



PROJECT. Acoustic Mitigation Systems - Hill Farm Partnership, Dance Hall

PROPOSAL No. 586/001

PROPOSAL FOR. Hill Farm Partnership
Suffolk
Huggins Lane
Eye
IP23 7ER

DATE. 1st November 2021

BRIEF

Direct Acoustics have been invited to supply a suitable acoustic mitigation design for a proposed Dance Hall venue at Hill Farm Partnership, Suffolk, IP23 7ER.

To support their change of use application, Hill Farm Partnership engaged Sharps Redmore to commission an acoustic feasibility study (Project No 2120307) to assess the potential noise impact that proposed dance hall events may have on the local area.

In order to protect the nearby residential properties from amplified music, Sharps Redmore have advised on the use of a highly directional speaker system and process-limiting platform used in conjunction with a marquee acoustic lining. In addition, it has been advised that sections of the interior of the barn, which will encompass an internal marquee, should be wrapped in 12mm concrete board.

It has been calculated that such measures in operation with an internal volume of 95dB $L_{Aeqt3min}$ will propagate down to a maximum of 34dBA $L_{Aeqt5min}$ at the boundary of the nearest noise sensitive receptor.

Subject to real world commissioning, there is the capacity to reduce the internal volume level if required by up to 5dBA in order to meet conditions.

The purpose of this document is to provide practical information on the technical aspects of the suggested mitigation equipment.



ZONE ARRAY

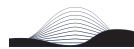
All amplified music at Hill Farm must be operated through a highly directional speaker system, called a Zone Array.

The Zone Array is a modular speaker system, enabling hundreds of small directional speakers to be installed across a single plane. Due to the alignment and orientation of the speakers, the system becomes highly directional. Through this directionality, it is possible to control acoustic temperatures and volume levels within specific areas.

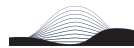
The Zone Array has been built primarily to provide a solution for venues that are struggling to control noise, specifically bass.

Using constructive and destructive interference to both create and localise low frequencies, the system can achieve results in scenarios of extreme sensitivity, where conventional speaker systems or traditional soundproofing methods have proved ineffective.

EXCELLENT LOW FREQUENCY LOCALISATION



33dB dropoff in 4 metres at 63Hz



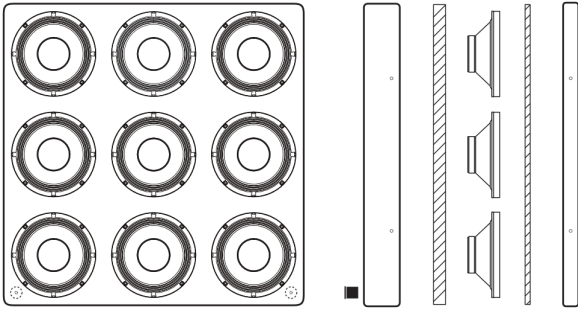
27dB dropoff in 4 metres at 125Hz



34dB dropoff in 4 metres at 250Hz



WHAT MAKES OUR SPEAKERS EFFECTIVE?



Speaker Positioning

Wave interference and phase cancellation

Multiple Speakers

Total surface area mimics individual speaker with lower frequency response

Acoustic Absorption

Improved sound attenuation

Modular Design

Can be scaled up or down to any size

THE TECHNOLOGY

Phase Cancellation

Engineering the control and dispersion of sound and noise.

Destructive Interference

Sound waves clashing into one another creating noise cancellation. This works on the axis toward the noise sensitive dwelling.

Constructive Interference

Sound waves coupling together to create full frequency sound on the dance floor. This constructive coupling will only occur directly underneath the Zone Array. Only 1m away, you will be into the destructive interference phase.

