3 % of the Brand Manuals also define their Brand Colors with device independent CIELAB-values. It appears that when designers and Brand Owners select and specifies Brand Colors they tend to choose colors which cannot be reproduced by using CMYK process colors and therefore the Brand Color cannot be shown in e.g. magazine ads, newspaper ads, digital print and other print media. They are bound to be disappointed. This Paper will present a practical approach to specifying and communication Brand Colors and to determine acceptable color deviation for specific Brand Colors.

Keywords: Brand Manual, Brand Color Specification, Color reproduction, Tolerance, Graphic Design

1. Introduction

Brand Owners care deeply about their Brand and their visual identity. They are as committed as they are concerned about how their Brand appears on all types of different media in the society. A Brand should create recognizability in the marked and the Brand Colors symbolize identity, emotions and inner values for that company.

That is why Brand Owners turn to professionals for help when they wish to produce a good and useful Brand Manual. They put all their trust and confidence in the hands of these professionals and the Brand Owners are willing to pay high prices for a useable and professional Brand Manual.

In most cases, these professionals are some kind of Design Agency or Advertising Agency and they are all able to produce a beautiful and professional looking Design Manual, Brand Manual, Visual Identity Guide or whatever the name they choose to give this Brand Book. It all looks very professional and impressive and that in itself seems to justify the high price they charge.

Although the agencies have delivered beautiful Brand Books in which the Brand Colors are described and technical specified as PANTONE, RGB, CMYK and Hexadecimal, those Brand Manuals cannot be used as manuals and those Brand Guides cannot be used as guides – when it comes to guidance on how to reproduce the Brand Colors.

The reason for that is that the Design professionals are not professionals in the field of Graphic Arts Technology, Color Management, Operations Management and Quality Management. They are experts in Design Management, Brand Management – in choosing colors that match the company’s values and producing a good layout and design.

Thus, it seems that the first priority of the Art Director or the Designer is to produce a pretty and beautiful Brand Book rather than a Brand Manual, which can actually be used as a manual or a guide. In surprisingly many cases the Brand Manuals contains contradictory and absurd information. The responsibility for this rests on the designers (Drew and Meyer 2006, pp. 147, 193)

Consequently one may wonder what the purpose really is with these Brand Manuals. Is it the intention that the Brand Manual should serve as a nice prestigious tribute to the Brand's visual identity or is it the intention of the Brand Manual that it should actually serve as a MANUAL for future professionals who need to reproduce those Brand Colors?

1.1 Ten Reasons why Brand Manuals cause Problems

When a Brand Color has been chosen by the Brand Owner and when an Art Director or Graphic Designer subsequently shall specify and describe this colors’ technical specifications in the Brand Manual this will in most cases be done by providing four sets of color specifications as shown in Figure 1:



Figure 1: A typical description of a Brand Color in a Brand Manual

However, these simple definitions raise a huge amount of unanswered questions among those professionals who are about to reproduce this Brand Color within their field. Those four color specifications pose more questions and obstructions than helpful guidelines.

For the professional expert who is looking for a precise color recipe or some guidance on how to reproduce this color, this Brand Manual has more the character of an enigmatic book of contradictions than that of a Manual.

At first it can quickly be determined that there is no help to be found if this Brand Color is to be painted on a wall, a door, a car or something else. There is no help to be found if we are about to produce cotton T-shirts or nylon bags in this Brand Color.

It seems that this Brand Manual is made exclusively for the Print Industry and for web creators. Or in other words this Brand Manual is made by Art Directors or Graphic Designers to other Art Directors or Graphic Designers however; even in these areas this information is incomplete and confusing.

Apparently all companies are using the same inexpedient method. All Brand Manuals, Brand Guides, Visual Identity Guidelines and Brand Books are fundamentally designed and structured in the same way, roughly using the same layout and defining and specifying the Brand Colors in the same manner. The design and branding professionals call this “Best Practice”.

However, the result is that Brand Colors is being reproduced with unacceptable large color differences while Designers and Brand Owners becomes frustrated and disappointed.

1.1.1 PROBLEM ONE: How are these values derived?

In none of the Brand Manuals, there is any information on how these color specifications has been generated.

Since it is typically an Art Director or a Graphic Designer who have read out these values from their Adobe Creative Suite software package then it is crucial to know which Working Space this Art Director have used in his or hers Color Settings.

The future professionals who shall use this Brand Manual to reproduce this Brand Color must adjust their Working Space and Color Settings to the exact same settings. Otherwise the probability of acceptable color match is minimized. Crucial information on methodology and color management is missing.

A Brand Manual should contain information on how the displayed values have been found.

1.1.2 PROBLEM TWO: Pantone?

In 91 % of the Brand Manuals, the Brand Color is specified as Pantone Colors. Either as an unspecific Pantone Color (e.g. Pantone 151) or as a Pantone Color specified as printed on gloss Coated paper (Pantone 151 C) or Uncoated paper (Pantone 151 U).

