Standards and Color Management

NPES PRINT BUSINESS OUTLOOK CONFERENCE 2017

FEBRUARY 5, 2017 • GREATER NOIDA, INDIA
Standards Matter

- Global Learning
- Global Access
Standards Which Matter

1. Measurement
2. Printing
3. File formats
Measurement

- ISO 3664
- CIE L*a*b* & delta-E
- ISO 13655
Lightness, Hue, Action!

- L*a*b* is equivalent to L*C*h*
- Hue difference generally easier to detect than chroma or lightness shift.
Gray Matters

• Humans are most susceptible to small changes in neutral colors, less able to detect changes in saturated colors.
• Gray is in the middle of the color space.
• Near-neutrals form a large proportion of what we see in graphic arts.
Soft Proofing

- ISO 3664
- ISO 14861
- ISO 12642
M etc: ISO 13655

- M0: legacy
- M1: defined UV: D50
- M2: UV-excluded
- M3: polarized
Printing

- ISO 12647 series
- CGATS TR015 – G7
- ISO 10128
- ISO/PAS 15339
ISO 12647-2

• ISO 2846 inks
• Prescribed papers
• Target dot gain curves

• Prescribed printing tolerances
• Targets offset lithography
  • Other parts targeting other printing processes
Prescribed Ink Colours

Table 5 — CIELAB coordinates of colours for the printing sequence cyan-magenta-yellow

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>CD1 Premium coated</th>
<th>CD2 Improved coated</th>
<th>CD3 Standard coated glossy</th>
<th>CD4 Standard coated matte</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Coordinates</td>
<td>Coordinates</td>
<td>Coordinates</td>
<td>Coordinates</td>
</tr>
<tr>
<td></td>
<td>L*  a*  b*</td>
<td>L*  a*  b*</td>
<td>L*  a*  b*</td>
<td>L*  a*  b*</td>
</tr>
<tr>
<td>Black</td>
<td>WB 16  0  0</td>
<td>WB 20  1  2</td>
<td>WB 20  1  2</td>
<td>WB 24  1  2</td>
</tr>
<tr>
<td></td>
<td>BB 16  0  0</td>
<td>BB 20  1  2</td>
<td>BB 19  1  2</td>
<td>BB 23  1  2</td>
</tr>
<tr>
<td></td>
<td>BB 55 -35 -51</td>
<td>BB 56 -36 -45</td>
<td>BB 53 -35 -42</td>
<td>BB 54 -32 -42</td>
</tr>
<tr>
<td>Magenta</td>
<td>WB 48 75 -4</td>
<td>WB 48 73 -6</td>
<td>WB 46 70 -3</td>
<td>WB 48 68 -1</td>
</tr>
<tr>
<td></td>
<td>BB 47 73 -4</td>
<td>BB 47 71 -7</td>
<td>BB 45 68 -4</td>
<td>BB 46 65 -2</td>
</tr>
<tr>
<td>Yellow</td>
<td>WB 89 -4 93</td>
<td>WB 87 -3 90</td>
<td>WB 84 -2 89</td>
<td>WB 85 -2 83</td>
</tr>
<tr>
<td></td>
<td>BB 87 -4 91</td>
<td>BB 84 -3 87</td>
<td>BB 81 -2 86</td>
<td>BB 82 -2 80</td>
</tr>
<tr>
<td>Red</td>
<td>WB 48 68 47</td>
<td>WB 48 66 45</td>
<td>WB 47 64 45</td>
<td>WB 47 63 41</td>
</tr>
<tr>
<td></td>
<td>BB 46 67 45</td>
<td>BB 47 64 43</td>
<td>BB 45 62 43</td>
<td>BB 46 61 39</td>
</tr>
<tr>
<td>Green</td>
<td>WB 50 -65 26</td>
<td>WB 51 -59 27</td>
<td>WB 49 -56 28</td>
<td>WB 50 -53 26</td>
</tr>
<tr>
<td></td>
<td>BB 49 -63 25</td>
<td>BB 49 -57 26</td>
<td>BB 48 -54 27</td>
<td>BB 49 -51 24</td>
</tr>
<tr>
<td>Overprint CMY100</td>
<td>WB 23 0 -1</td>
<td>WB 28 -4 -1</td>
<td>WB 27 -3 0</td>
<td>WB 26 0 -2</td>
</tr>
<tr>
<td></td>
<td>BB 23 0 -1</td>
<td>BB 27 -4 -1</td>
<td>BB 26 -3 0</td>
<td>BB 26 0 -2</td>
</tr>
</tbody>
</table>

