



NRC Construction Portfolio

Colour-Tunable LED Office Lighting: Harnessing New Capabilities while Saving Energy

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CORM 2012 Conference, Ottawa, 31 May 2012

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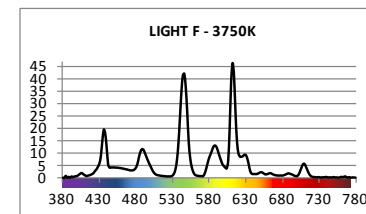
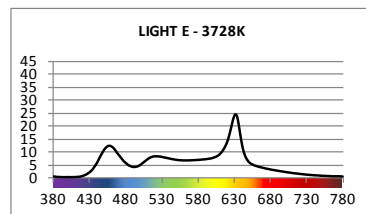
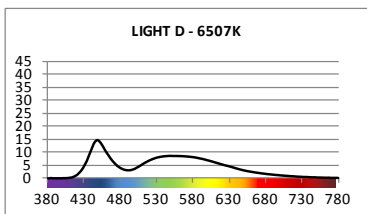
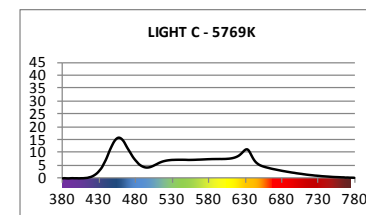
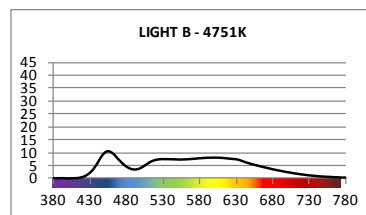
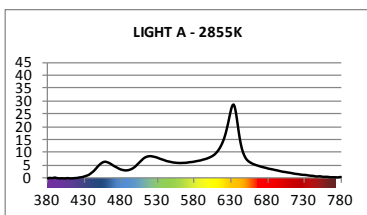
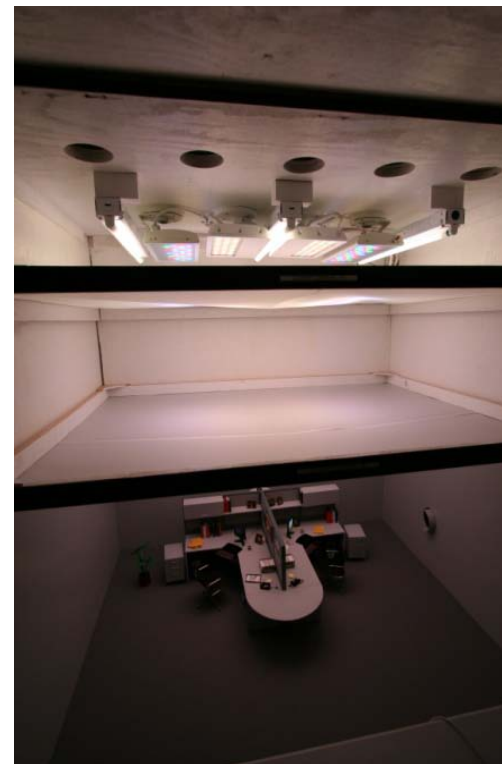
Individual Control

- Individual control over illuminance:
 - positive affect
 - performance
 - higher satisfaction
 - health & well-being



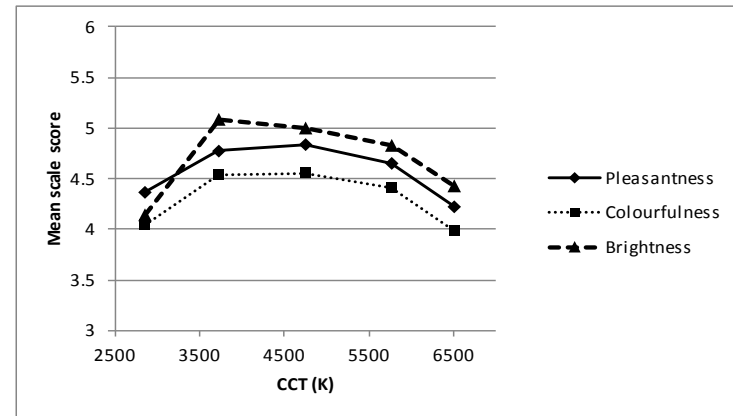
- What about tunable colour?

