

**Table 5 — Indoor ambient noise levels in spaces when they are unoccupied**

Criterion	Typical situations	Design range $L_{Aeq,T}$ dB	
		Good	Reasonable
Reasonable industrial working conditions	Heavy engineering	70	80
	Light engineering	65	75
	Garages, warehouses	65	75
Reasonable speech or telephone communications	Department store	50	55
	Cafeteria, canteen, kitchen	50	55
	Wash-room, toilet	45	55
	Corridor	45	55
Reasonable conditions for study and work requiring concentration	Library, cellular office, museum	40	50
	Staff room	35	45
	Meeting room, executive office	35	40
Reasonable listening conditions	Classroom	35	40
	Church, lecture theatre, cinema	30	35
	Concert hall, theatre	25	30
	Recording studio	20	25
Reasonable resting/sleeping conditions	Living rooms	30	40
	Bedrooms <sup>a</sup>	30	35

<sup>a</sup> For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB  $L_{Amax}$ .

**Table 6 — Indoor ambient noise levels in spaces when they are unoccupied and privacy is also important**

Criterion	Typical situations	Design range $L_{Aeq,T}$ dB
Reasonable acoustic privacy in shared spaces	Restaurant	40–55
	Open plan office	45–50
	Night club, public house	40–45
	Ball room, banquet hall	35–40
	Reception room	35–40

### 7.6.3.1 General

Complaints from office workers arise from the intrusion of external noise, high internal noise levels from services and excessive reflections from room surfaces. Inadequate sound insulation between offices is also a frequent source of complaint from those who require privacy for telephone conversations and interviews.

Privacy between offices and between an office and an occupied space requires good sound insulation and moderate background noise to mask intruding speech. In cellular office layouts the minimum acceptable sound insulation between two offices is about  $D_w = 38$  dB. Where privacy is important the minimum sound insulation should be  $D_w = 48$  dB although even then it is possible that voices will be heard, but the conversation will not usually be understood. Where the indoor ambient noise level is low it may be necessary to design for higher insulation values. As a rough guide, speech will be audible but not intelligible if  $D_w + L_A > 75$ , where  $D_w$  is the weighted level difference between rooms, and  $L_A$  is the indoor ambient noise level in the room.

Our assessment using measured levels of sound insulation takes the ambient noise levels for an unoccupied open plan office as recommended by table 6 of BS8233: 1999 Sound insulation and noise reduction for buildings – Code of practice’ 45-50dBA and a conservative assessment of noise levels in an occupied open plan space of 55dBA to assess the potential privacy ratings of the Airea system in practice.

**In-situ Measurements**

Measurements have been obtained using a precision grade sound analyser from Norsonic Type 140. A pink noise source has been placed within the Airea pod and measurements have been obtained internally and externally at a measured distance of 2 metres from the pod. Within the pod measurements have observed the distance from source and nearest reflective surface parameters discussed within BS EN ISO 140-4:1998 ‘Acoustics. Measurement of sound insulation in buildings and of building elements. Field measurements of airborne sound insulation between rooms’.

**Results**

Freq.	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dBA
Source	103.9	108.8	106.1	100.1	97.1	95.4	99.2	95.7	105.6
Receiver @ 2m Average	90	95.1	85.5	75.1	70	64.3	64.5	59.7	82.5
Level difference	13.9	13.7	20.6	25	27.1	31.1	34.7	36	Dw = 28dB

The following ISO 140-4 performance graph has been determined from the measurements undertaken. (Shown Overleaf)

Performance Certificate:

<b>Standardized level difference according to BS EN ISO 140-4</b>																																													
Field measurements of airborne sound insulation between rooms																																													
Client: OrangeBox	Date of test: 28 June 2011																																												
Description: Airea																																													
Object: Standard Circular Pot measurements from inside to two metres external.																																													
Source room volume: Receiving room volume:	<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>----- Frequency range according to the curve of shifted reference values (ISO 717-1)</p> <p>-----</p> </div> </div>																																												
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 2px;">Frequency f [Hz]</th> <th style="padding: 2px;"><math>D_{nT}</math> 1/3 octave [dB]</th> </tr> </thead> <tbody> <tr><td>50</td><td></td></tr> <tr><td>63</td><td></td></tr> <tr><td>80</td><td></td></tr> <tr><td>100</td><td>13.9</td></tr> <tr><td>125</td><td>13.7</td></tr> <tr><td>160</td><td>17.0</td></tr> <tr><td>200</td><td>18.0</td></tr> <tr><td>250</td><td>20.6</td></tr> <tr><td>315</td><td>25.0</td></tr> <tr><td>400</td><td>24.0</td></tr> <tr><td>500</td><td>25.0</td></tr> <tr><td>630</td><td>26.0</td></tr> <tr><td>800</td><td>24.0</td></tr> <tr><td>1,000</td><td>27.1</td></tr> <tr><td>1,250</td><td>27.0</td></tr> <tr><td>1,600</td><td>28.0</td></tr> <tr><td>2,000</td><td>31.1</td></tr> <tr><td>2,500</td><td>32.0</td></tr> <tr><td>3,150</td><td>34.7</td></tr> <tr><td>4,000</td><td></td></tr> <tr><td>5,000</td><td></td></tr> </tbody> </table>	Frequency f [Hz]	$D_{nT}$ 1/3 octave [dB]	50		63		80		100	13.9	125	13.7	160	17.0	200	18.0	250	20.6	315	25.0	400	24.0	500	25.0	630	26.0	800	24.0	1,000	27.1	1,250	27.0	1,600	28.0	2,000	31.1	2,500	32.0	3,150	34.7	4,000		5,000		
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