INTRODUCTION

The aim of this data sheet is to give advice in methods of limiting vibration within new build dwellings.

All forms of construction will vibrate due to the application of live loads, whether this is from occupants or from equipment such as washing machines or air conditioning units. Within a domestic property the vibration is more commonly felt coming through the floor with suspended floors being the most active member. With advancements in manufacturing technology, such as prestressing of concrete beams, it is now possible to span further between supporting walls/foundations. However, this comes with an increased risk of unwanted vibration within the floor.

It should be noted that modern construction details, which include lightweight internal partitions and perimeter floor insulation strips, have increased the thermal efficiency of the dwelling. However, such details could also have a detrimental effect on the dynamic performance of the entire dwelling, since the amount of mass available for damping out vibrations has reduced.

DESIGN CHECK

Floor beams should be checked for the service and ultimate bending moments and deflection. In addition, the natural frequency of the floor should be calculated and checked against the minimum requirements of 4.0 Hz for domestic usages and 8.4 Hz for rhythmical activities. The live load is applied in accordance with BS EN 1990 and BS EN 1991-1-1 and is defined as a quasi-static action, i.e. a dynamic action represented by an equivalent static action.

FLOOR SPAN

The clear span of the floor beams will govern what type of beam is used, e.g., depth and width. In addition to the clear span of the beams, the spacing of the beams also affects the structural behaviour of the floor. Beams that are closer together attract less load and deflect less. This results in a higher natural frequency of the floor, which is desirable.
LOCATION OF MACHINES/EQUIPMENT

The location of a machine can influence the performance of the floor. Placing a machine at mid-span will have a far greater impact than if the machine is placed at the end of the beam. This impact will not only be an increase in the deflection but could also be an increase in the level of vibration. In addition to not having a washing machine placed at midspan it is also advantageous to locate the machine away from lightweight internal walls. See Figure 1 for ideal locations.

Figure 1 - Ideal washing machine location

RECOMMENDATIONS

1) Design for a higher minimum natural frequency of 6.2Hz

2) Positions sources of vibration, e.g., washing machines, away from the mid-point of a beam span