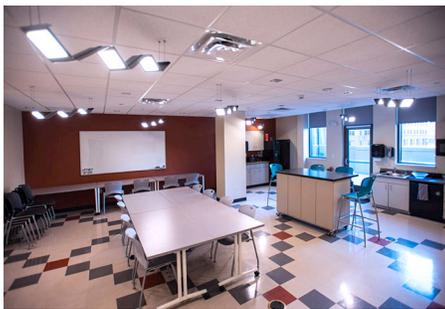


SSL DEMONSTRATION Evaluating OLED Lighting in the Accounting Office of DeJoy, Knauf & Blood LLP

A bold and innovative installation that uses various types of OLED luminaires to supplement LEDs and daylighting provides a unique opportunity to learn about the potential of OLED lighting technology.

In February 2017, the U.S. Department of Energy's (DOE) GATEWAY program was invited to evaluate the lighting system for the new offices of the Rochester, NY, accounting firm of DeJoy, Knauf & Blood LLP (DKB), one of whose founding partners, David DeJoy, is also co-founder and CEO of OLEDWorks LLC, the only U.S.-based OLED manufacturer. The large number of different OLED luminaires used in DKB's offices makes the installation unique and well worth studying.

In most of the DKB workspaces, which collectively comprise 13,905 square feet, OLED luminaires were installed in



Break room showing the recessed square LED downlights and the playful Visa Limit™ pendants. Photo courtesy OLEDWorks LLC and DeJoy, Knauf & Blood LLP



Visa Lighting Petal™ OLED pendants suspended above high-top tables in a casual lounge area off a main corridor. A small conference room equipped with OLED configuration is visible through the windows on the left. The square recessed downlights and cube pendants use LED sources. Photo courtesy OLEDWorks LLC and DeJoy, Knauf & Blood LLP

a supporting role, with LED luminaires and daylight providing the necessary illuminance levels for the primary work areas, and OLED products providing task lighting and decorative accents. The OLED luminaires are primarily located in visually prominent areas: conference rooms, partner offices, the break room and lounge-table areas, entry corridors, and the reception desk.

An amber OLED marker light is used in the "Zen/Mother's" relaxation room; a few angled OLED task lights add soft localized desk lighting in private offices; and a couple of pendant lights add a decorative touch to the copy room. In conference and break-room spaces, OLED luminaires provide both the needed task lighting and the face and room surface lighting, while serving as the focal design element. The lighting system expresses creativity and innovation, making a bold statement to clients and staff.

A Complementary Technology

The OLED luminaires were found to provide comfortable luminance levels; acceptable performance in terms of color quality, flicker, and controllability; and attractive design elements. All the OLED luminaires use OLEDWorks panels, and almost all are connected to 0–10V dimmers. The panels are almost all driven by dedicated OLED drivers, and two of the luminaire types (OMLED

One s5 and the OLED Devices task light with Keuka Module) incorporate OLED panels with integral drivers, eliminating the bulk of a remote driver. In nine months of operation, there have been no OLED driver or panel failures, and the OLED luminaires do not exhibit flicker that would exceed the guidelines of the IEEE Standard P1789-2015 in either maximum or minimum output range of the dimmer.

Efficacy of the OLED luminaires ranges from 21 to 58 lm/W, depending on the generation of panels used, as well as on the configuration of the luminaire and driver efficiency. Luminances of the exposed panels measured as high as 9318 cd/m², but it's common to find conference rooms where the OLED luminaires have been dimmed by employees to a level of 3300 to 6000 cd/m², and subsequent occupants use the dimmer/switch to turn the luminaires on or off without touching the dimming setting. Field measurements of white OLED panel color in different luminaires yielded consistent CCT values ranging from 2911K to 3074K, with CRI values from 79 to 91. The total connected lighting load using the combination of OLED and LED luminaires was calculated at 0.6 W/ft², well below the ASHRAE/IES 90.1-2013 maximum allowed lighting power density (Building Area Method) of 0.82 for office spaces.