In 46.2 % of the Brand Manuals, the Brand Color is specified and specifically defined as “C” meaning the way the Brand Color appears on gloss coated paper. This raises questions on how this Brand Color will appear on other substrates like uncoated paper, matte coated paper, plastic foil, textile, corrugated board, metal etc.

Since it is not possible to obtain a “C color” on a “U paper” or vice versa (Green 1995) then the Brand Owner will have to accept an unknown color difference if he choose another substrate than coated paper.

The differences between Pantone 151 C (Coated) and Pantone 151 U (Uncoated) is $16.7 \Delta E_{ab}$ or $6.4 \Delta E_{2000}$ (according to CIELAB-values from PANTONE Color Manager)

Will this be regarded as an acceptable color difference for this Brand Color? None of the Brand Manuals has any indications on this issue.

A Brand Manual should contain information on a Brand Color’s “master values” in CIELAB and comments on acceptable deviation tolerances.

1.1.3 PROBLEM THREE: CMYK? – Is this specific Brand Color achievable in CMYK?

In none of the Brand Manuals, there is any information on whether or not the Brand Colors can be reproduced with an acceptable color match by using the process colors CMYK. However, in 90.4 % of the Brand Manuals specific CMYK values are provided. As shown in Figure 1, the second information tells us that Pantone 151 C can be reproduced by using the CMYK-values: 60 % Magenta + 100 % Yellow.

Nevertheless, Pantone 151 C is a color, which cannot be reproduced satisfactorily by using the process colors CMYK. This is evidenced by the PANTONE COLOR BRIDGE Coated and in Adobe Creative Suite which gives a gamut warning. If Pantone 151 C is reproduced with the applied CMYK-values from the Brand Manual this would result in a color difference of $18.6 \Delta E_{ab}$ or $5.5 \Delta E_{2000}$ (according to CIELAB-values from PANTONE Color Manager). So this Brand Color is destined to have a huge color difference if it is reproduced in CMYK. Does the Brand Owner know that?

Only 45.8 % of the 300 Brand Colors can be achieved by using the process colors CMYK. However, there are no comments on that issue in none of the Brand Manuals. When a Brand Manual display specific CMYK values for a Brand Color this creates an expectation that this Brand Color can be reproduced in CMYK.

A Brand Manual should contain information on whether or not a Brand Color is achievable in CMYK.

1.1.4 PROBLEM FOUR: CMYK? – What kind of CMYK?

In 90.4 % of the Brand Manuals the Brand Colors is also specified with specific CMYK-values. In addition to the aforementioned example another problem with these CMYK-values is that there is no information on what kind of substrate and print technology this applies to.

Should the provided CMYK values be understood as if this Brand Color is printed on Gloss Coated paper as Pantone 151 C indicate? And if so, in what kind of print technology is it to be printed? (Sheet fed offset? Web Offset /Heatset? Gravure? Flexo?). The Brand Manuals doesn't tell. But it is of crucial importance for the outcome. There are as many CMYK's as there are paper types multiplied with the number of different printing technologies.

Less than 10 % of the Brand Manuals tries to give some kind of information on this. And in those cases most of them just indicate the same CMYK-values for both Coated and Uncoated paper which makes no sense, unless for example a red Brand Color is specified as 0 100 100 0, which would indicate that screening of this color is not acceptable.

A Brand Manual should contain information on which print conditions (ICC-profile) the displayed CMYK-values refer to.

1.1.5 PROBLEM FIVE: CMYK? – Why specific CMYK-values?

Another problem with defining a Brand Color with specific values for C, M, Y and K (like Figure 1; C0, M60, Y100, K0) is that this color only accidentally will be produced with those values – for many reasons.

It is well known in the Graphic Arts Industry, that if you send the same set of CMYK-combination to different printers and printing presses they would all produce different colors (Sharma, 2004; Richard, et al., 2008).

In a normal Color Managed workflow the Brand Color will be converted by using relevant ICC-profiles with different rendering intents, black generation and tone value increase correction curves. In some cases some sort of Ink Saving processing will also be applied. Thus the CMYK-values will be changed to match the current situation. So, why provide specific CMYK-values?

1.1.6 PROBLEM SIX: Specific CMYK values versus variation tolerances

According to ISO 12647-2:2013, section 4.3.4.2 the ordinary variation tolerance allows a variation of +/- 4 percentage points. That means that the CMYK values of the intended magenta of 60 % displayed in Figure 1 would be acceptable between 56 % and 64 %.

The difference between these two extremes will result in a color difference of 8.6 ΔE_{ab} , 5.6 ΔE_{2000} and 7.5 ΔH (according to CIELAB-values from Adobe Photoshop).

A Brand Manual should contain information on acceptable variation tolerances.

