

LUXURY WATERFRONT DEVELOPMENT CASE STUDY

Kinetics engineered an integrated acoustic solution for a basement chiller exhaust shaft, combining 600 mm double-bank acoustic louvres and 85 m² of absorptive wall lining to control noise from a 103 dBA exhaust fan while maintaining the required ventilation performance.



THE BACKGROUND

This premium waterfront residential development in Dubai incorporates a basement mechanical plant housing chillers and a dedicated exhaust ventilation shaft serving the chiller room. Acoustic assessment identified overall sound power levels of 103 dBA from the exhaust fan pressure side and 93 dBA from the chiller, requiring engineered noise mitigation to satisfy residential environmental criteria.

Kinetics Acoustics Technical Services LLC was appointed to undertake the complete acoustic scope, engineering design, fabrication drawings, supply and installation. The final solution integrated a 600 mm double-bank aluminium acoustic louvre with 85 m² of perforated metal absorptive wall lining, providing effective breakout noise control while maintaining the ventilation performance and architectural appearance of the development.

AT A GLANCE

Location:	Dubai, UAE.
Building Type:	Luxury Waterfront Residential Development
Area Analysed:	Basement Chiller Exhaust Shaft
Dominant Noise Source:	Exhaust Fan Pressure Side - 103 dBA
Associated Equipment:	Chiller - 93 dBA
Kinetics Solutions:	600 mm Double-Bank Acoustic Louvre. Perforated Metal Acoustic Wall Lining.
Treatment Quantity:	8.5 - Acoustic Louvre Scope 85 m ² - Acoustic Wall Lining

THE CHALLENGE

The shaft contained an exhaust fan with an overall sound power level of 97 dBA at the suction side and 103 dBA at the pressure side. The associated chiller radiated sound power level of 93 dBA.

Analysis confirmed that the exhaust fan governed the assessment because its pressure-side noise exceeded the chiller contribution. The dominant source therefore had to be treated before noise escaped through the shaft termination.

The solution also had to preserve the required airflow. Conventional solid barriers were unsuitable because the shaft remained part of the mechanical ventilation system and could not be acoustically sealed.

Internal reflections presented an additional challenge. Reflected shaft surfaces could allow the propagation of reverberation noise before reaching the external opening, resulting in an increase in the overall noise level.

Environmental criteria were assessed in accordance with ASHRAE noise and vibration guidance, Dubai Municipality Building Code 2021 and the applicable federal limits of 50–60 dB(A) during daytime and 40–50 dB(A) at night for the surrounding area classification.



THE SOLUTION

Kinetics reviewed the equipment sound-power data, shaft arrangement and external discharge path to determine how airborne noise would travel from the basement mechanical area to the outdoor environment.

The analysis considered octave-band sound power from 63 Hz to 8,000 Hz. Since the exhaust fan pressure-side level reached 103 dBA, compared with 93 dBA from the chiller, the fan was adopted as the governing source for treatment selection.

The final approach combined attenuation at the shaft opening with sound absorption inside the shaft. This treated both direct airborne transmission and reverberant noise before it reached the external discharge.

Execution

The acoustic treatment was coordinated with the basement mechanical arrangement and shaft elevation. The louvre was positioned at the upper opening, while acoustic lining was applied to the largest available internal wall surface.

The drawing developed by Kinetics showed a louvre elevation approximately 5,180 mm wide and 1,100 mm high, divided into three sections for practical fabrication, handling and installation.

This coordinated arrangement allowed the acoustic components to be integrated without obstructing the mechanical equipment layout or access requirements.

Double-Bank Acoustic Louvre

A powder-coated aluminium acoustic louvre with a 600 mm double-bank configuration was selected to maintain the resulting overall noise level within the specified limits while allowing ventilation air to pass through the opening.

The double-bank arrangement creates a deeper, indirect airflow path that increases acoustic attenuation compared with a conventional weather louvre while preserving the open area required by the ventilation system.

Kinetics acoustic louvres are manufactured in the UAE and are available in aluminium, galvanised steel and stainless steel construction. Their internal acoustic infill is specified for fire resistance in accordance with ASTM E84.



Shaft Reverberation Control

To reduce sound reflections inside the shaft, Kinetics installed 85 m² of 50 mm thick perforated metal acoustic wall lining on the largest available wall surface.

The lining was constructed using a 0.7 mm powder-coated perforated GI facing with 48 kg/m³ acoustic Rockwool insulation. Black glass-fibre tissue was incorporated to retain the infill and prevent fibre migration through the perforated face.