DKB employee feedback about the OLED lighting has been very positive,

Color characteristics of luminaires installed at DKB offices

Area/luminaire type	CCT (K)	CRI (R _a)
Open office Acuity Mark LED Slot2 linear runs	3476	82
Lounge Visa Petal™ OLED pendant	2945	79
Copy room Designplan Blade OLED pendant	2914	80
Private office Acuity Gotham EVO® LED downlight	3472	83
Small conference room Acuity Winona® Trilia™ OLED pendant	3074	91
Small conference room Birot Zhen OLED pendant	2924	81
Reception desk OMLed One s5 OLED pendant	2917	80
Break room Visa Limit™ OLED pendant	2948	82
Zen/Mother's room Acuity Winona® amber OLED nightlight	2100	88
Private office OLED Devices OLED task light	2911	82

especially given the contrast to the staff’s previous rabbit-warren office layouts with dated, fixed-output, T8 fluorescent, deep-cell parabolic louver luminaires. The exposed OLED panels emit a soft, minimal-shadow lighting that makes faces and expressions visible and increases room brightness by delivering

light to vertical surfaces. At the panel luminances used, this is achieved without employees reporting glare. The flexibility to dim the lighting is also appreciated.

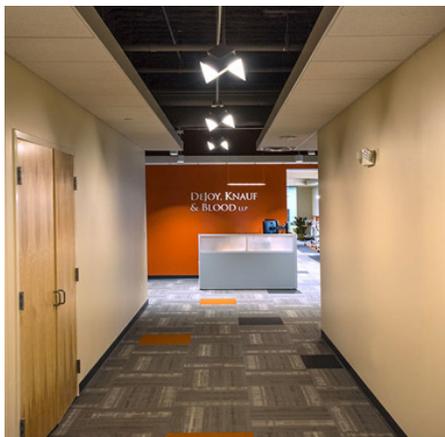
OLED Lighting Going Forward

Ongoing concerns for OLED architectural lighting include a premium luminaire price point that limits its wider use in projects and applications, low efficacy compared to LED luminaires, and rising panel voltage and power draw over time. While the efficacy range of the OLED luminaires in this project was considerably lower than that of the LED products (80–90 lm/W), projected performance for the next generation of OLED panels is 80 to 90 lm/W at a nominal luminance of 8300 to 3000 cd/m², lifetime between 30,000 and 50,000 hours, and CRI of 90. DOE intends to evaluate future installations of luminaires that use these next-generation OLED panels once they reach the market.

OLED panels draw more power as they age, so it’s important for design professionals to provide “headroom” on the

OLED loads in electrical circuits, to avoid circuits becoming overloaded over time. An additional power draw of approximately 15% is also recommended in lighting power density calculations, to account for panel-to-panel variations when new, for panel changes over time, and for variations in ambient temperature.

New OLED products have entered the market in 2017, prompting DKB to remove some of the LED linear products in the open office in March and replace them with a nominal 4' linear configuration of the Acuity Brands Peerless Olescence™ luminaire, which has a single line of 3500K LEDs delivering uplight, and eight 3000K OLEDWorks Brite 2 series 50 x 200 mm panels downward. This luminaire combines the high efficiency of the LEDs for indirect lighting with the comfort and appearance of the visible OLED panels on the downward side. The overall luminaire performance is rated at 71 lm/W, 75 lm/W, or 81 lm/W, depending on the LED package specified. DOE hasn’t tested this product or verified the ratings. ■



Entry corridor showing four Visa Lighting Petal™ pendants and a five-panel OMLed One s5 pendant above the reception desk. *Photo courtesy OLEdWorks LLC and DeJoy, Knauf & Blood LLP*

GATEWAY
Demonstrations

GATEWAY demonstrations showcase high-performance LED products for general illumination in commercial, municipal, and residential applications. Demonstrations yield real-world experience and data on the performance and cost effectiveness of lighting solutions. For more information, see <https://energy.gov/eere/ssl/gateway-demonstrations>.



For more information, visit: energy.gov/eere/ssl
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