1.1.7 PROBLEM SEVEN: RGB and Hex Values? – Which Color Space?

In 81.4 % of the Brand Manuals the Brand Colors is specified with additional RGB values. The Brand Manual's attempt to specify color values for websites, mobile platforms and other screen technologies raises the same unanswered questions. Are the stated RGB-values understood to be sRGB, AdobeRGB, eciRGB, AppleRGB or another RGB? No answer is given. And since the Hexadecimal values are directly connected to the chosen RGB color space, the same questions apply here.

Since the standard RGB for the Internet is sRGB (W3C 2015, IEC 1999) and since most mobile media displays colors through sRGB, it would be natural to expect that the stated RGB-values is to be understood as sRGB.

However, since most Art Directors and Graphic Designers work in AdobeRGB and since they are the professionals who have made these Brand Manuals it is more likely that the displayed RGB-values are

AdobeRGB. The point is that there is no information on this issue in any of the Brand Manuals. In only 1.3% of Brand Manuals the Brand Colors is specified as a specific RGB (sRGB).

A Brand Manual should contain information on which color space the displayed RGB-values refer to.

1.1.8 PROBLEM EIGHT: CIELAB? – Why are there no device-independent values?

Since all the color code values shown in the Brand Manuals are device-dependent color values it is far too risky to rely on the Brand Manual's Pantone-, RGB, Hex- and CMYK-values unless they are followed by specific information on devices and substrates – which they aren't. Furthermore, less than half of all Brand Colors can be reproduced by using the process colors CMYK and a similar amount of Brand Colors cannot be shown on a sRGB a screen which is a problem since sRGB is the standard for the Internet (W3C 2015, IEC 1999) and most mobile devices.

A Brand Manual should contain information on device independent CIELAB values for the Brand Color.

1.1.9 PROBLEM NINE: Acceptable color deviations?

In none of the 156 Brand Manuals acceptable deviation tolerances is neither specified nor commented. In spite of all the potential risks of color mismatch described above no guidance on acceptable color difference can be found in any of the Brand Manuals.

In only two of the 156 Design Manuals (Canon 2015 and Siemens 2008) the Brand Colors was defined with CIELAB-values but not even here were there any indications of acceptable color deviations.

A Brand Manual should contain information on acceptable deviation tolerances.

1.1.10 PROBLEM TEN: The missing Color specifications

In Figure 1 which represents a typical example of a Brand Manual's Color specifications it is remarkable that the Brand Color only is specified for reproduction on an unknown screen technology and in an unknown print technology using an unknown print substrate.

In short, the values in Figure 1 only try to meet the needs of the Printer and the Web Designer, even though it fails. There is no color specifications for the use in other industries, technologies or other color systems like RAL, NCS, Textile etc.

Only 4.5 % of the Brand Manuals provide NCS-values, only 6.4 % provide RAL-values and only 2.6 % of the Brand Manuals provide values for textile.

A Brand Manual should contain information for other industries, technologies and color systems.

In the light of all these potential problems it would be relevant to present a proposal on how a useful and professional Brand Manual should specify and communicate Brand Colors and how to determine specific values for acceptable color deviations for each specific Brand Color.

2. Methodology

In the search for literature on this subject (*how to specify Brand Colors in a Brand Manual*), the TAGA 2005-2014 Proceedings and the IARIGAI proceedings from the 39th to the 42nd conferences where consulted. Although it was possible to find some literature that seems relevant for this paper's subject regarding Color Management, Spot Colors and Brand Colors (Chung *et al.* 2004, Chung 2005, Chung *et al.* 2007, Sperry and O'Hara 2007, Sangmule *et al.* 2010, Shendye *et al.* 2011, Seymour 2013), they all seem to be focusing on subjects that where in the periphery of this paper's subject. However, some useful points and statements from this literature where used.

Other sources on Spot Colors and Brand Colors where consulted (VIGC 2008, Fogra 2010, Meittamo, 2010) and so was textbooks aimed for Graphic Arts Designers regarding selecting and specifying colors where conducted (Eisemann 2000, Drew and Meyer 2006, Schmidt 2013).

It has not yet been possible to find any literature that directly describes how to specify Brand Colors in a Brand Manual or how to precisely communicate a color's technical specifications.

Through an Internet research 156 Design Manuals from major recognized Brands where found and downloaded after which 300 Brand Colors were chosen and analyzed.

Throughout this paper Pantone 151 C is used as a representative example of a Brand Color. This Color where chosen because it is out of CMYK gamut like more than half of all Brand Colors examined.

The CMYK-values, RGB-values, Hex-values and CIELAB-values presented in the tables in this paper were found by using PANTONE COLOR BRIDGE Coated (the Plus Series) 2015. After registration of this product the PANTONE COLOR MANAGER Software (version 2.1.0.249 for Windows) were downloaded and installed after which the official Pantone CIELAB values from all Pantone Colors where downloaded to Excel.