In-Phase Wave Interference



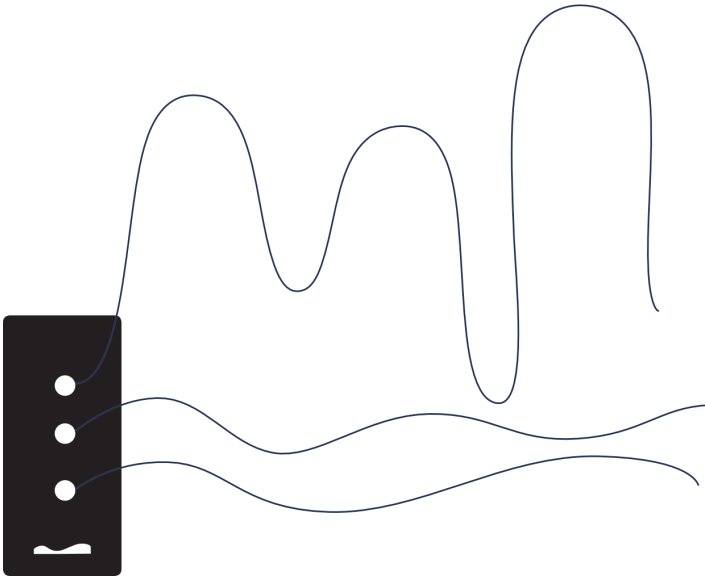
Out of Phase Wave Interference





FREQUENCY SPECIFIC LIMITATIONS

To ensure a consistent operational volume level to each Hill Farm dance hall event, the Zone Array is used in conjunction with a digital signal process-limiter. This will control the output power, and therefore the volume level, of the visiting DJ or band, who are able to plug in directly via an XLR patch point.



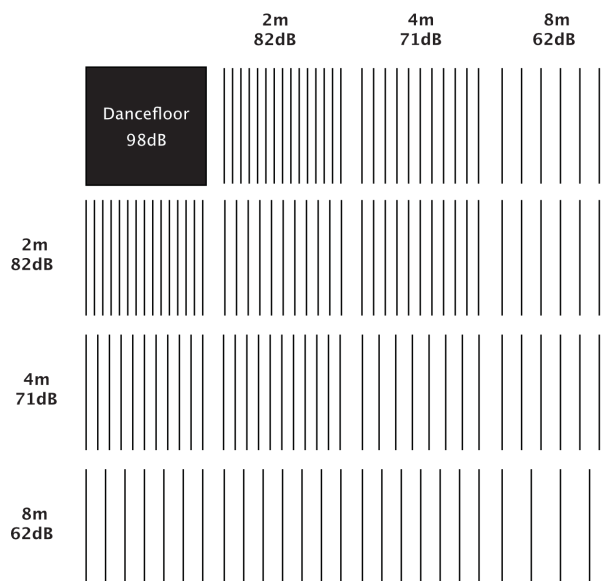
It enables all inputs and outputs to be processed and limited to the requirements outlined by Sharps Redmore in Project No 2120307.

In addition by using the open architecture software installed on the process-limiter, Direct Acoustics have created a frequency specific limiting module that has the capacity to accurately remove and control troublesome frequencies.

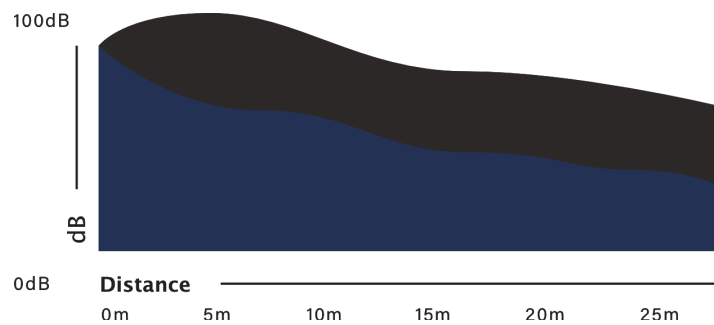
The system can be put in place, fine-tuned and password protected in conjunction with relevant authorities to prevent tampering.



DISPERSION HEATMAP AT 125Hz



ZONE ARRAY VS CONVENTIONAL PA 98dB LAeq



A standard PA is omnidirectional in its nature, therefore as you can see in the graph low frequency does not decay as effectively as a highly directional speaker system, such as the Zone Array.

SYSTEM SPECIFICATIONS

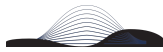
Power Rating.	120W
Nominal Impedance.	72Ω
Usable Bandwidth.	55Hz - 18KHz
Components.	9x6" coil, Aluminium die-cast basket, 8Ω
Connections.	IN: NLA SpeakON Link: NLA SpeakON
NL4.	1+/1-
Dimensions.	600mmW x 600mmD x 75mmH
Weight.	5.4Kg
Colour.	White or Black (as standard) Any RAL colour bespoke
Materials.	Perforated Aluminium Acoustic Absorbent Foam



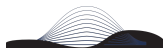
LIVE MUSIC

The Zone Array will control the output power and volume level of any amplification equipment run through the process-limiter.

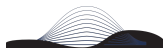
If Hill Farm Partnership wishes to permit live music, they must consider the non-amplified nature of instruments and additional equipment live acts require to perform. These are as follows:



Drum kit



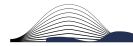
Guitar amplifiers



Stage wedge monitors

SILENT STAGES

All of the above create sound and therefore potential noise issues, but can be overcome by creating a silent stage and replacing them with the following equipment.



