CALMFLOOR
ACTIVE VIBRATION CONTROL

CASE STUDY

Fast-track problematic vibration resolution

Client: F1 Arcade

Project: Social gaming & F1 simulation experience centre

Location: Boston, USA

The project

F1 Arcade provides a hugely popular and very dynamic social gaming experience with simulators that replicate the thrills of a race through use of an actuated driving seat.

F1 Arcade in Boston, USA, is set on the second floor of a tall building; a structure comprising a lightweight concrete slab on top of steel beams with a number of high-end retail units below.

Excessive vibration generated while the 62 F1 driver simulators were in use was being transmitted to adjacent units in the building. With restrictions being imposed on the use of the simulators during peak hours by its landlord, F1 Arcade needed a transformative mitigation solution that would resolve its vibration problem – urgently.

The challenge

The challenge was to bring F1 Arcade's excessive vibration to within levels deemed acceptable by the building's owner – without structural intervention, downtime or disruption to F1 Arcade operations. Crucially, the solution had to be tested, proven and commissioned within an exceptionally short timeframe.

Within one week, our UK Technical team flew to the US for an urgent site visit to measure, demonstrate and test the effectiveness of **CALM®FLOOR** active mass damper (AMD) technology.

Close collaboration with F1 Arcade's vibration consultant and the building owner's structural engineering team (McNamara Salvia) and their acoustic engineers (Acentech) was critical. All elements of the test phase had to be meticulously monitored and validated. We were also required to work alongside other third-party contractors to ensure the proposed installation of **CALM®FLOOR** AMDs would be concluded seamlessly.

When F1 Arcade's popular gaming experience centre in Boston reported problematic vibration from its F1 driver simulators, **CALM®FLOOR** was deemed the only potential solution that could meet the challenge.

The UK Tech team flew to the US within days, conducting tests and simulations before installing 11 AMDs and **reducing vibration instantly by 76%.** All this within just **six weeks**.

F1 Arcade, Boston, USA.

F1 ARCADE

For the test, we placed a single **CALM®FLOOR** unit on the structural slab, but not rigidly connected to the structure itself. In initial tests, reductions of over 50% were achieved over a broad frequency range, illustrated by the 1/3 octave plot (top, figure 1). The more detailed spectrogram plot analysis shows energy at multiple frequencies within this region (bottom, figure 1).

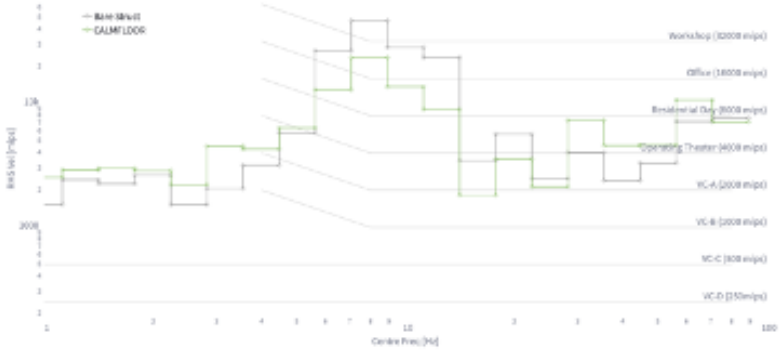


Figure 3: 1/3 octave plot.

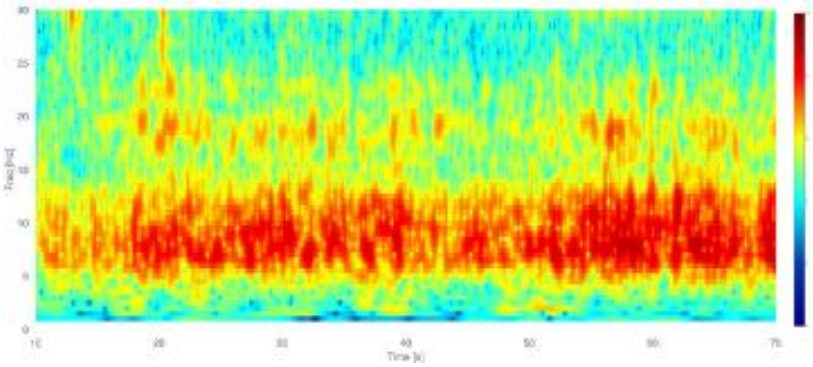


Figure 2: Spectrogram plot.