All calculated ΔH , ΔE_{ab} and ΔE_{2000} values were found by using those official Pantone CIELAB values. The official iOS apps: "myPANTONE" and "PANTONE X-ref" were used to find corresponding colors from different Pantone Color fan Decks.

The RAL Colors were found through the official RAL COLOUR iOS App "RAL iCOLOURS" while the NCS Color values were found through the online application "NCS NAVIGATOR Premium".

The color code values from different RGB and CMYK color spaces were found through Adobe Photoshop where the color settings gradually were changed to different RGB and CMYK ICC-profiles using Absolute Colorimetric Rendering Intend and subsequently the CIELAB values for PMS 151C were entered through color picker each time. No measurements have been carried out.

3. Results and Discussions

For all existing Brands it applies that they have already chosen their Brand Colors whether they are reproducible or not. But when it's time to produce a new Brand Manual then it is important to initially find the device independent "master values" (CIELAB values) for this specific Brand Color. This can easily be found via Adobe Photoshop, the PANTONE COLOR Manager software or the smartphone app "myPANTONE". The L*a*b* details for PANTONE 151C are given in Figure 2.

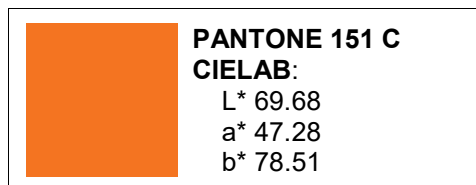


Figure 2: Specification of a Brand Color's "Master Values"

In principle, a Brand Manual doesn't need to contain much more color specifications than these. However, if the Brand Manual should be helpful to those professionals who are about to reproduce this color within their discipline, within their color system then a Brand Manual should provide much more information.

3.1 Determination of device dependent CMYK values

In Table 1 below five different CMYK value combinations for PMS 151 C is shown for lithographic offset printing on coated paper. This is to illustrate that they are all different and that they only apply to these five print conditions.

Table 1: Five different CMYK interpretations based on the CIELAB values of PMS 151 C

Color Settings: Working Space (Absolut Colorimetric R.I.)	ISO Coated v2 (FOGRA39)	PSO Coated v3 (FOGRA 51)	Euroscale Coated v2	U.S. Web Coated (SWOP) v2	U.S. Sheet fed Coated v2
PANTONE 151 C					
CIELAB L*	69.68	69.68	69.68	69.68	69.68
CIELAB a*	47.28	47.28	47.28	47.28	47.28
CIELAB b*	78.51	78.51	78.51	78.51	78.51
CMYK:	0 56 97 0	0 55 99 0	0 55 96 0	0 54 100 0	0 52 99 0
CIELAB values for this CMYK combination of PMS151C by using this CMYK profile	64.00 35.00 63.00	64.00 37.00 64.00	63.00 34.00 62.00	62.00 31.00 58.00	64.00 35.00 63.00
Closest CMYK-match to PMS 151 C	2.8 ΔH 20.6 ΔE_{ab} 7.1 ΔE_{2000}	1.5 ΔH 18.7 ΔE_{ab} 6.0 ΔE_{2000}	3.3 ΔH 22.2 ΔE_{ab} 7.3 ΔE_{2000}	4.0 ΔH 27.3 ΔE_{ab} 8.8 ΔE_{2000}	2.8 ΔH 20.6 ΔE_{ab} 6.4 ΔE_{2000}

So, if the Brand Manual should contain specific CMYK values they should be followed by a reference to an ICC-profile. However, any CMYK reproduction of PMS 151 C will still result in a huge color deviation.

3.2 Determination of device dependent RGB values

In Table 2 below five different RGB value combinations for PMS 151 C is shown. Also in this case, it is seen that they are all different and that they only apply to one RGB color space (ICC-profile).

Table 2: Five different RGB interpretations based on the CIELAB values of PMS 151 C

Color Settings: Working Space (Absolut Colorimetric R.I.)	AdobeRGB	sRGB	AppleRGB	eciRGB v2	CIE RGB
PANTONE 151 C					
CIELAB L*	69.68	69.68	69.68	69.68	69.68
CIELAB a*	47.28	47.28	47.28	47.28	47.28
CIELAB b*	78.51	78.51	78.51	78.51	78.51
RGB	236 131 23	255 132 0	255 109 0	233 146 43	250 146 57
HTML / Hex #	ec8317	ff8400	ff6d00	e9922b	fa9239
CIELAB values for this RGB combination of PMS 151 C by using this RGB profile	70.00 47.00 79.00	69.00 44.00 75.00	70.00 46.00 73.00	70.00 47.00 79.00	70.00 47.00 80.00
Closest RGB-match to PMS 151 C	0.5 ΔH 0.6 ΔE_{ab} 0.4 ΔE_{2000}	1.0 ΔH 4.9 ΔE_{ab} 1.2 ΔE_{2000}	1.8 ΔH 5.7 ΔE_{ab} 1.5 ΔE_{2000}	0.5 ΔH 0.6 ΔE_{ab} 0.4 ΔE_{2000}	1.0 ΔH 1.5 ΔE_{ab} 0.6 ΔE_{2000}

So, if the Brand Manual should contain specific RGB values they should be followed by a reference to an ICC-profile.