Ex 1: Scale Model



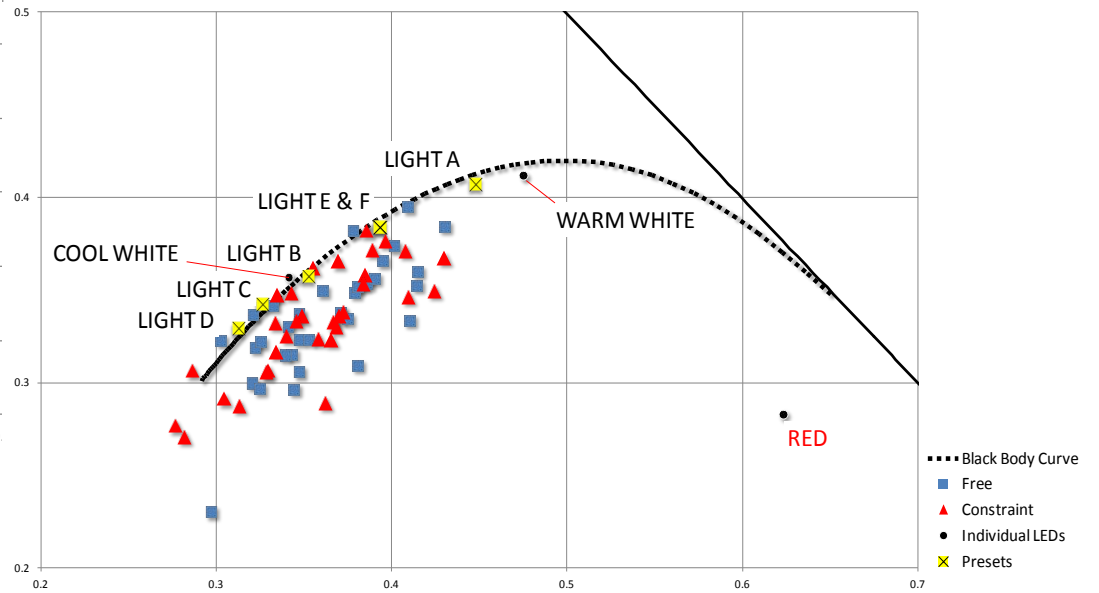
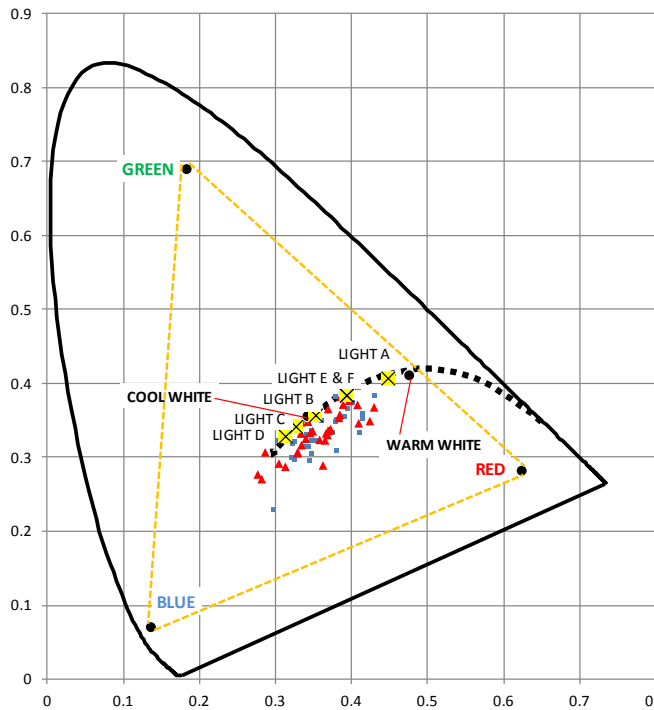
Ex 1: Procedure / Results