Digital Drum Kits



Direct injection boxes



In-ear monitors or a speaker routed via the process-limiter

Direct Acoustic will offer further assistance upon installation by reaching out to visiting acts and outlining the regulations they must follow to use the Zone Array and meet requirements set by Sharps Redmore and the local council.

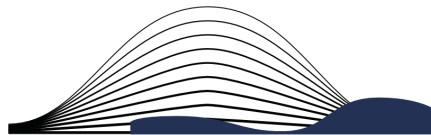


MARQUEE ACOUSTIC LININGS

In addition to the Zone Array directional speaker system, Sharps Redmore have specified the installation of a MAL22 acoustic lining.

The MAL range – which is specifically designed for marquee application, and fabricated to slide directly into the frame of the marquee – provides a high degree of control to non-amplified sounds such as acoustic instruments and noise from attendees. This is due to the composite make-up employed utilising both absorption and mass to create the most effective acoustic marquee lining available.

The linings have undergone UKAS accredited lab tests to identify their frequency specific sound reduction index which has been included within Sharps Redmore's acoustic modelling.





Composite Materials

Absorptive and mass loaded barriers

Lab Tested Data

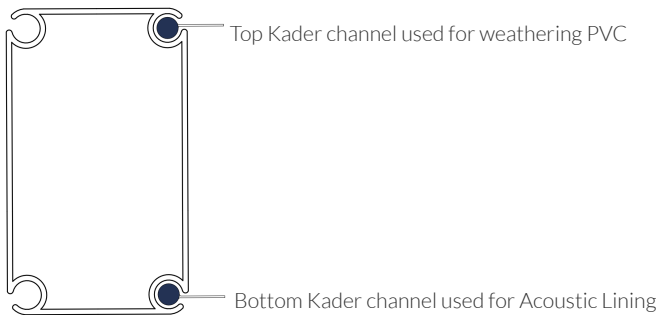
MAL products have been tested and accredited

Modular Design

Can be scaled up or down to any size

Easy Installation

Uses conventional Keder fed system



MAL22 SPECIFICATIONS

Rw Rating.	22dB RW (Ctr -3)
Weight.	6.9.kg/m ²
Dimensions.	Available for 5m or 3m bay marquees
Installation.	via 11mm Keder bead

The MAL22 lining and the 12mm concrete board are separate elements installed independently of each other. Please find lab testing data and acoustic modelling data below.



Test Report No: C/24219/T01

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Date: 13/11/2018

SRL Laboratory Test Data MAL22

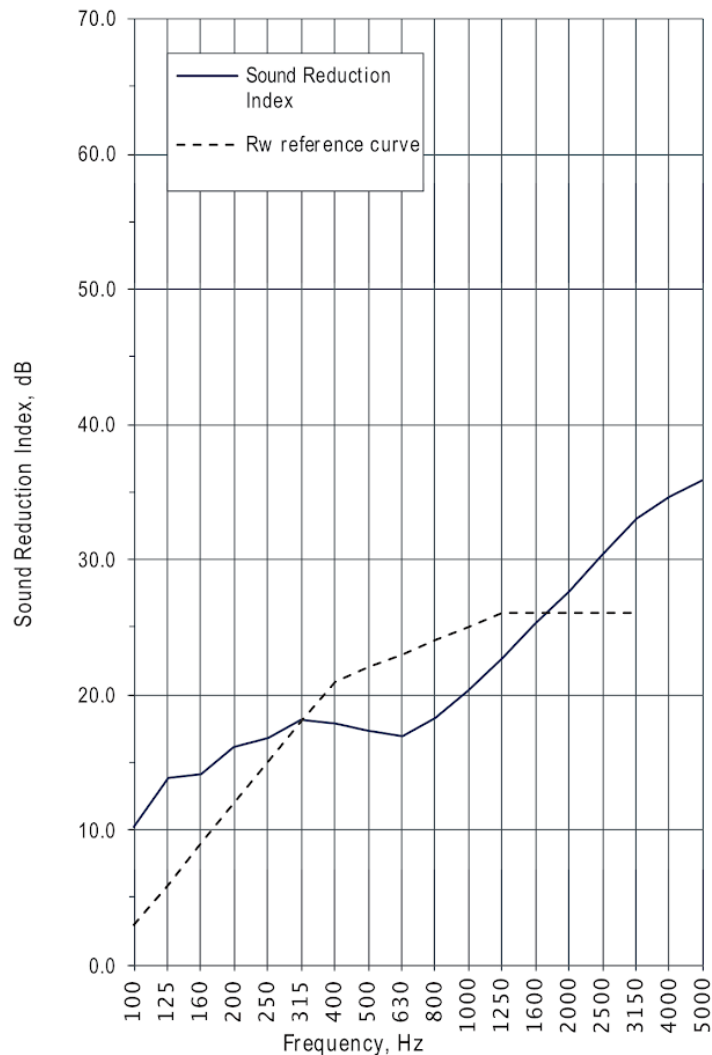
Test Number: 6
Client: Direct Acoustics
Test Date: 02/11/2018
Sample Height: 2.2m
Sample Width: 2m
Sample Weight: 6.9kg/m²