3.3 Finding matching colors in other Color Systems

On the basis of the color name “Pantone 151 C” the official Pantone app “PANTONE X-ref” can be used to find corresponding Pantone colors in other Pantone Fan Decks.

On the basis of the CIELAB values of Pantone 151 C the official “RAL iCOLOUR” app can be used to determine the closest RAL color match.

On the basis of the CIELAB values of Pantone 151 C the official online application “NCS NAVIGATOR Premium” can be used to determine the closest NCS color match.

The results can be seen in table 3 on the following page.

4. Determination of acceptable color deviations

4.1 Closest match within the same process

When measuring Brand Colors and other Spot Colors it is recommendable to use the ΔE_{2000} formula since this is created to display a numeric value for the specific color difference that the human eye perceives, independent of the color hue and saturation.

Since there is no official ISO-standard for Brand Colors or Spot Colors and thus no standard for acceptable color deviation tolerances for specific Brand Colors, then the Brand Owner or the Graphic Arts Designer themselves must determine which color deviations can be accepted in each case – for each Brand Color.

However, some of the process standards within the ISO 12647-family specify some informative deviation tolerances. ISO 12647-2:2013 and ISO 12647-3: 2013 specify informative deviation tolerance of 3.5 ΔE_{2000} for the chromatic solid process colors CMY produced in lithographic offset while ISO

12647-6:2012 specify a variation tolerance of less than 1.5 ΔE_{2000} for Spot Colors produced in flexographic printing.

It should also be taken into account that the inaccuracy between measuring devices and the differences in paper within the same batch alone can cause a deviation of 1-2 ΔE_{ab} (bvdM 2003).

Fogra suggests that the uniform deviation tolerance for Spot Colors in offset printing should be 2.5 ΔE_{2000} (FOGRA 2010 pp. 10).

In Belgium customer demands a maximum ΔE_{ab} of 2, for quality print jobs (VIGC 2008).

Thus, based on the above, it should be possible to expect a maximum color difference of 3 ΔE_{2000} for any Brand Color reproduced within the same process.

4.2 Closest match across substrates and technologies

If the Designer and the Brand Owner only have specified one Brand Color name with no further information and if they expect that this Brand Color is to be reproduced on all substrate types in all reproductive technologies, then the Brand Owner have to accept the closest possible color match between the Brand Color and the chosen substrate and reproduction technology.

In view of the aforementioned studies a method is proposed to determine specific color deviation tolerances for a specific Brand Color.

Table 3: Determination of closest match to the Brand Color Pantone 151 C

	Color Name	CIELAB			Color Differences		
		L*	b*	a*	ΔE_{ab}	ΔE_{2000}	ΔH
PANTONE FORMULA GUIDE Coated	151 C	69.68	47.27	78.51	0	0	0
PANTONE FORMULA GUIDE Uncoated	151 U	72.00	48.07	62.04	16.7	6.4	9.9
PANTONE COLOR BRIDGE Coated	151 CP	67.88	32.91	66.77	18.6	5.5	6.9
PANTONE COLOR BRIDGE Uncoated	151 UP	71.14	30.68	47.58	35.1	8.3	2.2
PANTONE + CMYK Coated	P 24-7 C	66.66	33.70	61.22	22.2	5.6	3.1
PANTONE + CMYK Uncoated	P 17-8 U	69.87	33.02	53.74	28.6	6.4	0.7
PANTONE GoeGuide Coated	13-1-5 C	72.53	44.93	78.49	3.7	2.4	2.0
PANTONE GoeGuide Uncoated	7-1-7 U	74.23	44.39	75.51	6.2	3.6	0.9
PANTONE GoeBridge Coated	13-1-6 CP	64.87	34.15	66.23	18.6	6.1	5.4
PANTONE FASHION+HOME Cotton	15-1263 TCX Autumn Glory	71.60	46.24	76.30	3.1	1.5	0.3
PANTONE FASHION+HOME Nylon Brights	15-1460 TN Orange Clown Fish	74.53	74.18	78.84	27.3	11.8	21.2
PANTONE FASHION+HOME INTERIORS Paper	15-1263 TPX Autumn Glory	71.38	49.05	79.60	2.7	1.4	1.0
RAL Classic For industrial varnish, powder coating and plastics	2003 Pastellorange	64.23	44.09	61.86	17.8	6.6	6.4
NCS For painting	S 0580-Y40R	69.00	43.00	75.00	5.6	1.6	1.9

All color differences are calculated from the CIELAB-values of the reference color Pantone 151 C

5 Proposal for future Brand Color specification

Based on the research of this paper the following Brand Color specification guidelines are proposed. This would be useful to most professionals regardless of industry and technology.