- Scale ratings of pre-sets: pleasantness, colourfulness, brightness



- Free choice using 5 channels
- Illuminance-constrained (450-550 lx) choice

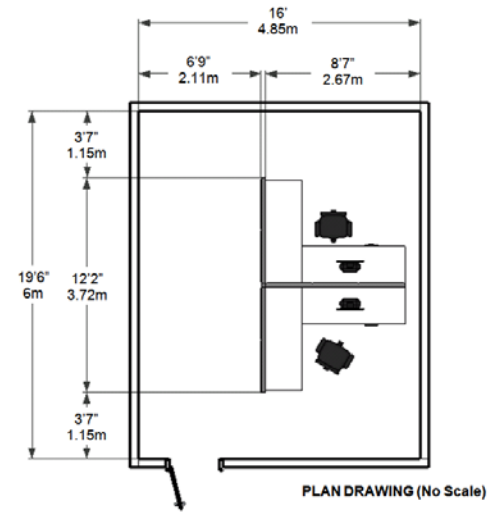
Ex 1: Choices



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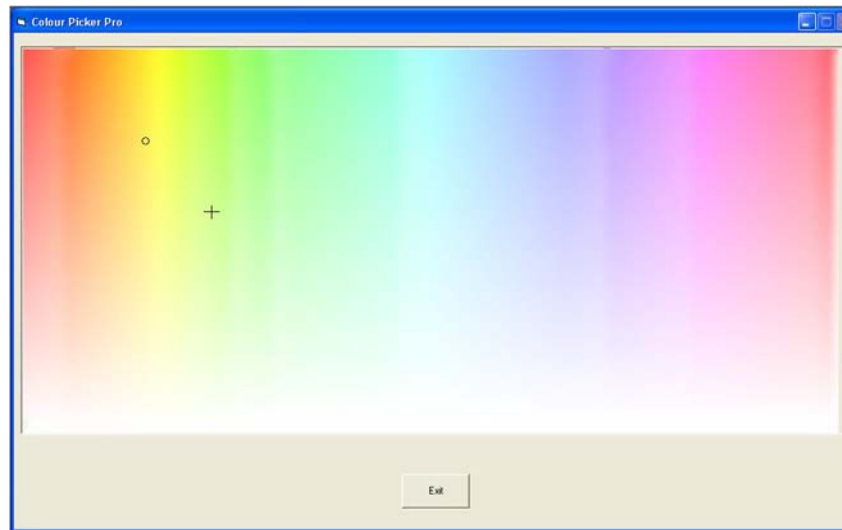
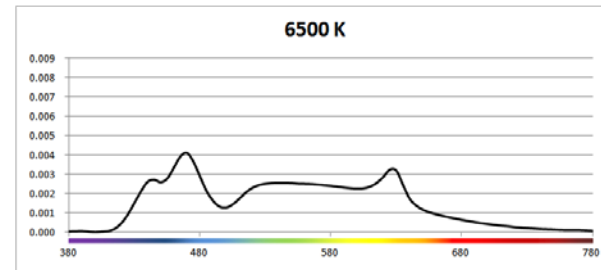
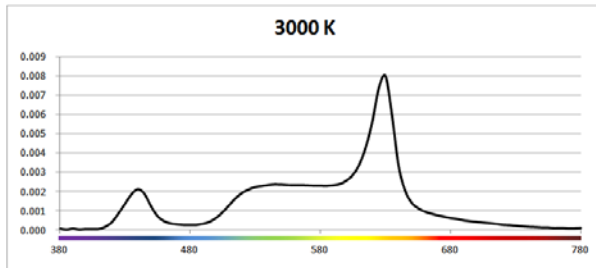
Measure	Condition	Median	Mean	SD	Min	Max
Ave E (lx)	Free	1042	992	391	109	1578
Ave E (lx)	Const.	540	517	50	320	553
CCT (K)	Free	4470	4747	2027	2832	14016
CCT (K)	Const.	4280	5013	2091	2726	11321
CRI	Free	87	82	16	29	95
CRI	Const.	83	82	11	55	96
CQS	Free	91	89	6	70	96
CQS	Const.	91	89	5	76	96
Δuv	Free	-0.0135	-0.0145	0.0109	-0.047	0.005
Δuv	Const.	-0.012	-0.0121	0.0094	-0.042	0.006

