

**Title:**                                   **Opacity Reference Material Proposal**

**Source:**                                   **Kevin Tall – Individual contribution**

**Distribution:**                           **ISO/IEC JTC1/SC 17/WG 1**

**Date of submission:**               **17, May 2004**

**Requested Action:**                   **For consideration at the next WG 1 meeting in  
Okinawa, Japan**

## Introduction

The concern expressed over the suitability of wratten neutral density filters for the new opacity test method reference material, is well founded. Test results from 22 wratten 2.0 neutral density filters have revealed substantial variation. See Attachment A for test measurements.

## Proposal

I propose that tinting screen film be used as the opacity reference material for the test method described in N1279 (WD ISO/IEC 10373-12003-7) clause 5.10.2 Opacity for conformance to editions of ISO/IEC 7810 later than the 2003 edition.

Tinting screens are plastic films possessing a black (opaque) photographic emulsion layer with regularly spaced "dots" that allow light to pass through the film. Tinting screens are available in a variety of dot sizes and spacing (referred to as "lines" by the graphic industry). I have conducted some preliminary tests with one "10%" screen. (See Attachment B)

The advantages of using a screen material for the Opacity Reference are:

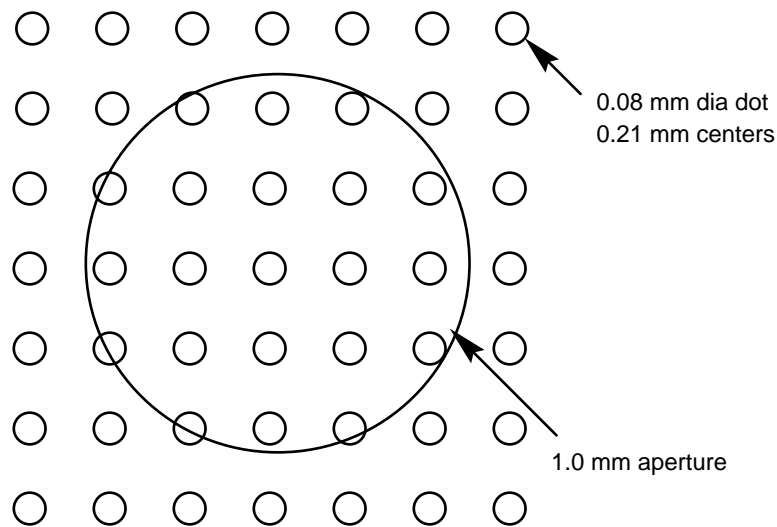
1. Consistent light transmission at any wavelength (see spectrophotometer data – Attachment B page 1)
2. Consistent sensor current ( $\pm 0.5\%$ ) measurements across one 25 mm square sample\*. (see sensor data – Attachment B page 2)
3. Inexpensive and readily available.
4. % transmission reference based on geometry – not from a materials ability to absorb or reflect certain light wavelengths.

\*More testing needs to be done with more screens for sensor current consistency. I understand that 3%, 5% and 7% screens are also available.

If WG-1 consensus will consider a Tinting Screen for the reference material, I will obtain 3%, 5% 7%, 10% screens in sufficient quality (they are relatively inexpensive - about US\$2 for 100 mm x 150 mm sheet) and distribute to anyone in WG-1 who wishes for their own testing.

Note: Tinting screens are not to be confused with Contact screens, which were formerly used in pre-press activities to convert continuous tone photographs to halftones. Computer plate-making systems have eliminated the need for contact screens. Tinting screens continue to be used by graphic artists.

Example using a "10% tinting screen:



Approximate number of dots within 1.0 mm aperture from a 10% screen  
(close, but not to scale)

About 17.8 dots are positioned within the 1.0 mm aperture viewing area from a screen with these characteristics. Finding the minimum and maximum current value by moving the 25 mm square screen around the sensor port yielded the data shown in Attachment B page 2.

Qualification – To be determined

One idea is for qualifying the reference material using the same spectrophotometer currently required for opacity compliance testing (ISO/IEC 10373-1:1998).

Eclipse Laboratories will volunteer to provide such qualified reference material for the new opacity test method.

Sensor Current (mA)  
from 2.0 NDF- Wratten

**ATTACHMENT A**

Filter #	860 nm LED		950 nm LED	
	Min	Max	Min	Max
001-7	0.74	0.76	0.93	0.95
001-8	0.90	0.94	1.06	1.14
002-1	0.77	0.78	0.91	0.93
002-2	0.80	0.81	0.95	0.97
002-3	0.64	0.65	0.76	0.77
002-4	0.76	0.79	0.91	0.93
002-5	0.75	0.76	0.87	0.89
002-6	0.68	0.70	0.80	0.82
002-7	0.63	0.64	0.76	0.78
002-8	0.69	0.71	0.80	0.82
002-9	0.75	0.78	0.90	0.93
002-10	0.77	0.78	0.90	0.92
003-1	0.84	0.83	0.97	0.98
003-2	0.73	0.76	0.91	0.92
003-3	0.81	0.82	0.94	0.96
003-4	0.76	0.80	0.90	0.93
003-5	0.80	0.81	0.89	0.93
003-6	0.77	0.78	0.89	0.91
003-7	0.72	0.74	0.85	0.87
003-8	0.77	0.80	0.92	0.93
003-9	0.82	0.83	0.95	0.96
003-10	0.73	0.74	0.83	0.85
<b>Min</b>	0.63	0.64	0.76	0.77
<b>Max</b>	0.90	0.94	1.06	1.14
<b>Ave</b>	0.76	0.77	0.89	0.91
<b>SD</b>	0.06	0.06	0.07	0.08
<b>Range</b>	0.79 +/- 0.16		0.95 +/- 0.19	

Open current (mA)	8.38	8.04
% of open current	9.4% +/- 1.9%	11.8% +/- 2.4%

10nm Spectral Value Listing

13-MAY-04  
07:27:52

IR Standard Name :10% screen

Percent Transmission

400	10.46	550	11.26	700	11.34	850	11.55	1000	11.41
410	10.61	560	11.35	710	11.39	860	11.55	1010	11.47
420	10.70	570	11.41	720	11.46	870	11.50	1020	11.54
430	10.76	580	11.30	730	11.53	880	11.42	1030	11.57
440	10.82	590	11.33	740	11.51	890	11.37	1040	11.56
450	10.89	600	11.45	750	11.44	900	11.38	1050	11.51
460	10.96	610	11.41	760	11.40	910	11.45	1060	11.44
470	11.00	620	11.35	770	11.43	920	11.53	1070	11.39
480	11.06	630	11.44	780	11.50	930	11.58	1080	11.35
490	11.12	640	11.49	790	11.52	940	11.58 <sup>N</sup>	1090	11.33
500	11.15	650	11.41	800	11.49	950	11.53	1100	11.35
510	11.22	660	11.36	810	11.43	960	11.46		
520	11.21	670	11.46	820	11.41	970	11.39		
530	11.28	680	11.54	830	11.44	980	11.35 <sup>Low</sup>		
540	11.30	690	11.48	840	11.50	990	11.36		

Range 0.23

800-1000nm 11.46% ± 0.12%

Sensor Current (mA)  
from 10% screen

Filter #	860 nm LED		950 nm LED	
	Min	Max	Min	Max
"10%" Screen	1.24	1.32	1.26	1.34
<b>Range</b>	1.28 +/- 0.04		1.30 +/- 0.04	
Open current (mA)	8.18		8.1	
<b>% of open current</b>	15.6% +/- 0.5%		15.9% +/- 0.5%	