

## **David M. Keith**

David Keith, principal of Marshall Design, Inc., is a lighting consultant with over twenty-five years experience in design, project management, research, product development and education.

His academic experience includes undergraduate studies in architecture and a B.S. in Architectural Engineering (1985) and a M.S. in Civil Engineering (1997) from the University of Colorado in Boulder. David was registered as EIT # 13560 in the state of Colorado.

Lighting design clients and projects include the Boulder County Courthouse Plaza, Boulder Community Hospital intensive care facilities, The Way Station outreach center, terminals and concourses at Stapleton International Airport, interiors and roadways at Denver International Airport, the National Western Stock Show Arena, E-470 roadway lighting and maintenance facilities, Jefferson County's Columbine Library, Leanin' Tree Museum, Gateway Park outdoor entertainment facility, and McGrath and Lillie's BASIS research facility. David also worked with Public Service Company of Colorado, providing consulting services for Demand Side Management programs, from development through implementation. He has worked with the Colorado Department of Transportation on numerous projects, such as the design for the entire I-25/I-76 interchange, the lighting of State Highway 119 from Black Hawk to US 6, improvements to the intersection of I-25 & 120th Avenue, lighting for the Hogback Park and Ride facility, and additional lighting for the interchange at I-70 and C-470. He has also consulted on numerous residential and commercial projects, small and large.

David has consulted with clients on a wide range of issues related to lighting, including ordinances and legal cases. He has worked with jurisdictions across the Rocky Mountain region on developing, writing and reviewing ordinances on outdoor lighting. As the leader of the team working for the City of Arvada, CO, David met with staff and the community, organized a city-wide survey of outdoor lighting and associated educational lighting tours, supervised the ordinance development and presented the resulting document at public meetings. Following minor revisions coordinated by the team, the city council of Arvada adopted the document unanimously in 2005. In 2011, David worked with the city of Centennial, CO, to develop an ordinance promoting energy-efficient exterior lighting, with requirements for lighting quality and limits on obtrusive light, which was also approved unanimously.

David has been an active volunteer addressing lighting issues, principally with the Illuminating Engineering Society of North America (IES), working at the local and international levels. He served in IES as president of the Rocky Mountain Section in Denver, and as Regional Vice-President for the Rocky Mountain region. Since 1987, he has been a member of the IES Roadway Lighting Committee, recently serving as chairman of the Fundamentals and Education subcommittee. He worked with the Colorado Office of Energy Conservation in 1997 on the "Energy Guidelines for Commercial and High-Rise Residential Buildings in Colorado", serving as the representative for the local IES section. He contributed to the IES Lighting Fundamentals text, in part as principal author of the 1999 revision to the section "Lighting Applications for Exterior Environments", and was a member of the IES

Educational Review Council from 2007 through 2010. He has served as a technical advisor to various organizations including the Lighting Research Center, the Denver Museum of Nature and Science and the New York State Energy Research and Development Authority. In 2002, David was honored as a Fellow of the IES, and served from 2003 through 2006 on the IES Technical Review Council.

Lighting research experience includes working with the Electric Power Research Institute on the Advanced Lighting Systems, evaluating the potential of integrated office lighting controls (Journal of the IES v26n1), and developing a prediction tool for peak occupancy of offices (JIES v28n1). This research was extended through work with the Lawrence Berkeley National Laboratory on refining methods for predicting energy savings. David also has done development and research into roadway lighting optimization and the reduction of energy use and light pollution, published in a series of papers (JIES v29n2, JIES v31n2 and two in JIES v32n1). Along with J. Knox, David has also worked to develop and present papers addressing the atmospheric scatter of light into skyglow (2003 IDA Conference, 2008 CORM) and modeling the interaction of surfaces and sources for color perception (2003 IES Conference). David was also one of the authors of a paper (Sensors 2010) reporting the spectral power distributions of exterior light sources and the potential for measurement of man-made radiation from satellites – a critical step in evaluating light pollution and its environmental impacts. In 2011, David was a co-author of a paper that evaluated light source spectra and proposed efforts to limit the effects of residual light pollution on wildlife, human health and stellar visibility (J. of Environ. Man., 2011).

David has talked about lighting with people at all levels, from beginners through professionals, at local, national and international levels. He has taught classes on light and color to students ranging from grade school to college art students, and entire courses on lighting and design to interior design students, engineering students and professionals. For fifteen years, David served as Education chairman for the Rocky Mountain Section of the IES and he helped develop the particular ED-100 Lighting Fundamentals course that he and others taught in Denver from 1994 through 2009. He has also taught most of the IES ED-150 Intermediate Lighting course and additional courses accredited by IES and other organizations as continuing education for professionals in lighting and related fields. David has made presentations at numerous meetings for a variety of organizations, including the International Dark-sky Association, Colorado police officers, AIA, IEEE, the IES Annual Conference, the IES Street and Area Lighting Conference and the Lighting Urban Community International (LUCI). His presentations and classes get great reviews. In particular, the IES Roadway Lighting Committee recognized David's 2003 presentation on light sources and atmospheric scatter as the most outstanding of the year. From 2005 through 2007, David taught in the interior design program at the Rocky Mountain College of Art and Design, and in the spring semester of 2008, in the illumination engineering program at the University of Colorado in Boulder. In 2012, his teaching for the Rocky Mountain Section in Denver included the IES Fundamentals of Lighting course and the new seminar "Changing Light for Health".