Vibration Prediction & Control Award

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Winner

Bickerdike Allen Partners - Sound-Induced Vibration and Risk to Museum Collections

The National Gallery sound induced vibration research represents pioneering work into the risks posed to artworks by airborne sound, addressing a long standing gap in both acoustics and heritage science. As cultural institutions increasingly host amplified music and events within gallery spaces, collections face repeated vibration loading with potential cumulative effects. This collaborative project – uniting heritage scientists, preventative conservators, acoustic specialists and academic partners – set out to understand these risks and establish evidence based criteria for safe operation.

A central component of the study involved experimental investigations with the National Gallery, including controlled laboratory testing at London South Bank University. Using anechoic chamber conditions, the team isolated airborne sound transmission from structure borne vibration, enabling a clear assessment of how direct acoustic energy alone can induce movement within artworks. Complementary in situ surveys and controlled trials within gallery environments provided insight into real operational conditions and informed the development of practical sound and vibration control criteria for events.

The research combined preventative conservation principles with advanced vibration engineering techniques. Non contact laser Doppler vibrometry was used to measure vibration responses directly on paintings, revealing strongly frequency dependent behaviour. Low frequency content below 100 Hz was shown to produce significant movement even when overall sound pressure levels appeared moderate. This challenges reliance on simple broadband sound limits and supports a more nuanced approach based on frequency content and resonance effects.

In her testimonial, the Principal Scientist at the National Gallery, emphasised the significance and long term value of the work. She noted that while the Gallery has long managed vibration risks from construction and handling, this project entered new territory by examining sound exposure during events. Crucially, the study demonstrated for the first time that airborne sound alone can, under certain conditions, induce vibration in paintings.

Judges recognised the submission as a standout entry with wide reaching impact. They praised its academic rigour, practical application and cross sector collaboration, noting that it "*moved the industry forward*" by establishing criteria for a previously undefined issue and the use of advanced experimental methods was highlighted as a key strength.