Measurement is in accordance with ISO 13655-D50 illuminant, 2° observer, 0:45 or 45:0 geometry. Measurements should be made using M1. Values are given for white backing (WB) and black backing (BB) on dry sheets.
Prescribed Dot Gains
### Prescribed Papers

**Table 1 — Standard printing conditions for typical print substrates**

<table>
<thead>
<tr>
<th>Printing condition</th>
<th>Print substrate description (Table 2 and 3)</th>
<th>Colorant description (Table 5 and 6)</th>
<th>Screening description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Periodic screens</td>
<td>Non-periodic screens</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TVI curve</td>
<td>Frequency (cm⁻¹)</td>
</tr>
<tr>
<td>PC1</td>
<td>PS1</td>
<td>CD1</td>
<td>A</td>
<td>60 to 80</td>
</tr>
<tr>
<td>PC2</td>
<td>PS2</td>
<td>CD2</td>
<td>B</td>
<td>48 to 70</td>
</tr>
<tr>
<td>PC3</td>
<td>PS3</td>
<td>CD3</td>
<td>B</td>
<td>48 to 60</td>
</tr>
<tr>
<td>PC4</td>
<td>PS4</td>
<td>CD4</td>
<td>B</td>
<td>48 to 60</td>
</tr>
<tr>
<td>PC5</td>
<td>PS5</td>
<td>CD5</td>
<td>C</td>
<td>52 to 70</td>
</tr>
<tr>
<td>PC6</td>
<td>PS6</td>
<td>CD6</td>
<td>B</td>
<td>48 to 60</td>
</tr>
<tr>
<td>PC7</td>
<td>PS7</td>
<td>CD7</td>
<td>C</td>
<td>48 to 60</td>
</tr>
<tr>
<td>PC8</td>
<td>PS8</td>
<td>CD8</td>
<td>C</td>
<td>48 to 60</td>
</tr>
</tbody>
</table>
What is G7?
G7 Method

- CGATS TR015
- Use of 1-d curves to ensure G7 aims are achieved:
  - Definition of color for 3-color overprints.
  - Defined $a^*$, $b^*$ ($C^*$,$h^*$) from white (substrate) to dark point.
  - Defined lightness from white to dark, based on NPD (neutral print density).
  - Similar curve shapes for all substrates, printing processes.

\[
a^*(TV_c) = a^*_s \times \left(1 - \frac{TV_c}{100}\right)
\]
\[
b^*(TV_c) = b^*_s \times \left(1 - \frac{TV_c}{100}\right)
\]
ISO/PAS 15339

- 7 CRPCs:
  - CRPC-1 - Newsprint
  - CRPC-2 - Improved Newsprint
  - CRPC-3 - Universal Premium Uncoated
  - CRPC-4 - Universal Supercalendared
  - CRPC-5 - Universal Publication Coated, **SWOP 2013**
  - CRPC-6 - Universal Premium Coated, **GRACoL 2013**
  - CRPC-7 - Universal

- Synthetic data sets based on real-world conditions.
- Gray balance-aligned for shared visual appearance.
ISO/PAS 15339-2:2015
Shared Hue Angles
Shared Common Appearance: ISO/PAS 15339
File Formats

• ISO 17972: CxF
• ICC
  • ISO 15076: v4
  • ISO 20677: iccMAX
• ISO 15930: PDF/X
• ISO 20616: PQX
File Format Relevance
Thank You!