Understanding Document E

Richard Watson, Hepworth Acoustics Limited advise on getting to grips with Approved Document E

The latest revision of Approved Document E to the Building Regulations has been in effect for over three years now. Most architects and related professionals I come across up and down the country are aware of it to one degree or another. However, it is a different matter to fully comprehend the ramifications of the entire document, especially when a working knowledge of many other Approved Documents is required.
Understanding the numerical sound insulation performance requirements in Approved Document E is reasonably simple, as there are two tables of values in the regulations (table 1a for dwelling houses and flats, table 1b for rooms for residential purpose), however, understanding what 45dB DnT,w + Ctr means, and how to achieve it is much more difficult.

The terms and units used in describing sound insulation performance are complex, and it is not easy to predict how a construction type will perform on-site, particularly with other complicating factors such as flanking walls and floors, layout, workmanship etc.

The first step is to ensure that the separating wall or floor has been correctly designed, with the advice of an acoustician.

Next it is necessary to ensure that the performance of the separating wall or floor is not compromised in construction. The potential for compromising the sound insulation performance of a separating element can be reduced by ensuring the most common construction faults are avoided. The following construction faults have been witnessed on many sites, and if avoided, or spotted early enough to remedy, the separating wall or floor should perform to the level specified.

Incorrect Wall Ties

Separating walls must have Approved Document E "type A" wall ties. BS5628 is the primary document generally used for defining wall ties. It provides recommendations on length of tie, embedment, density and positioning. Masonry-to-masonry ties are classified as Types 1 to 4; where the classification of each tie is determined by strength, function and use. However, the BS5628 types are not comparable with the Approved Document E types, and BS5628 should be disregarded when using Approved Document E.

Approved Document E "type A" wall ties are either a butterfly, or must meet a specific dynamic stiffness. However, butterfly wall ties were specified in BS1243, and this has recently been withdrawn by BSI and so we are left with the dynamic stiffness method only. These wall ties are usually a double triangle tie type, but not all double triangle types will meet the dynamic stiffness requirement.

Many manufactures make "type A" wall ties, and usually they are 2.3 to 2.5mm diameter stainless steel wire in a double triangle shape. To check if a tie type qualifies, the dynamic stiffness should be as follows:

$n\, k_{Xmm} < 4.8\ (MN/m^3)$ where cavity width is X mm and n is number of ties per m^2.

Approved Document E also specifies a "type B" tie for use in external masonry cavity walls, i.e. not separating walls between demises. Therefore when a manufacturer states that a tie is "Approved Document E compliant", it may not necessarily mean it can be used in separating walls.

It is still hard to know by sight if a wall tie is "type A" Generally, if it looks hard to bend, it won't be a "type A" wall tie. Using the wrong wall tie type may reduce performance by around 5dB (or even more, depending on the wall tie used). This alone can make a well designed wall result in a failure on site.

Bridging Cavity

Following on from incorrect wall tie types, the next most likely fault in a separating wall is probably bridging of the cavity. The cavity between masonry leaves needs to be clear. Any bridging across the cavity will reduce the performance of the wall, in the same way that bridging a car shock absorber with metal would reduce its efficiency. All additional bridging will reduce performance to some degree.

Floating Screed

"Type 2" floors in Approved Document E of building regulations are essentially a concrete base of some sort, with ceiling, and a floating screed on a resilient layer. These floors are used a lot in sites up and down the UK. Generally speaking, the airborne sound insulation of these floors is good. However, reasonably often these floors will fail impact sound insulation testing.

Approved Document E does not permit any floor covering to be in place during testing and impact testing must be undertaken directly onto the screed. The "type 2" floor relies on impact sound insulation performance being provided by the resilient layer between floating screed and base. If the resilient layer is not in good condition, not properly jointed, or not turned up sufficiently around the perimeter of the floating screed, then the screed can bleed through to the concrete base, or possibly into the walls. This will reduce performance in a similar way to the shock absorber example given earlier as the two 'independent' materials are now joined. This lack of separation between the two layers has a massive effect on impact sound insulation performance, and usually only a minimal effect on airborne performance. It is critical that the floating floor does float. In my experience, often the best floating floors are installed by specialist sub-contractors who spend all day every day laying these types of floor.

Just for completeness, a "type 1" concrete floor can have a soft floor covering bonded to the floor surface as this is viewed as part of the construction. Approved Document E defines a soft floor covering as any resilient material or material with resilient base with an overall uncompressed thickness of at least 4.5mm or 17dB Lw. The impact sound insulation test is carried out onto the floor covering, and will typically have a very good impact sound insulation performance.