Manchester mummies like sleeping.

Introduction

Nobody enjoys being woken from a deep and restful sleep, particularly if this involves being unceremoniously shaken from your resting place by large scale construction works. However, as the following case highlights, extensive construction works at the Manchester Museum threatened to rouse the assembled Egyptian mummies from their collective slumber. Bearing in mind that some of these residents had been 'resting' since around 3100 BC, this was to be avoided at all costs.

The situation arose as a result of proposed works as part of a wider Capital Development Project at the Manchester Museum. This project would see some parts of the existing 1912 'pavilion', built to house the archaeological and Egyptological collections, and the 1927 building, housing the ethnographic collections, being modified to accommodate a new wing. The construction of the new wing was to be accompanied by a complete refurbishment of the entire Museum, including the historic Coupland building. The modifications required the removal of some of the internal and external structural elements, these activities had the potential to generate high levels of local vibration. Concern was expressed about the possible effect that such vibration levels could have on the displayed collections of irreplaceable antiquities. As the commencement date for the main works approached this concern became ever more pressing, particularly as many of the larger artefacts including the mummies could not be found alternative temporary accommodation.

The obvious questions, which presented themselves, were - what levels of vibration would cause damage to the exhibits and could the refurbishment continue without removing them? This concern was principally related to the collection of mummies, but also the very fragile entomological exhibits. The immediate response to this question was a resounding ' nobody really knows!' In an effort to address this question, two options presented themselves. The first option was to commence a series of tests, exposing a selection of the mummies to increasing levels of vibration and then quantifying the resulting damage. Strangely this option of literally shaking a mummy to pieces, to assess its robustness, was not greeted with universal enthusiasm by Museum staff! The second option involved a literature review of the subject, to which end a search of the World Wide Web was instituted. This search quickly revealed that the effects of vibration on ancient mummified remains does not appear to be an active area of research.

Consequently an alternative strategy was required. As the artefacts had been exhibited within the museum for many years and had apparently not sustained any particular damage, it was assumed that the current vibration climate must not pose a significant threat to the continued longevity of the exhibits. Therefore an ambient vibration survey to quantify the existing vibration climate, was suggested.

Survey.

Seven particularly sensitive locations were identified and in conjunction with Museum curatorial staff, suitable measurement locations in these areas were identified. It was decided that the principal sources of vibration would be both the passage of vehicles along the busy Oxford Road and the collective footfalls from parties of museum visitors. Unfortunately at this time many of the areas in the 1912 and 1927 buildings were closed to the public, consequently it was not possible to assess the vibration induced by the potentially more significant source of parties of visitors.

The survey itself was conducted using a Svantek Svan 912A with accelerometers mounted on an inertia block. Bearing in mind the Museum's proximity to the busy Oxford Road, the surveys were undertaken to coincide with the morning rush hour. Simultaneous third octave band measurements, between 1 and 80Hz, were made in all of the three orthogonal axes at each measurement location. In addition Museum curatorial staff, during the course of each measurement, made subjective assessments.

As the uncertainty as to what levels of vibration may induce damage remained, the decision was taken to adopt a precautionary approach and utilise human perception as the threshold criteria. This, it was envisaged, would provide suitable 'protection' for the Museum's oldest and most venerable residents. To this end the base curves contained within BS 6472:1992 were employed as the 'not to exceed' threshold criteria. Any subsequent operations generating vibration above the base curve levels would be suspended until an examination of the exhibits had been completed.

Break - out time.

The next phase involved the measurement of two of the operations thought likely to have potentially the greatest impact on the exhibits, namely the breaking out of a concrete stair case in the 1927 building and the removal of a base slab in the Coupland Building. In the case of the staircase, removal was to be effected using pneumatic jack-hammers, however the base slab required the use of an excavator mounted pecker and nibbler.

A series of trial operations were arranged to quantify the typically resulting vibration levels and measurement equipment, museum staff and contractors were placed on standby. Once the assembled personnel had readied their fingernails for nibbling and fixed their combined gazes on the exhibits, the trials commenced. In all cases 60 second bursts of activity were initiated, while RMS acceleration level were measured in the floor in a number of sensitive locations. Activity was then suspended whilst comparisons of the measured levels were undertaken, inspections made, conversations had, brows mopped and consultants revived.

With reference to the jack hammer operations on the staircase, in general the measured RMS acceleration did not breach the base curve values, confirming the subjective assessment. In this situation the measured Z-axis acceleration levels remained higher than the levels measured in both the X and Y-axes. Turning to the breaking out of the floor slab, again the measurements confirmed the subjective assessment that vibration could just be perceived in the floor. In this case the measured levels in the X and Z axes exceeded the levels measured in the Y axis, especially when the excavator bucket was scraping along the edge of the slab removing some of the fragmented concrete. Consequently whilst some of the exhibits on the ground floor were shaken, they were not unduly stirred.

Just in case.

Much to the relief of all involved the above exercise demonstrated that works could be conducted without necessitating the temporary removal of the exhibits. Despite this the original question relating to the resilience of ancient Egyptian mummies, when exposed to vibration, remains. Therefore should anyone be in possession of such information the author would be delighted to hear from you just in case.

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