



## ACOUSTIC LIGHTING CASE STUDY

# Bello Solar - Meeting Room



Three *LumiScapes by Cooledge FABRICore* luminaires provide high quality glare-free illumination and a significant reduction in noise to ensure comfort and clarity for meetings.

- Luminaire : (3) FABRICore suspended
- Light Output/Flux: 10,000 lm per luminaire
- CCT: 3500K
- CRI: >90

### 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.



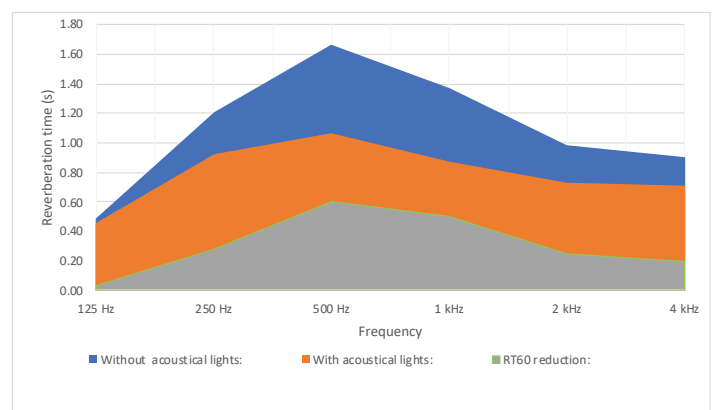
### Photometric Rendering

- Illuminance (workplane): 788 lux (73 fc)
- Uniformity: Min/Max = 0.41
- Glare: Max. UGR <19

### 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:

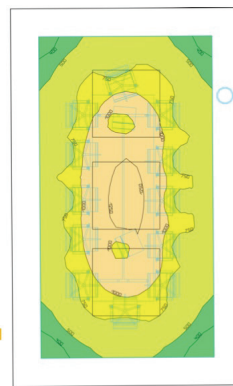
- Avg. Decrease in Reverberation Time: ~0.55s
- % Increase in Sabins (Absorption Area): 36%

## ROOM DIMENSIONS & PROPERTIES

Room Dimensions	(m)	(ft)
Length	6.7	22
Width	4.1	13.3
Height	4.2	13.8

Surface	Type	(m <sup>2</sup> )	(sqft)
Floor	Carpet	27.2	293
Ceiling	Concrete smooth	27.2	293
Wall	Plaster	45.5	489.9
Glass (outdoor)	Outdoor glass	28.1	303
Glass (indoor)	Indoor/seperation glass	16.8	180.3
FABRICore	Suspended	6.4	68.8

## LIGHTING PERFORMANCE



Glare evaluation according to UGR											
		70	70	50	50	30	70	70	50	50	30
μ Ceiling		50	30	50	30	30	50	30	50	30	30
μ Walls		30	20	20	20	20	30	20	20	20	20
μ Floor		30	20	20	20	20	30	20	20	20	20
Room size	X Y	Viewing direction at right angles					Viewing direction parallel				
		to lamp axis					to lamp axis				
2H	2H	15.3	16.7	16.6	16.9	17.1	15.4	16.7	16.7	17.0	17.2
	3H	16.9	18.1	17.2	18.4	18.7	17.0	18.2	17.3	18.5	18.8
	4H	17.0	18.7	17.9	19.0	19.3	17.7	18.8	18.0	19.1	19.4
	6H	18.0	19.1	18.4	19.4	19.7	18.2	19.3	18.6	19.6	19.9
4H	2H	18.2	19.3	18.6	19.6	19.9	18.4	19.4	18.8	19.7	20.1
	3H	18.3	19.3	18.7	19.7	20.0	18.5	19.5	18.9	19.8	20.2
	4H	18.0	17.1	16.3	17.4	17.7	16.1	17.2	16.4	17.5	17.8
	6H	17.6	18.8	18.1	19.1	19.4	17.9	18.9	18.2	19.2	19.5
8H	2H	18.5	19.4	18.9	19.8	20.2	18.7	19.6	19.1	19.9	20.3
	3H	19.2	20.0	19.6	20.3	20.7	19.3	20.1	19.8	20.5	20.9
	4H	19.4	20.1	19.8	20.5	21.0	19.6	20.3	20.0	20.7	21.1
	6H	19.6	20.2	20.0	20.7	21.1	19.7	20.4	20.2	20.8	21.3
12H	2H	18.9	19.6	19.3	20.0	20.4	19.0	19.7	19.4	20.1	20.5
	3H	19.7	20.3	20.1	20.7	21.1	19.8	20.4	20.3	20.8	21.3
	4H	20.0	20.5	20.4	21.0	21.4	20.1	20.7	20.6	21.1	21.6
	6H	20.2	20.7	20.7	21.1	21.6	20.4	20.8	20.9	21.3	21.8
15H	2H	18.9	19.6	19.3	20.0	20.4	19.0	19.7	19.4	20.1	20.5
	3H	19.7	20.3	20.2	20.7	21.2	19.9	20.4	20.3	20.8	21.3
	4H	20.1	20.5	20.6	21.0	21.5	20.2	20.7	20.7	21.2	21.7
	6H	20.1	20.5	20.6	21.0	21.5	20.2	20.7	20.7	21.2	21.7
Variation of the observer position for the luminaires 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		+0.3 / -0.6					+0.3 / -0.6				
Standard table		B106					B106				
Correction Summand		2.8					2.9				
Corrected glare indices referring to 1000lm Total luminous flux											

UGR diagram (SHR: 0.25)

## ACOUSTIC PERFORMANCE

### Sabin Absorption Area (m<sup>2</sup>)

Frequency	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Floor area	1.4	2.7	2.7	8.2	10.9	13.6
Ceiling area	0.3	0.3	0.5	0.5	0.5	0.5
Wall area	25.0	6.4	3.6	1.8	5.5	5.0
Glass area	5.1	1.7	1.1	0.8	0.6	0.6
Roll door area	5.9	4.2	3.0	2.0	1.2	0.7
Cooledge luminaires	3.0	4.7	6.3	7.6	6.4	5.6
<b>ΣSw</b>	<b>40.6</b>	<b>19.9</b>	<b>17.3</b>	<b>21.0</b>	<b>25.0</b>	<b>26.0</b>

### Absorption Values\* per Frequency

Surface	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Floor	0.05	0.10	0.10	0.30	0.40	0.50
Ceiling	0.01	0.01	0.02	0.02	0.02	0.02
Wall	0.55	0.14	0.08	0.04	0.12	0.11
Glass (outdoor)	0.18	0.06	0.04	0.03	0.02	0.02
Glass (indoor)	0.35	0.25	0.18	0.12	0.07	0.04
FABRICore	0.47	0.73	0.98	1.19	1.00	0.88

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.

### Sabin Absorption Area (sqft)

Frequency	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Floor area	14.7	29.3	29.3	87.9	117.2	146.5
Ceiling area	2.9	2.9	5.9	5.9	5.9	5.9
Wall area	269.5	68.6	39.2	19.6	58.8	53.9
Glass area	54.5	18.2	12.1	9.1	6.1	6.1
Roll door area	63.1	45.1	32.5	21.6	12.6	7.2
Cooledge luminaires	32.3	50.2	67.4	81.9	68.8	60.6
<b>ΣSw</b>	<b>437.0</b>	<b>214.3</b>	<b>186.4</b>	<b>226.0</b>	<b>269.4</b>	<b>280.1</b>