

Acoustical Banners for Reverberation Control in Sports Arenas

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In 1980, Bob Coffeen (Coffeen Fricke and Associates, Inc.) conceived the idea of using unfaced fiberglass blankets suspended like a hammock to provide cost-effective sound absorption for large spaces such as gymnasiums, arenas, exhibit halls and similar building spaces. The acoustical consultants successfully treated two projects with this prototype banner. Subsequently, they were involved with a gymnasium project at Ozark Christian College in Joplin, MO, that had a very restricted budget.

It was at this point in 1982 that Bob Coffeen contacted Bernie Zarnick of MBI Products. Together they determined that a thin fabric or plastic covering would be more visually desirable and would not negatively affect the sound-absorbing properties of the core material. This covering was necessary to achieve a suitable color and appearance for the banners while also encapsulating the fiberglass core material. MBI produced the banners for the gym and termed them "Lapendary® Panels." This product has now been used in more than 90 large sports arenas across the country and at many other facilities.

Construction. The Lapendary Acoustical Banner is typically manufactured of a low-density fiberglass core, anywhere from 0.75-1.5 lb density. It generally comes in thicknesses ranging from 1-4 in. It can be

encapsulated with a PVC film, nylon rip-stop sailcloth or a decorative fabric.

NRC. The sound absorption is very good across the frequency band (Table 1). The absorption for 2 in. x 0.75 lb material is greater than 0.92 from 125-4000 Hz. We attribute this unique absorption characteristic to its method of suspension and covering used on the panel itself.

Suspension. The Lapendary banner is typically suspended in a catenary fashion (Figures 1-3). Due to the large variety of buildings needing acoustical treatment and the prevalence of sprinkler systems, several other methods of suspension have been designed. The acoustical banners can be "buttoned" up to the deck with 3-in.-diameter washers for a very flat appearance. The acoustical banners can also be suspended to the deck using aircraft cable. The cable method is more attractive than the washers, but it is also more labor intensive. There are other less conventional methods of suspension available, but those are designed on a job-by-job basis.

Cost. Lapendary banners are very affordable. Material costs can be as low as \$1.25 per ft². Installation labor can be as low as \$1.50 per ft².

Case Study. The acoustical consulting firm of Peter Klaveness & Associates conducted a case study on the Arco Arena in

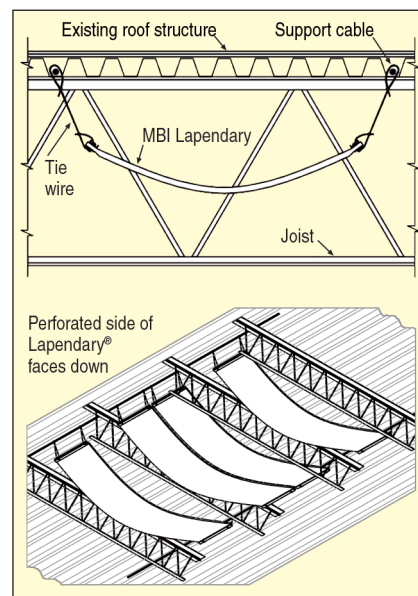


Figure 1. Lapendary acoustical banners suspended in typical catenary fashion.

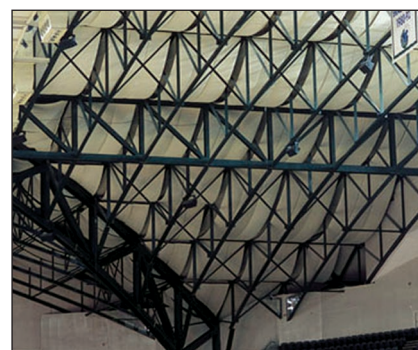


Figure 2. Typical installation.



Figure 3. Close-up view of typical installation.

Sacramento, CA, before and after the installation of Lapendary banners. Arco Arena has about 17,000 seats, and approximately 90% of the high roof area was treated with acoustical banners to achieve these results. Table 2 shows the arena's pre- and post-treatment reverberation times in sec.

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Table 1. Acoustical test results for 2-in.-thick Lapendary banner with 0.75-lb density core. Octave band center frequencies shown in bold (NRC = 1.00).

1/3, 1/1 Octave Center Frequency, Hz	Absorption Coefficient	Total Absorption in Sabins	Percent of Uncertainty w/95% Confidence Limit with Specimen
100	0.71	50.81	0.40
125	1.09	78.42	0.51
160	0.83	59.90	0.59
200	0.99	71.34	0.55
250	0.97	69.70	0.58
315	0.86	61.86	0.59
400	0.81	58.52	0.65
500	0.92	66.32	0.64
630	1.03	73.92	0.55
800	1.02	73.79	0.64
1000	1.05	75.62	0.59
1250	1.09	78.27	0.61
1600	1.07	76.89	0.60
2000	1.00	72.18	0.57
2500	1.06	76.04	0.56
3150	1.09	78.62	0.67
4000	1.11	79.67	0.52
5000	1.11	80.05	0.57

Table 2. Pre- and post-treatment reverberation time (in sec) for Arco Arena (test date courtesy of Peter Klaveness & Associates).

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Pre-Treatment	5.8	6.6	5.9	6.3	6.1	3.9
Post-Treatment	2.0	2.3	2.4	2.4	2.5	1.9