Treating the internal wall reduced reverberant noise before noise reached the acoustic louvre. This improved the performance of the complete system by combining internal absorption with attenuation at the discharge opening.



Acoustic Material Performance

The perforated acoustic treatment was selected for durability in a mechanical environment as well as its broadband sound-absorption characteristics.

The associated APMP-B acoustic panel system achieves an NRC of 0.90.

The modular system combines high-density acoustic insulation with a perforated inner face, enabling it to absorb reflected sound while also limiting sound transmission.

Verified Louvre Construction

Independent laboratory testing was conducted on a Kinetics 600 mm acoustic-louvre specimen, with the single-number classification calculated in accordance with ASTM E413.

The tested KINETICS-600 specimen comprised a 600 mm-deep, double-bank configuration with a 2 mm aluminium frame, aluminium blades, perforated aluminium facings and 48 kg/m³ fibreglass acoustic insulation. Its STC rating was determined under laboratory conditions.

For this development, the project-specific design used a deeper 600 mm double-bank arrangement selected through the acoustic analysis to address the higher exhaust-fan sound power and the required environmental criteria.



THE RESULTS

Targeted noise Control

The acoustic assessment identified the 103 dBA exhaust-fan pressure side as the governing source, allowing the treatment strategy to focus on the most critical airborne-noise path.

This source-led approach avoided unnecessary treatment of lower-level contributors while ensuring that the shaft-opening design addressed the dominant risk to the external environment.

Combined Attenuation and Absorption

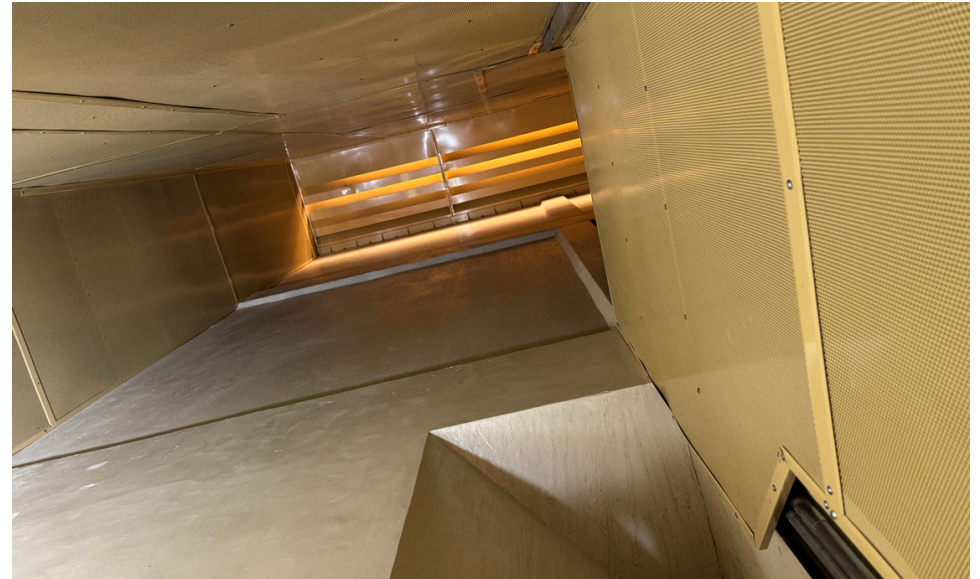
The completed design combined a 600 mm double-bank acoustic louvre with internal perforated-metal wall lining rather than relying on a single acoustic element.

The louvre attenuates noise at the shaft termination, while the absorptive lining reduces reflected energy inside the shaft before it reaches the opening. Together, the systems provide more effective control than either measure used independently.

Ventilation Performance Maintained

The acoustic solution was developed around the mechanical ventilation requirement. Its open-louvre construction allows exhaust airflow to continue while providing an acoustically treated, indirect path to the outdoor environment.

This enabled the project to meet environmental noise requirements while maintaining the required ventilation opening.



Architectural Integration

The powder-coated aluminium finish provides a clean external appearance suitable for a premium residential development. Sectional fabrication also allowed the louvre bank to be coordinated with the available opening and surrounding building elements.

The acoustic treatment therefore remained visually integrated with the architecture while concealing the internal attenuation system.

Durable Mechanical-Room Treatment

The perforated GI wall lining, aluminium louvre construction and high-density mineral-fibre infill provide a robust treatment suitable for a basement mechanical environment.

The completed package was engineered for long-term noise control, practical maintenance and compatibility with the development's mechanical and architectural requirements.



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info@kineticsgroup.ae
sales@kineticsgroup.ae



kineticsgroup.ae



04-885 7361