Test Room: Source Receiving
Air Temperature: 11.8 °C 12.6 °C
Air Humidity: 61 % 57 %
Volume: 115 m³ 300 m³

Air Pressure: 1015mbar

Product: MAL22

Freq, f Hz	Sound Reduction Index, dB	
	½ Oct	Octave
50+	14.3	11.3
63+	13.5	
80+	8.6	
100	10.2	12.4
125	13.9	
160	14.1	
200	16.1	16.9
250	16.8	
315	18.1	
400	17.9	
500	17.3	17.3
630	16.9	
800	18.3	
1000	20.3	20.1
1250	22.7	
1600	25.3	
2000	27.7	27.3
2500	30.4	
3150	33.1	
4000	34.6	34.4
5000	35.9	
6300+	36.8	
8000+	36.9	37.2
10000+	38.0	
Average 100-3150	19.9	Version v3.1



Rating according to BSEN ISO 717-1:2013

$R_w(C;C_{tr}) = 22(-1; -3) \text{ dB}$

* shows measurement corrected for background

> shows measurement limited by background

+ shows Frequency beyond standard and not UKAS accredited



Sound Insulation Prediction (v9.0.7)

Program copyright Marshall Day Acoustics 2017
margin of error is generally within $R_w \pm 3$ dB

- Key No. 2599

Job Name: Hill Farm Partnership

Job No.: 586

Initials: RA

Date: 04/11/2021

File Name: Insu

Notes:



R_w	32 dB
C	-2 dB
Ctr	-3 dB

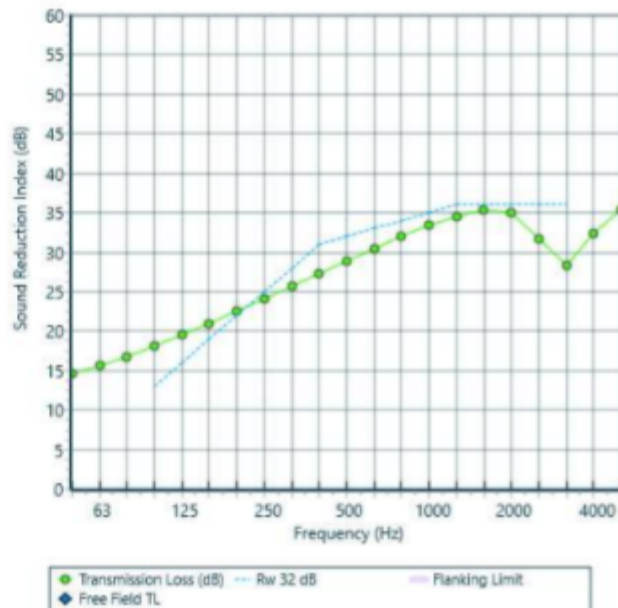
Panel Size = 2.7 m x 4.0 m
Partition surface mass = 15.3 kg/m²

System description

Panel 1 : 1 x 12.0 mm RCM CerBoard (cement particle board)

Floor Cover: Thickness: 0 mm

freq. (Hz)	TL (dB)	TL (dB)
50	15	
63	16	16
80	17	
100	18	
125	20	19
160	21	
200	23	
250	24	24
315	26	
400	27	
500	29	29
630	31	
800	32	
1000	33	33
1250	35	
1600	35	
2000	35	34
2500	32	
3150	28	
4000	32	31
5000	35	





COMMISSIONING & NOISE MANAGEMENT PLAN

Upon installation, Direct Acoustics will liaise with Sharps Redmore and the local authority to commission the final volume levels and ensure that all pertinent acoustic criteria is met. This includes any planning & licensing conditions placed upon the application.

To further help Hill Farm Partnership reduce their noise footprint, Direct Acoustics have also compiled a venue specific Noise Management Plan outlining relevant procedures for all staff and visiting acts to follow during and pre & post dance hall events.

Please see 663/NMP accompanying this document for comment.