	PANTONE 151 C																												
	CIELAB:	L* 69.68 a* 47.28 b* 78.51																											
	sRGB	255 132 0 (Warning out of gamut)																											
	HTML	ff8400 (sRGB) Warning out of gamut																											
	CMYK Coated	0 55 99 0 (FOGRA51) Gamut Warning																											
	Textile	15-1263 TCX																											
	Interiors	15-1263 TPX																											
	RAL	2003																											
	NCS	S 0580-Y40R																											
	<p>This Brand Color should be reproduced by using a Pantone 151 spot color printing ink when possible. In other cases the following color deviation tolerances apply.</p> <p>Acceptable deviations when PMS 151C is reproduced</p> <table border="0"> <tr> <td>• within the same process (technology and substrate)</td> <td>3 ΔE_{2000}</td> <td>(0.0)</td> </tr> <tr> <td>• on same substrates (regardless of technology)</td> <td>3 ΔE_{2000}</td> <td>(0.0)</td> </tr> <tr> <td>• on different substrates</td> <td>7 ΔE_{2000}</td> <td>(6.4)</td> </tr> <tr> <td>• by using process colors CMYK on coated (CP)</td> <td>6 ΔE_{2000}</td> <td>(5.5)</td> </tr> <tr> <td>• by using process colors CMYK on uncoated (UP)</td> <td>9 ΔE_{2000}</td> <td>(8.3)</td> </tr> <tr> <td>• as cotton products</td> <td>3 ΔE_{2000}</td> <td>(1.5)</td> </tr> <tr> <td>• as nylon products</td> <td>12 ΔE_{2000}</td> <td>(11.8)</td> </tr> <tr> <td>• as industrial products (RAL)</td> <td>7 ΔE_{2000}</td> <td>(6.6)</td> </tr> <tr> <td>• as painted surfaces (NCS)</td> <td>3 ΔE_{2000}</td> <td>(1.6)</td> </tr> </table>			• within the same process (technology and substrate)	3 ΔE_{2000}	(0.0)	• on same substrates (regardless of technology)	3 ΔE_{2000}	(0.0)	• on different substrates	7 ΔE_{2000}	(6.4)	• by using process colors CMYK on coated (CP)	6 ΔE_{2000}	(5.5)	• by using process colors CMYK on uncoated (UP)	9 ΔE_{2000}	(8.3)	• as cotton products	3 ΔE_{2000}	(1.5)	• as nylon products	12 ΔE_{2000}	(11.8)	• as industrial products (RAL)	7 ΔE_{2000}	(6.6)	• as painted surfaces (NCS)	3 ΔE_{2000}
• within the same process (technology and substrate)	3 ΔE_{2000}	(0.0)																											
• on same substrates (regardless of technology)	3 ΔE_{2000}	(0.0)																											
• on different substrates	7 ΔE_{2000}	(6.4)																											
• by using process colors CMYK on coated (CP)	6 ΔE_{2000}	(5.5)																											
• by using process colors CMYK on uncoated (UP)	9 ΔE_{2000}	(8.3)																											
• as cotton products	3 ΔE_{2000}	(1.5)																											
• as nylon products	12 ΔE_{2000}	(11.8)																											
• as industrial products (RAL)	7 ΔE_{2000}	(6.6)																											
• as painted surfaces (NCS)	3 ΔE_{2000}	(1.6)																											

Figure 3: Proposal for future Brand Color specification including acceptable color deviations.

Attention: These values only apply for this specific Brand Color.

All other Brand Colors will have other deviation values.

Values in brackets indicates the calculated values from Table 3

[this is ongoing and future work]

