



ACOUSTIC LIGHTING CASE STUDY

BCG Chicago – Lobby



IMMERSIVE ILLUMINATION

Cooledge Luminous Ceiling products deliver “immersive illumination” that includes superior color rendering qualities AND significant levels of comfortable, glare-free light that brings the feeling of the outdoors...inside.



Photometric Rendering

- Illuminance (work plane): 397 lux (37 fc)
- Uniformity: Min/Max = 0.51
- Glare: Max. UGR <19

INTERIOR DESIGN: Charlie Greene Studio

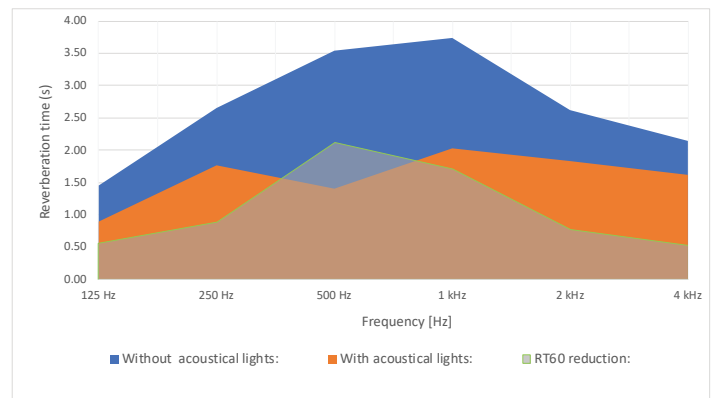
A Cooledge Flush Mount Specialty Illumination Solution was installed in this corporate lobby to deliver immersive illumination on the scale of nature.

- Luminaire Size: 1 @ 67' x 17.5' (20.4m x 5.2m)
- Light Output/Flux: 86 lm/sqft (928 lm/m²)
- CCT: 3000K
- CRI: 94
- R9: 92

NOISE REDUCTION

A key measurement of the success of acoustic materials is the effective increase in absorbing area created by their addition and the decrease in reverberation time or time for noise to be reduce by 60dB.

Most critical are the values at the mid-frequencies (500Hz-1000Hz) where speech hearing is most attuned to human speech.



Reverberation Time

For 500Hz – 1000Hz:

- Avg. Decrease in Reverberation Time: ~2.04s
- % Increase in Sabins (Absorption Area): 134%

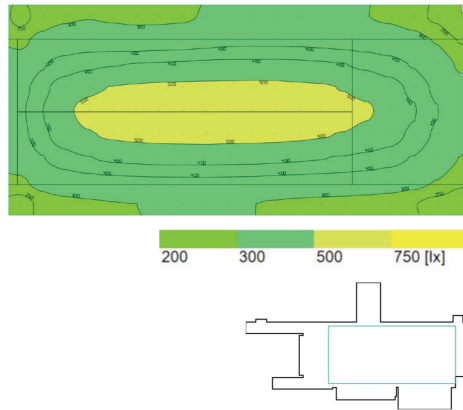
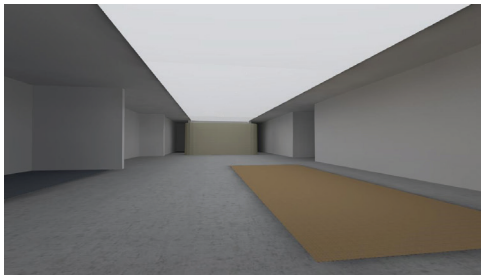
THE DETAILS



ROOM DIMENSIONS & PROPERTIES

Room Dimensions	(m)	(ft)	Surface	Type	(m ²)	(sqft)
Length	23.0	75.5	Floor	Stone / Terazzo	176.1	1,899.71
Width	8.7	28.6	Carpet	Thin carper on stone/concrete	24.3	261.6
Height	3.0	9.8	Ceiling	Gypsum suspended	200.5	2,158.6
			Wall	Gypsum	119.7	1,288.6
			Cooledge SIS	Flush Mount	108.3	1,165.5

