# BubbleDeck Acoustic Tests and Reports

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# Acoustic Tests and Studies

Tests have been carried out in Denmark, the Netherlands, Germany and in UK (Channel Islands).
The conclusions are unambiguous:

BubbleDeck performs acoustically in a better way than any other hollow or solid floor structures. Because of the three-dimensional structure and the gentle graduated force flow, the hollow spheres have a positive influence on sound insulation.

The tests reveal that airborne sound insulation is even higher than expected. This indicates the bubbles have a positive influence. Furthermore the combination of in-situ concreting on site with the semi pre-cast elements produce a seamless finished slab without any joints, avoiding joint discontinuity associated with fully pre-cast planks (such as hollowcore) that can seriously impair sound insulation performance.

## *BUILDING REGULATIONS CRITERIA*

Approved Document E, 2003 Edition: Floor Types 1 or 2 requires a concrete slab (cast in-situ or with permanent shuttering) to have a minimum mass of either 365 kg/m2 (Clause 3.29 Floor Type 1.1C), or 300 kg/m2 (Clause 3.67 Floor Types 2.1C and 2.1C(b)).

### *Our thinnest BubbleDeck 230mm slab with a mass of 390 kg/m$^2$ (95% full bubble pattern) exceeds Approved Document Part E requirement for Floor Types 1 or 2.*

All thicker BubbleDeck slab types have increased mass, exceeding Approved Document Part E requirement for Floor Types 1 or 2, as follows:-

| Slab Type | Thickness | Mass kg/m$^2$ |
|---|---|---|
| **BD230** | **230mm** | **390** |
| **BD280** | **280mm** | **484** |
| **BD340** | **340mm** | **573** |
| **BD390** | **390mm** | **694** |
| **BD450** | **450mm** | **820** |

## *TESTS AND REPORTS*

### *Report from Adviesbureau Peutz & Associes bv: Comparison of BubbleDeck vs.Hollow core – Enclosure F1.*

A comparison was made between BubbleDeck and hollow core deck prior to the construction of Weena Tower. Deck types of similar height were compared.
The noise reduction with BubbleDeck was 1 dB higher than hollow core.

The main criteria for reducing noise is the weight of the deck and therefore BubbleDeck evidently will not act otherwise than other deck types with equal weight.

### *German Test Certificate Number P-SAC 02/IV-065 concerning solid and live load Sound insulation – Enclosure F2.*

The German "Materialforschungs- und Prüfungsanstalt für das Bauwesen Leipzig e.V." has issued the German Test Certificate Number P-SAC 02/IV-065 concerning solid and live load Sound insulation according to DIN EN ISO 140 / DIN ISO 717.

The results for 230 and 340 mm decks are:

| | **Sound insulation dimension** | **Additional spectrum adaptation values (DIN ISO 717-1)** | | | | | | **Standard impact sound level** |
|---|---|---|---|---|---|---|---|---|
| Deck | $R_w$ (C;Ctr) | $C_{50\text{-}3150}$ | $C_{tr50\text{-}3150}$ | $C_{50\text{-}5000}$ | $C_{tr50\text{-}5000}$ | $C_{100\text{-}5000}$ | $C_{tr100\text{-}5000}$ | $L_{c,w\ (C1;C50\text{-}3150)}$ |
| mm | dB | dB | dB | dB | dB | dB | dB | dB |
| **230** | 55 (-2 ; -7) | -2 | -8 | -1 | -10 | -1 | -8 | 78 (-11 ; -12) |
| **340** | 57 (-2 ; -7) | -3 | -9 | -2 | -7 | -2 | -9 | 76 (-13 ; -13) |

### *Test Report from Adviesbureau Peutz & Associes b.v.: Sound Resistance. March 2004 - Enclosure F3.*

Field tests in a raw building in Leiden, the Netherlands, concerning “Air and Contact Noise-resistance”. The slabs were BD 230 mm with a fixed floor layer of 30 mm.
The measurements and ratings were carried out in regulation with ISO 717-1:1996 and NEN 5077:2001

| | | | |
|---|---|---|---|
| Weighted Sound Reduction (vertical) | $R'_w$ (C;Ctr) | = | 54 (-1; -14) |
| Reduction Index for Airborne Sound | $I_{lu}$ | = | + 3 |
| Impact Resistance Level (vertical) | $L'_{n,Tw\ (}C_1)$ | = | 72 (-14) |
| Reduction Index for Impact Sound | $I_{co}$ | = | + 2 |
| Impact Resistance Level (horizontal) | $L'_{n,Tw\ (}C_1)$ | = | 63 (-13) |
| Reduction Index for Impact Sound | $I_{co}$ | = | + 10 |

### *Test Report from Ian Sharland Ltd : Airborne and Impact Sound Insulation. Nov 2005 - Enclosure F4.*

Field tests in Le Coie Housing Development in St. Helier, Jersey, concerning “Airborne and Impact Sound Insulation”. The slabs were BD 280 mm, part of a standard party floor with ceiling and screed. The measurements and ratings were carried out in regulation with ISO 140-4:1998, ISO 140-7:1998, ISO 717-1:1997 and ISO 717-2:1997.

The Vertical Impact sound reduction (Floors) mean result was: $L_{nTw}$ = 44 dB
The Vertical Airborne sound reduction (Floors) mean result was: $D_{nTw}$ = 61 dB
The Horizontal Airborne sound reduction (Walls) mean result was: $D_{nTw}$ = 60 dB

The results show that the floor structures tested meet and significantly exceed the requirements of the UK Building Regulations (2000).

### *Test Report from Ian Sharland Ltd : Airborne and Impact Sound Insulation. Aug 2005 - Enclosure F5.*

Field tests in Le Coie Housing Development in St. Helier, Jersey, concerning “Airborne and Impact Sound Insulation”. The slabs were BD 280 mm, part of a standard party floor with ceiling and screed. The measurements and ratings were carried out in regulation with ISO 140-4:1998, ISO 140-7:1998, ISO 717-1:1997 and ISO 717-2:1997.

The Vertical Impact sound reduction (Floors) mean result was: $L_{nTw}$ = 52 dB
The Vertical Airborne sound reduction (Floors) mean result was: $D_{nTw}$ = 63 dB
The Horizontal Airborne sound reduction (Walls) mean result was: $D_{nTw}$ = 50 dB

The results show that the floor structures tested meet and exceed the requirements of the UK Building Regulations (2000).

***Test Report from Ian Sharland Ltd : Airborne and Impact Sound Insulation. May 2006 - Enclosure F6.***

Field tests in Le Coie Housing Development in St. Helier, Jersey, concerning “Airborne and Impact Sound Insulation”. The slabs were BD 280 mm, part of a standard party floor with ceiling and screed. The measurements and ratings were carried out in regulation with ISO 140-4:1998, ISO 140-7:1998, ISO 717-1:1997 and ISO 717-2:1997.

The Vertical Impact sound reduction (Floors) mean result was: $L_{nTw}$ = 45 dB
The Vertical Airborne sound reduction (Floors) mean result was: $D_{nTw}$ = 63 dB
The Horizontal Airborne sound reduction (Walls) mean result was: $D_{nTw}$ = 54 dB

The results show that the floor structures tested meet and exceed the requirements of the UK Building Regulations (2000).

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