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APPENDIX A

List of those 156 Brand Manuals, which form the empirical basis for this study

ABSOLUT Vodka	2013 Master Brand Identity Design Guidelines v.1.3
ACER	2012 Visual Identity Guidelines Consumer
Adobe	2010 Corporate Brand Guidelines
Amazon	2012 Brand Usage Guidelines
AMD	2014 Brand Guidelines Version 3.0
American Red Cross	2014 Brand identity at a glance
AP	2012 Associated Press Brand Guidelines.
Apple	2006 Identity Guidelines. For Channel Affiliates and Apple-Certified Individuals
AT&T	2009 Brand Guidelines at a Glance April 2009
AUDI	2009 Guideline. The Audi Brand Logo Corporate Design
AUDI	2010 Corporate Design · Branding on textiles AUDI AG
Bentley	2010 Digital Brand Guidelines
BlackBerry	2007 Branding Guidelines. Version 4.0
Bluetooth	2011 Brand Usage Guide
Botswana Pride Mark	2011 Brand Guidelines
British Airways	2007 The BA Way Brand Guidelines v.1
CaféWell	2015 A guide to the CaféWell Brand. Brand Guidelines
Canon	2015 Visual Identity Guidelines Version 1.2
Casio	2000 Logo Guide
CISCO	2010 Cisco HTML email MED Templates Guide
Coca Cola	2012 Brand Equity Package
Coca-Cola Zero	2009 Brand Identity and Design Standards v1.0
CULT SHAKER	2013 Design manual for CULT SHAKER
DBU	[Danish: Danish Football Association] 2006 Dansk Boldspil Union Designmanual 1.0 2010 Dansk Boldspil Union Designmanual 2.0
Dansk Journalistforbund	2006 [The Danish Union of Journalists] Designmanual
Danske Bank	2013 [Danish Bank] Danske Bank Design Tool Kit (online version)
Dell	2012 Brand Identity Standards Version 4.5
Digitaliseringsstyrelsen	2013 [Danish:] Designguide
easyJet	2011 The easyGroup Brand Manual
eBay	2005 Compatible Application. Logo System Guidelines
ENQA	2013 European Association for Quality Assurance in Higher Education. Visual identity guidelines
ESSO Imperial Oil	2003 Signatures and logos 5.9.5.1/E. Supplement to the Corporate Identity Manual
European Commission	2011 European Commission visual identity guidelines
FAIRTRADE	2011 Certification Mark Guidelines Issue 1
Falck	2013 Falck Brand Guide. Falck Group Branding & Marketing
Ferrari	2014 Challenge Teams Branding Guidelines
FL Smidth	2011 Visual Guidelines
FOGRA	2015 http://www.fogra.org/en/fogra-fogracert-en/fogracert.html
Ford	2006 The brand book Feel the difference
Folkekirken	2012 [Danish: Church of Denmark] Designmanual 1.1
FUJITSU	2005 Fujitsu Services Visual Identity Guidelines V.1.3 (The Ministry of Environment and Food of Denmark)
Fødevareministeriet	2014 Ministeriet for Fødevarer, Landbrug og Fiskeri. Fødevareministeriets Designmanual
GE Direct Response	2006 Brand Expression Guidelines Version 2.0
GÉANT	2009 Corporate Identity Guidelines for use
Google	2013 Google Visual Assets Guidelines Part 1 Branding, Graphic Design, Icon Design
Google	2014 Evolving the Google Identity
Harley-Davidson	2001 Visual Identity and Trademark Guidelines
HP	2006 Brand identity standards. How we look and how we talk.
HUAWEI	2011 Device Brand Visual Identity Guidelines
IBM	2010 Impact 2010 Design Guidelines
IEEE	2010 The Institute of Electrical and Electronics Engineers. Visual Identity Guidelines
Intel	2010 Trademark and Logo Usage Guidelines - 3rd Party
Kodak	2011 Express Digital Solutions. Visual Identity Guidelines
Konservative	2014 [Danish: Conservative People's Party] Designmanual
Københavns Kommune	2012 [Danish: Copenhagen Municipality] Designupdate
Land Rover	2002 communication guidelines 01.11.02 ©Land Rover Version 1.0
LEGO	2013 The LEGO® Brand Manual
Lenovo	2015 WW Visual Identity Guidelines v1.0
LG Electronics	2004 Brand communication guidelines
Liberal Party of Canada	2015 CAMPAIGN BRAND GUIDELINES

