Acoustical Data
cloud softlight pendants

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cloud softlight pendant Acoustical Data

The attached report gives the results of Sound Absorption Test and the determination of the Noise Reduction Coefficient on the molo's paper and textile cloud softlight pendants.

The Noise Reduction Coefficient (NRC) represents the percentage of sound-waves, encompassing the typical frequencies of human speech, that are absorbed by cloud softlight and NOT reflected back into the room or space.

Products with high NRC ratings improve the acoustics in a room, increase speech clarity and reduce room sound reflections. The curved, organic forms of cloud, round and undulated, along with their exposed cellular honeycomb structure create a large and exceptionally varied surface with no right angles. cloud softlight breaks up a typical room's parallel walls and flat surfaces, absorbing sound while reducing reflection and standing waves.

Suspending cloud in a space has the potential to improve speech intelligibility, reduce noise from overhead vents, and/or block out environmental noise from open windows without obstructing views.

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Re: Acoustical Data for molo "Cloud Softlight" – Review and Comment

Further to our proposal of Sept. 16, 2010, BKL Consultants Ltd. is pleased to present this review and interpretation the acoustical test data you have obtained on your "Cloud Softlight" lighting products. The data upon which this work is based comes from the report titled "Measurement of the Sound Absorption of Cloud-Lighting Systems" prepared by Dr. Murray Hodgson and dated August 2010. Surface areas for each sample were provided on Jan 13, 2011.

Data

The cited report contains sound absorption data measured by Dr. Hodgson using the reverberation room method described in ASTM Standard C423 for four configurations of Cloud Softlights as follows:

Softlight Configuration Tested	Surface Area (m^2)
1. 8' cluster in textile (comprises one extra large one large one medium and two small)	10.46
2. Extra large pendant in textile	5.18
3. Small pendant in textile	0.50
4. Extra large pendant in paper	5.18

The data were presented as total absorption in one third octave bands from 100 Hz to 8000 Hz for each example. We have extracted the data for octave band centre frequencies so that the results can be more easily compared with published data from manufacturers of acoustical products. The overall values are presented below:

Overall Sound Absorption in Metric Sabins						
Octave Band Centre Frequency	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1. 8' cluster in textile	0.39	3.22	4.55	2.86	3.44	5.07
2. Extra large pendant in textile	0.16	2.62	3.07	2.36	1.86	2.82
3. Small pendant in textile	0.28	0.43	0.03	0.16	0.42	0.32
4. Extra large pendant in paper	0.49	1.19	1.96	3.20	2.01	2.30

These values represent the sound absorption provided by each specimen in metric sabins in each octave band. One sabin can be considered to be one square meter of perfect sound absorption.

Discussion

The data noted above provide a measure of the absolute quantity of sound absorption provided by each specimen tested. These data are of limited usefulness to designers since they do not permit easy comparison between different materials, or scaling for different sizes or configurations. Acoustical materials are more usually characterised by their sound absorption *coefficients*, or their total absorption divided by the surface area. This dimensionless quantity is generally a more useful design tool which permits ready assessment of overall absorption for combinations of materials, and comparison of the sound absorption effectiveness of different materials. The following table shows the derived absorption coefficients.

Sound Absorption Coefficient Table						
Octave Band Centre Frequency	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1. 8' cluster in textile	0.06	0.24	0.39	0.33	0.31	0.48
2. Extra large pendant in textile	0.12	0.38	0.56	0.44	0.33	0.56
3. Small pendant in textile	0.90	0.74	0.52	0.51	0.68	0.94
4. Extra large pendant in paper	0.07	0.20	0.35	0.61	0.44	0.46

A further simplification of the absorption data provides an arithmetic average of the coefficients from 250 Hz to 2000 Hz, giving a metric known as the Noise Reduction Coefficient (NRC). The NRC is the most widely quoted acoustic characteristic of acoustical finish materials, and is the metric most frequently recognised and specified by designers. These values are shown below.

Noise Reduction Coefficient Table	
Softlight Configuration	NRC
1. 8' cluster in textile	0.32
2. Extra large pendant in textile	0.43
3. Small pendant in textile	0.61
4. Extra large pendant in paper	0.39

The analysis shown above provides values which can be used to characterise the acoustical absorption of the sizes and configurations of Cloud Softlights in accordance with generally accepted industry usage.

However, a critical look at the data suggests that it is of limited application. For instance, the NRC values for fabric (Tyvek) Softlights suggest that the small unit is a more efficient absorber than the extra large alone, which in turn is more effective than the cluster. These data do not demonstrate scalable acoustic performance, and suggest that extrapolation from individual units to arrays may not produce the expected performance. Additional testing of multiple units would be required in order to develop reliable scaling factors.

As an aid to acoustical designers using the Softlights, we have gone back to the overall absorption data and compared the values with those for areas of typical lay-in ceiling panels, as follows. The mineral panel is typical of standard office ceilings, and the fibreglass “Nubby” panel is a high performance acoustical ceiling product commonly used in “open office” environments.

Softlight Configuration	Equivalent area of typical mineral lay-in ceiling[1] (NRC = 0.55-0.60)	Equivalent area of typical fibreglass lay-in ceiling[2] (NRC = 0.75-0.80)
1. 8' cluster in textile	6.8 m^2	4.0 m^2
2. Extra large pendant in textile	4.9 m^2	2.8 m^2
3. Small pendant in textile	0.5 m^2	0.2 m^2
4. Extra large pendant in paper	3.7 m^2	2.32 m^2

[1] Armstrong “Fine Fissured” ⅝ in. thick

[2]Armstrong “Painted Nubby” ¾ in. thick

Thus, one textile cluster provides equivalent sound absorption to around 6.8 m^2 of a mineral tile ceiling, or 4 m^2 of a high performance fibreglass ceiling.

Conclusions

The raw sound absorption data from several sizes of Cloud Softlights were processed to provide absorption coefficients and NRC values compatible with industry standard terminology for acoustical materials. The data do not appear to scale in a predictable manner, suggesting that caution must be exercised in extrapolating the results to different sizes and arrangements of Softlights. As an aid to designers we calculated the areas of typical sound absorptive lay-in ceilings which have equivalent sound absorption to the Softlight units tested. We caution against extrapolation of these data to different sizes or arrangements of Softlights without additional test data.

Sincerely,

BKL Consultants Ltd.
per

Michael R. Noble, M.Sc.

Enclosures