Ex 2: Setting & Lighting

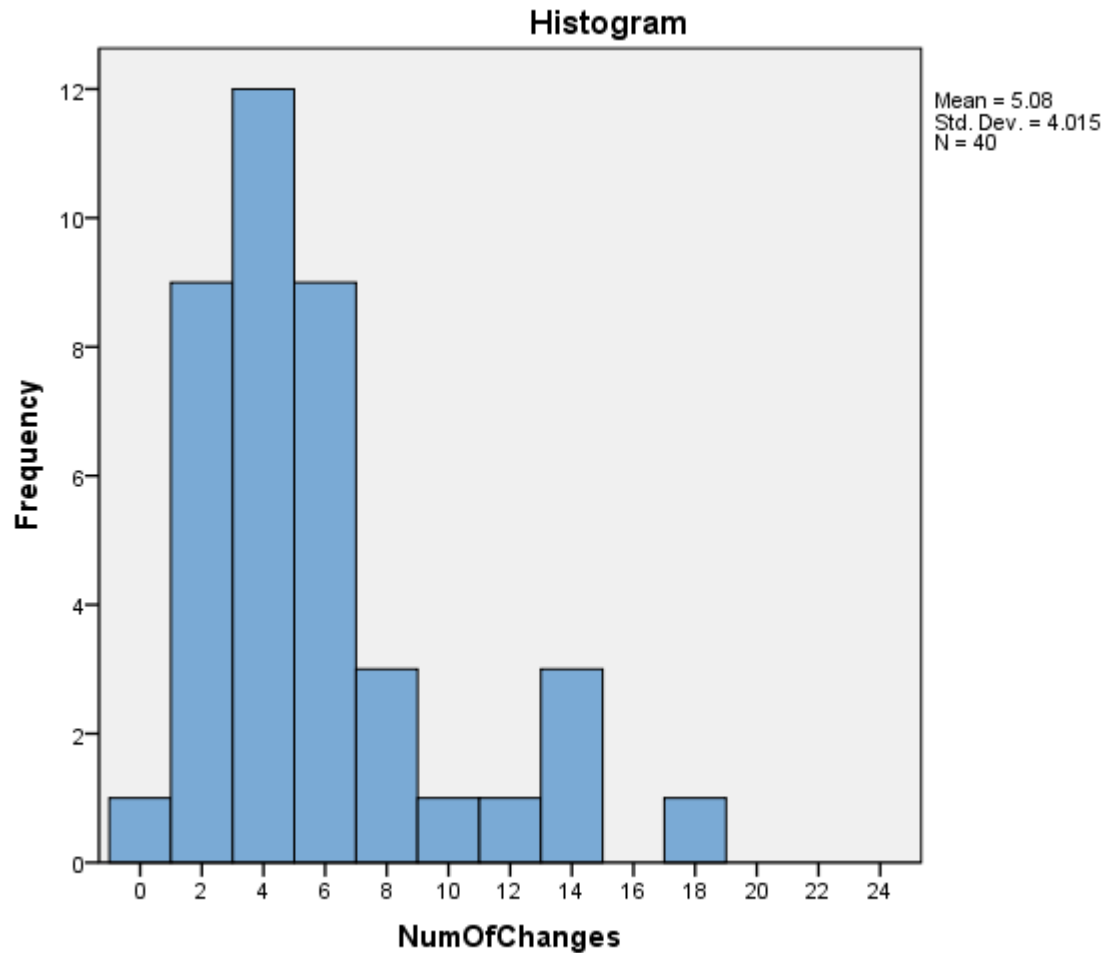


Ex 2: Procedure

	No Change		Choice	
<i>Lighting for Periods 1-2</i>	3000 K	6500 K	3000 K	6500 K
<i>Lighting @ Period 3-4:</i>	Unchanged		Self-Chosen	



