



ACOUSTIC LIGHTING CASE STUDY

Audi Omaha – Vehicle Handover



Cooledge Surface Mount Specialty Illumination Solutions were installed at this dealership that feature exceptional quality of illumination.

- Luminaire Size: 2 @ 21' x 12' (6.4m x 3.7m)
- Light Output/Flux: 395 lm/sqft (4260 lm/m²)
- CCT: 4000K
- CRI: 94
- R9: 92

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

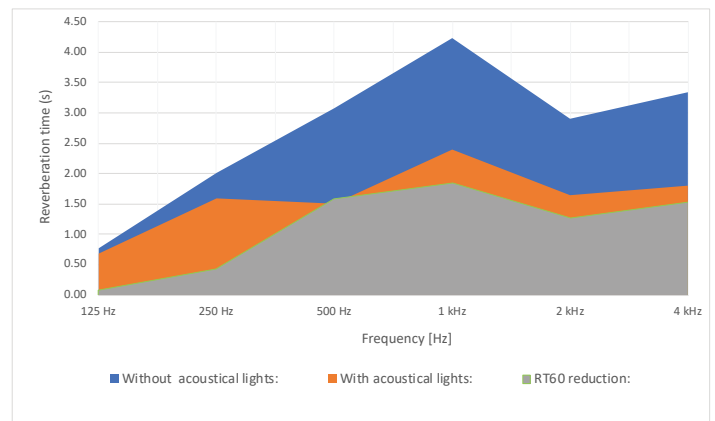
- Illuminance (workplane): 1499 lux (139fc)
- Uniformity: Min/Max = 0.42
- Glare: Max. UGR <19

ARCHITECT: Carlson West Povondra Architects
 LIGHTING DESIGN: Morrissey Engineering

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

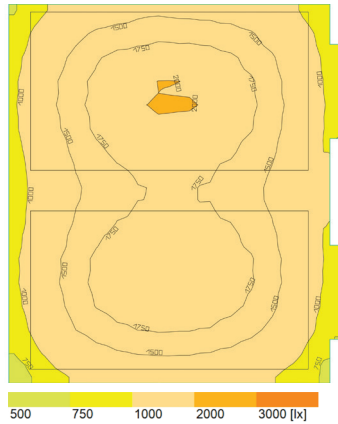
For 500Hz – 1000Hz:

- Avg. Decrease in Reverberation Time: ~1.71s
- % Increase in Sabins (Absorption Area): 48%

ROOM DIMENSIONS & PROPERTIES

Room Dimensions	(m)	(ft)	Surface	Type	(m ²)	(sqft)
Length	9.8	32	Floor	Tile	80.8	865
Width	8.3	27	Ceiling	Plaster	80.8	865
Height	3.0	10	Wall	Drywall/Gypsum (5/8")	61.0	656
			Glass	Glass	29.3	315
			Rolling Door	Translucent Plastic	18.0	194
			Cooledge SIS	Surface Mount	47.4	510

LIGHTING PERFORMANCE



Glare evaluation according to UGR												
p Ceiling		70	70	50	50	30	70	70	50	50	30	30
p Walls		50	50	50	30	30	50	50	30	30	30	30
p Floor		20	20	20	20	20	20	20	20	20	20	20
Room size X Y		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
2H	2H	12.6	13.9	12.9	14.2	14.4	12.8	14.1	13.1	14.4	14.6	
	3H	14.1	15.3	14.4	15.6	15.9	14.4	15.6	14.7	15.9	16.1	
	4H	14.7	15.9	15.1	16.2	16.5	15.0	16.2	15.4	16.5	16.8	
	6H	15.2	16.3	15.5	16.6	16.9	15.5	16.6	15.9	16.9	17.3	
	8H	15.3	16.4	15.7	16.7	17.0	15.7	16.8	16.1	17.1	17.4	
4H	12H	15.4	16.4	15.8	16.7	17.1	15.8	16.8	16.2	17.2	17.5	
	2H	13.2	14.4	13.6	14.7	15.0	13.4	14.6	13.7	14.9	15.2	
	3H	15.0	16.0	15.4	16.3	16.6	15.2	16.2	15.6	16.5	16.9	
	4H	15.7	16.6	16.1	17.0	17.3	16.0	16.9	16.4	17.3	17.6	
	6H	16.3	17.1	16.7	17.5	17.9	16.6	17.4	17.1	17.8	18.2	
8H	8H	16.5	17.2	16.9	17.6	18.0	16.9	17.6	17.3	18.0	18.4	
	12H	16.6	17.3	17.1	17.7	18.1	17.0	17.7	17.5	18.1	18.6	
	4H	16.0	16.8	16.5	17.2	17.6	16.3	17.0	16.7	17.4	17.8	
	6H	16.7	17.3	17.2	17.8	18.2	17.1	17.7	17.5	18.1	18.6	
	8H	17.0	17.6	17.5	18.0	18.5	17.4	17.9	17.9	18.4	18.8	
12H	12H	17.2	17.7	17.7	18.2	18.7	17.6	18.1	18.1	18.5	19.0	
	4H	16.0	16.7	16.5	17.1	17.6	16.3	17.0	16.7	17.4	17.8	
	6H	16.8	17.3	17.3	17.8	18.3	17.1	17.7	17.6	18.1	18.6	
	8H	17.1	17.6	17.6	18.1	18.6	17.5	17.9	18.0	18.4	18.9	
	12H	17.1	17.6	17.6	18.1	18.6	17.5	17.9	18.0	18.4	18.9	

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 area	0.8	0.8	1.6	1.6	1.6	1.6
Ceiling area	11.3	8.1	4.8	4.0	3.2	2.4
Wall area	33.5	8.5	4.9	2.4	7.3	6.7
Glass area	1.5	0.9	0.6	0.6	0.9	0.6
Roll door area	3.2	1.1	0.7	0.5	0.4	0.4
Cooledge luminaires	6.2	5.2	13.3	7.1	10.4	9.9
ΣSw	56.5	24.6	25.9	16.3	23.8	21.6

Sabin Absorption Area (sqft)

Frequency	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Floor area	8.7	8.7	17.3	17.3	17.3	17.3
Ceiling area	121.1	86.5	51.9	43.3	34.6	26.0
Wall area	360.8	91.8	52.5	26.2	78.7	72.2
Glass area	15.8	9.5	6.3	6.3	9.5	6.3
Roll door area	34.9	11.6	7.8	5.8	3.9	3.9
Cooledge luminaires	66.3	56.1	142.8	76.5	112.2	107.1
ΣSw	607.5	264.2	278.5	175.4	256.2	232.7

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
Ceiling	0.14	0.10	0.06	0.05	0.04	0.03
Wall	0.55	0.14	0.08	0.04	0.12	0.11
Glass	0.05	0.03	0.02	0.02	0.03	0.02
Rolling Door	0.18	0.06	0.04	0.03	0.02	0.02
Cooledge Luminaires	0.13	0.11	0.28	0.15	0.22	0.21

Using simplified Sabin's Law formula

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