Our tests demonstrated that **CALM®FLOOR** AMDs would be effective at reducing vibration across this frequency range and, by distributing multiple units to each hotspot and connecting each AMD rigidly to the structure, peak performance would certainly be achieved.

The simulation

A Finite Element (FE) model of a section of the building was created using F1 Arcade's structural drawings. Key structural members, and some non-structural partitions, were included in the model and capture the floor's dynamic behaviour (figure 3).

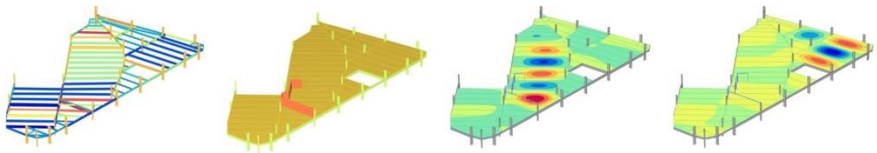
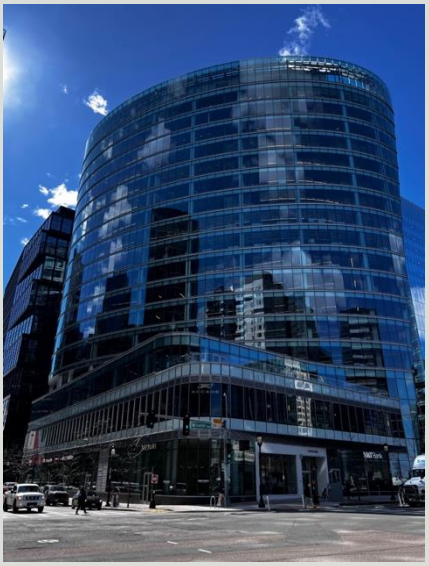


Figure 3: FE model.



"We are pleased to report that our landlord has officially deemed the issue as resolved and closed. Thank you and the CALMFLOOR team for all your hard work in resolving this issue for us."

Nicole Mendoza,
Construction Project Manager, USA
F1 Arcade

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A modal analysis of this model in conjunction with our site measurements was used to identify the best locations for the requisite number of **CALM®FLOOR** units to achieve maximum impact on the structural vibration. The distinction between the dynamic behaviour in different parts of the floor showed how the mode shapes are localised and the likelihood that vibration levels would be exacerbated when the simulators were in use.

This demonstrated that **CALM®FLOOR** AMDs should be spatially distributed to ensure control would be effective and consistent.

The solution

Following our site tests and simulation, we recommended 11 AMDs should be strategically installed at key locations (figures 4 & 5).

The emphasis was placed on areas where multiple simulators had caused excessive, multiple modes of vibration and which had given neighbouring occupants cause for concern. Since the combined force output of multiple simulators running simultaneously had the potential to exceed **CALM®FLOOR** force capacity, clusters of AMD units were recommended.

Figures 4 & 5. Recommended locations of 11 AMDs.

The result

Thanks to a rapid response and the calibre of our site testing and simulations, we deployed a solution that reduced our customer's vibration levels by **76%.** This was implemented without any structural intervention or downtime – within just **six weeks** from date of order.

With a validated data set, F1 Arcade had the evidence and confidence to implement our recommended **CALM®FLOOR** solution. Within hours of installation, our client experienced the high-performance, low-vibration and complaint-free environment we had proved would be achieved.

Having incorporated **CALM®CONNECT** smart portal for real-time monitoring and a **CALM®CARE** comprehensive SLA, F1 Arcade is satisfied that active vibration control is the perfect solution for further locations around the world.

Eliminate unwanted vibration – straight out of the box.

"I'm thrilled to share that the F1 Arcade project was a great success. The data collected from the tenant floor both before and after the installation of Calmfloor units, showed impressive results – a remarkable 76% reduction in the low-frequency vibrations we targeted.

This is a fantastic outcome, and we're grateful for your role in providing such an effective solution for vibration control."

Omer F. Tigli
Vibrations Group Director
McNamara Salvia

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