Ex 2: Frequency of Use

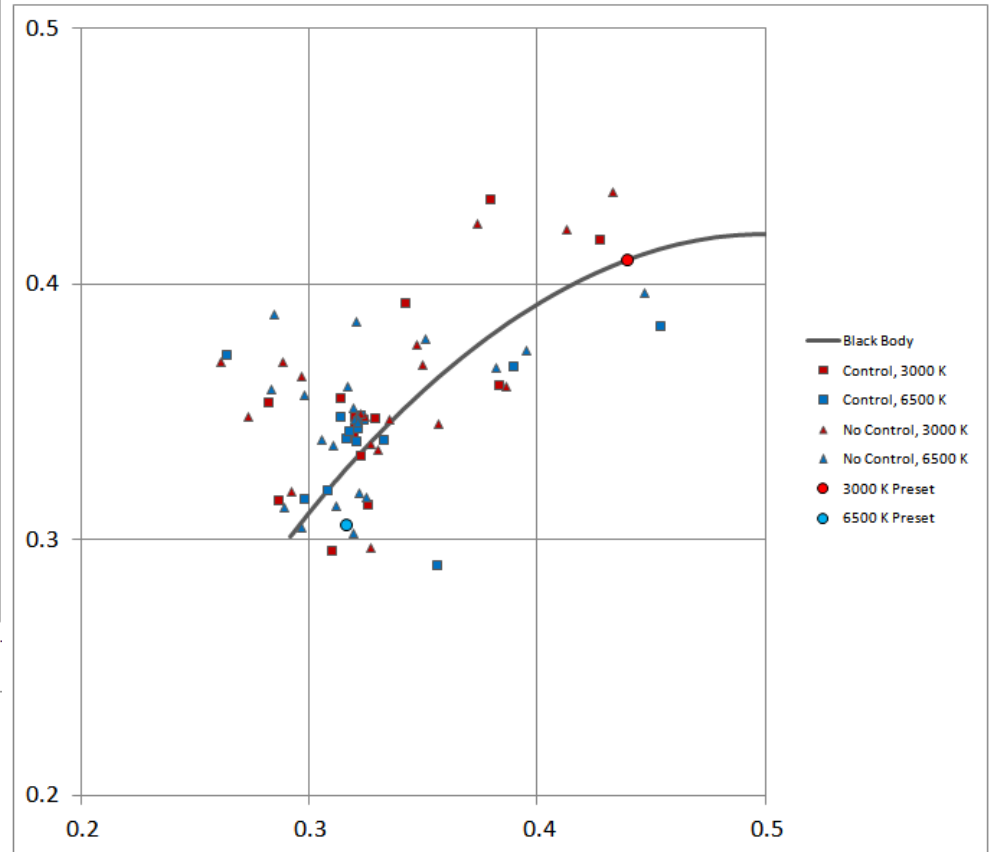
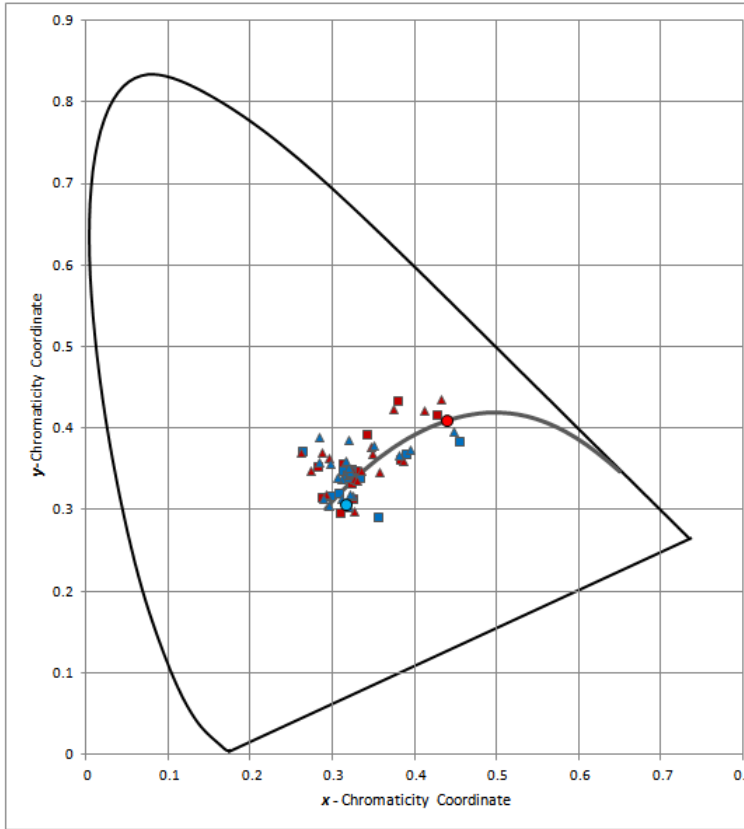


Ex 2: First Spectrum Chosen

- Starting spectrum had no effect on colour-tuning choices (MANCOVA not statistically significant).

	Initial Spectrum	N	CCT (K) <i>M (SD)</i>	Δuv <i>M (SD)</i>	CRI <i>M (SD)</i>	CQS <i>M (SD)</i>
No Change						
First choice	3000 K	19	5751(1568)	.0106 (.0167)	86(7.58)	87(6.01)
(Departure)	6500 K	21	6085(1371)	.0078(.0146)	86(5.08)	86(4.52)
Choice						
First choice	3000 K	20	6149(1495)	.0081(.0145)	86(4.41)	86 (4.16)
(After lunch)	6500 K	19	5828(1554)	.0106(.0129)	86(5.93)	86(4.77)

Ex 2: Final Choices



Discussion

- People do choose a range of spectra, but...
 - what they choose depends on what's available.
 - the concept of colour-tuning is unfamiliar.
- Participants with control said they liked it.
- Control interfaces for tunable colour need research attention.

Acknowledgements

- This work was supported by: Natural Resources Canada (EcoEnergy Technology & Innovation Fund; Office of Energy Efficiency; Clean Energy Fund); BC Hydro; Philips Color Kinetics; Philips CANLYTE; GO Lighting, NRC Institute for Research in Construction; and volunteer advisors from industry and research labs.
- The project team included NRC colleagues Chantal Arsenault and Benjamin Birt, and has included students Chris Hahn, Derek Ludwig, Toby Pilditch, and Pavel Popov.
- Naomi Miller, Lorne Whitehead, and Howard Yaphe provided useful advice.

