Illuminating
ENGINEERING SOCIETY

IES TM-30-15

IES Method for **Evaluating Light Source Color Rendition**

IES TM-30-15

IES Method for Evaluating Light Source Color Rendition

Publication of this Technical Memorandum has been approved by the IES. Suggestions for revisions should be directed to the IES.

Approved by the IES Board of Directors, May 18, 2015, as a Transaction of the Illuminating Engineering Society of North America.

Published by the Illuminating Engineering Society of North America, 120 Wall Street, New York, New York 10005.

IES Standards and Guides are developed through committee consensus and produced by the IES Office in New York. Careful attention is given to style and accuracy. If any errors are noted in this document, please forward them to Director of Technology, at the above address for verification and correction. The IES welcomes and urges feedback and comments.

ISBN # 978-0-87995-312-6

Printed in the United States of America.

DISCLAIMER

IES publications are developed through the consensus standards development process approved by the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on lighting recommendations. While the IES administers the process and establishes policies and procedures to promote fairness in the development of consensus, it makes no guaranty or warranty as to the accuracy or completeness of any information published herein. The IES disclaims liability for any injury to persons or property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this document.

In issuing and making this document available, the IES is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the IES undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

The IES has no power, nor does it undertake, to police or enforce compliance with the contents of this document. Nor does the IES list, certify, test or inspect products, designs, or installations for compliance with this document. Any certification or statement of compliance with the requirements of this document shall not be attributable to the IES and is solely the responsibility of the certifier or maker of the statement.

Prepared by the Color Metric Task Group of the IES

Color Metric Task Group

M. Royer, *Chair*

A. David
R. Burkett
P. Fini
K. Houser
Y. Ohno
K. Teunissen
M. Wei*

IES Color Committee

W. Luedtke, *Chair*

C. Cowan
W. Davis
F. Florentine
T. Hensley
C. Hunt
J. Livingston
N. Miller*
M. Royer
M. Thompson*
L. Whitehead
M. Wood

* Advisory Member

Special thanks to K. Smet and L. Whitehead, specifically with regard to the process of establishing the color evaluation samples.

Contents

1.0 Introduction . . . 1

2.0 Scope . . . 2

3.0 Definitions, Variables, and Procedure . . . 2
- **3.1 Colorimetric Observer** . . . 2
- **3.2 Test Source** . . . 2
- **3.3 Reference Illuminant** . . . 2
- **3.4 Color Evaluation Samples (CES)** . . . 3
- **3.5 Range and Interpolation of Data** . . . 4
- **3.6 Calculation of Tristimulus Values** . . . 4
- **3.7 Color Space and Chromatic Adaptation Transformation** . . . 5
  - 3.7.1 Calculation of Color Coordinates . . . 6
- **3.8 Color Difference Formula** . . . 7
- **3.9 Fidelity Index (R_f)** . . . 7
- **3.10 Gamut Index (R_g)** . . . 8
- **3.11 Two-axis System** . . . 9
- **3.12 Fidelity Measures For Specific Hues Angle Bin and Color Samples** . . . 10
- **3.13 Flow Chart** . . . 11

4.0 Limitations and Notes . . . 11
- **4.1 Average Values** . . . 11
- **4.2 Comparison Across CCTs** . . . 11
- **4.3 Energy Efficiency** . . . 11
- **4.4 Color Samples** . . . 11
- **4.5 Preferred Chromaticity** . . . 13
- **4.6 Fluorescence and Whiteness** . . . 13
- **4.7 Color Rendition Preference** . . . 13

References . . . 13

Annex A - Spectral Reflectance Factors . . . 15

Annex B - Color Evaluation Samples . . . 26