Lions Clubs International	2008 Graphic Identity Manual
LLOYD'S	2009 Brand guidelines
Lundbeck	2013 Lundbeck Abilify Maintena Global Brand Plan
MAERSK Oil	2015 Brand Universe / Primary colours (online version)
MasterCard	2015 Brand Guidelines. MasterCard Brand Mark Standard v.7.4
MasterCard	2006 SecureCode Custom Identifier Standards, version 4.0
McDonald's	1999 Global Logo and Trademark Standards Reference Guide
Meditech	2015 The MEDITECH Brand Identity Guide. A Comprehensive Guide to Our Company's Look, Sound, and Feel
Microsoft	2012 Visual Identity Guidelines
Microsoft Certified	2013 Professional Credential and Logo Usage Guidelines
MONSANTO	2012 Branding Guidelines
MT Højgaard	2014 Visual identitet
NASA	2006 NASA style Full Guide
NASCAR	2006 LOGO GUIDELINES
NATO	2007 Visual Identity Guidelines
NEFCO	2014 The Nordic Environment Finance Corporation. Visual identity guidelines v.1.1
Nintendo	2008 Corporate Identity & Graphics Standards Manual ext.version
Nordic Investment Bank	2013 Corporate visual identity. Version 1.1, Screen.
Northwest Territories Arts	2013 Visual Identity Guidelines, version 3
Novo Nordisk	2010 Brand Manual 4th edition
Novo Nordisk	2010 online version web 2010
NUNAVUT CANADA	2010 Visual Identity Guidelines
NVIDIA	2012 Corporate Brand Guidelines 1.2
OECD	2014 The OECD Logo Guide - An explanation and guide for use
Oracle	2012 Partner Network Brand Guidelines
PayPal	2013 Corporate Master Brand Guidelines
Pfizer	2015 Branding Guidelines Visual Identity (online version)
Pinterest	2015 Brand Guidelines for partners. Version 1.0
Radikale Venstre	2010 [The Danish Social-Liberal Party] Identity guidelines
Rockefeller Brothers Fund	2011 Visual Identity Guidelines
Rotary	2015 Tell Rotary's Story. Voice and Visual Identity Guidelines
Royal Academy of Engineering	2012 A guide to our visual identity
Royal Mail	2009 English logo guidelines
Røde Kors	2013 [Danish Red Cross] Designmanual
Samsung	2008 Brand guide. Version 1.0
SIEMENS	2008 Produktfarben A&D
Sioux Center Christian School	2015 Visual Identity Guideline
Skype	2005 The world according to Skype
SkyWest Airlines	2011 Identity Standards, External Guide 10/2011
Socialdemokraterne	2014 [Danish: Social Democrats] Designguide 2011 [Danish: Social Democrats] Designmanual 2010-2011
SONY VAIO	2004 VAIO Brand Guidelines
Spotify	2013 Partner Brand Guidelines
Starbucks	2011 "We Proudly Serve" Identity and Logo Usage Guidelines.
Stockholm Environment Institute	2010 Visual identity guidelines
TDC	2014 Designmanual Print
TEDx	2009 Identity Guidelines
Television Academy	2015 Brand Guidelines. The People who bring you the Emmys
The Salvation Army	2008 Graphic Standards & Guidelines Manual
Time Warner	2010 Logo Guidelines
TIMEX	2011 Timex Group Corporate ID Style Guide: Logotype
Twitter	2015 Brand Assets (online web)
U.S. Department of Homeland Security	2003 Seal and Signature Usage Guidelines
UK Parliament. The House of Commons	2011 Visual identity
UN	2015 United Nations Brand Guidelines. Time for global action for people and planet
UNDP	2014 UNDP BRAND MANUAL
UN GLOBAL COMPACT	2007 Design Manual. Introducing a new Visual Identity
UNICEF	2012 Brand Tool Kit
Universities:	
Berkeley University of California	2013 Brand Guidelines
Boston University	2008 Brand Identity Standards First Edition
Concordia CA	2013 Brand Standard Manual.
Copenhagen University	2015 Designguide (online version)
Danish Technical University	2015 Visuel identitet, designguide
Harvard University	2014 Brand and Visual Identity Guidelines v.2.0
Howard University	2015 Identity Guidelines
New York University	2014 Ready Made Color Palettes
Northern Illinois University	2008 Graphic Standards and Visual Identity Guide
University of Oxford	2014 Oxford blue Visual identity guidelines
Rochester Institute of Technology	2012 RIT Brand Identity Guidelines
Ryerson University	2015 Brand Standards Guide Version 1.0

Stanford University	2015 Identity Toolkit (web-version)
University of Calgary	2015 Visual Identity Standards 1.0
University of California San Francisco	2015 Brand Guidelines Version 1.2
University of Cambridge	2012 Identity guidelines fifth edition
University of East Anglia	2009 Brand identity guidelines
University of Louisiana at Monroe	2015 Identity standards manual
University of Miami	2011 Visual Identity Manual Updated
US AID	2005 GRAPHIC STANDARDS MANUAL 2005
US Airways	2010 Corporate identity guidelines 2010
Vimeo	2015 Brand Guidelines (web online 2015-10-20)
Visit Denmark	2015 Graphic design guidelines 2015
Visit England	2015 "2016 Year of the English garden". Logo Design Guidelines
Visit Sweden	2013 Visual identity for Sweden as a destination. V.1.3
VW	2005 Corporate Design Guidelines: Volkswagen Logo. Versions and their Applications to the Volkswagen events' organizers
VOLVO	2009 LOOK & FEEL
VOLVO	2015 Volvo Brand Identity Guideline
W3C	2004 W3C 10 Tenth Anniversary Logo and Typography Guidelines
Walmart	2014 The Brand Guide
WatchGuard	2015 BRAND GUIDELINES
WENAAS	2012 Design Guidelines
Winnipeg	2001 Visual Identity Guidelines
YAMAHA	2012 Visual Identity
YouTube	2013 Brand Assets Print and TV
AACCC	2015 Alberta Aboriginal Construction Career Centres. Visual Identity Guidelines
ZDF	2002 Zweites Deutsches Fernsehen. Styleguide / Corporate-Design

This Paper was presented as Proceedings of the 43rd International Research Conference of iarigai, the 25th of August 2016 at Ryerson University, Toronto, Canada.

Advances in Printing and Media Technology



Published by the International Association of Research Organizations for the Information, Media and Graphic Arts Industries (iarigai)



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