LIGHTING PERFORMANCE



Glare evaluation according to UGR													
		70	70	50	50	30	30	70	70	50	50	30	
μ Ceiling		50	30	50	30	30	50	30	50	30	30	50	
μ Walls		20	20	20	20	20	20	20	20	20	20	20	
μ Floor		20	20	20	20	20	20	20	20	20	20	20	
Room size	X	Viewing direction at right angles to lamp axis						Viewing direction parallel to lamp axis					
Y		2H	3H	4H	8H	12H	2H	3H	4H	8H	12H		
2H	2H	7.8	9.2	8.1	9.4	9.7	8.0	9.4	8.3	9.6	9.8		
	3H	9.4	10.6	9.7	10.9	11.2	9.6	10.8	9.9	11.1	11.4		
	4H	10.0	11.2	10.3	11.4	11.7	10.3	11.4	10.6	11.7	12.0		
	8H	10.5	11.5	10.8	11.9	12.2	10.8	11.9	11.1	12.2	12.5		
	12H	10.6	11.7	11.0	12.0	12.3	10.9	12.0	11.3	12.3	12.6		
	2H	10.7	11.7	11.1	12.0	12.4	11.0	12.1	11.4	12.4	12.7		
4H	2H	8.5	9.7	8.9	10.0	10.3	8.6	9.8	9.0	10.1	10.4		
	3H	10.2	11.2	10.6	11.6	11.9	10.4	11.4	10.8	11.8	12.1		
	4H	11.0	11.9	11.4	12.2	12.6	11.2	12.1	11.6	12.5	12.9		
	8H	11.6	12.4	12.0	12.7	13.1	11.9	12.7	12.3	13.0	13.4		
	12H	11.8	12.5	12.2	12.9	13.3	12.1	12.8	12.5	13.2	13.6		
8H	4H	11.3	12.0	11.7	12.4	12.8	11.5	12.2	11.9	12.6	13.1		
	8H	12.0	12.6	12.5	13.1	13.5	12.3	12.9	12.8	13.3	13.8		
	12H	12.3	12.8	12.8	13.3	13.8	12.6	13.1	13.1	13.6	14.1		
	2H	12.5	13.0	13.0	13.4	13.9	12.8	13.3	13.3	13.8	14.3		
12H	4H	11.3	12.0	11.8	12.4	12.8	11.5	12.2	12.0	12.6	13.0		
	8H	12.1	12.6	12.6	13.1	13.6	12.3	12.9	12.8	13.3	13.8		
	12H	12.4	12.9	12.9	13.3	13.8	12.7	13.2	13.2	13.6	14.1		
Variation of the observer position for the luminaire distances S													
S = 1.0H		+0.1 / -0.1						+0.1 / -0.1					
S = 1.5H		+0.2 / -0.3						+0.2 / -0.3					
S = 2.0H		+0.4 / -0.6						+0.3 / -0.6					
Standard table		BK06						BK06					
Correction Summand		-4.8						-4.6					
Corrected glare indices referring to 1989lm Total luminous flux													

UGR diagram (SHR: 0.25)

ACOUSTIC PERFORMANCE

Sabin Absorption Area (m²)

Frequency	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Floor stone area	1.8	1.8	3.5	3.5	3.5	3.5
Floor carpet area	1.2	2.4	6.1	7.3	8.5	9.7
Ceiling area	30.1	20.1	10.0	8.0	14.0	18.0
Wall area	34.7	12.0	6.0	4.8	8.4	10.8
Cooledge luminaires	53.1	27.1	42.2	23.8	21.7	22.7
ΣSw	120.8	63.3	67.8	47.4	56.1	64.8

Sabin Absorption Area (sqft)

Frequency	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Floor stone area	19.0	19.0	37.9	37.9	37.9	37.9
Floor carpet area	13.1	26.2	65.4	78.5	91.5	104.6
Ceiling area	323.8	215.9	107.9	86.3	151.1	194.3
Wall area	373.7	128.9	64.4	51.5	90.2	116.0
Cooledge luminaires	571.1	291.4	454.6	256.4	233.1	244.8
ΣSw	1300.7	681.2	730.3	510.7	603.9	697.6

Absorption Values* per Frequency

Surface	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Floor	0.01	0.01	0.02	0.02	0.02	0.02
Carpet	0.05	0.10	0.25	0.30	0.35	0.40
Ceiling	0.15	0.10	0.05	0.04	0.07	0.09
Wall	0.29	0.10	0.05	0.04	0.07	0.09
Cooledge luminaires	0.49	0.25	0.39	0.22	0.20	0.21

Using simplified Sabin's Law formula

(*) Absorption value source: 1. Ej Evans and EN Bazley, "Sound Absorbing Materials," HM Stationary Office, London, 1964.; 2. SM Levy (2012) "Construction calculation manual (p. 528). Waltham, MA, Butterworth-Heinemann; 3. OA Hassan (2009) "Building acoustics and vibration: Theory and practice (pp. 731-740), New Jersey, World Scientific.; 4. PS Acoustics dr. Ir. P Schevenels, "Akoestiek in gebouwen-de praktijk" 2019.; 5. Cooledge Lighting Inc., acoustical measurements external laboratory data.