

ISO 16283

The pros and cons in a nutshell



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But first, a little history.....

Anyone remember Ecohomes 2006?

BRE dropped the ANC Scheme!

ANC Scheme members were no longer allowed to carry out tests for Ecohomes 2006.

“The ANC test procedure involves people waving a microphone around in the test room and using a portable stereo (ghetto blaster) as the sound source”

(BRE Head of Acoustics)

Following urgent negotiations with BRE, the ANC issued the following statement to its members:

“The ‘manual moving microphone’ test procedure, when correctly implemented, complies fully with ISO 140-4 and ISO 140-7 and has been considered acceptable by the ANC Registration Scheme committee and by DCLG (formerly the ODPM). The test method is not accepted by BRE for Ecohomes tests, however, and the Ecohomes protocol required for ANC testers is currently as follows:

To be accepted by the [Ecohomes] assessor, reports prepared by ANC registered consultants must clearly confirm compliance with one of the following methods:

- 1. Unattended source and receiver room measurements, using static microphone positions (as defined in ISO 140:4 Section 6.3.2.).*
- 2. Unattended source and receiver room measurements using a mechanical rotating boom microphone system (sweep radius as defined in ISO 140:4 Section 6.3.2.)*
- 3. Attended source and receiver room measurements using static microphone positions (as defined in ISO 140:4 Section 6.3.2) provided that the tester remains still during each measurement and provided that the tester remains in the room throughout the measurements.*

This ludicrous requirement persisted until the Code for Sustainable Homes was published in May 2008 and Ecohomes was phased out!

Research

IOA Spring Conference – University of Reading – August 2007

An empirical study of the effects of occupied test rooms when measuring Airborne Sound Insulation

A joint research project by the Association of Noise Consultants (ANC), Robust Details Ltd (RDL) and the Building Research Establishment (BRE).

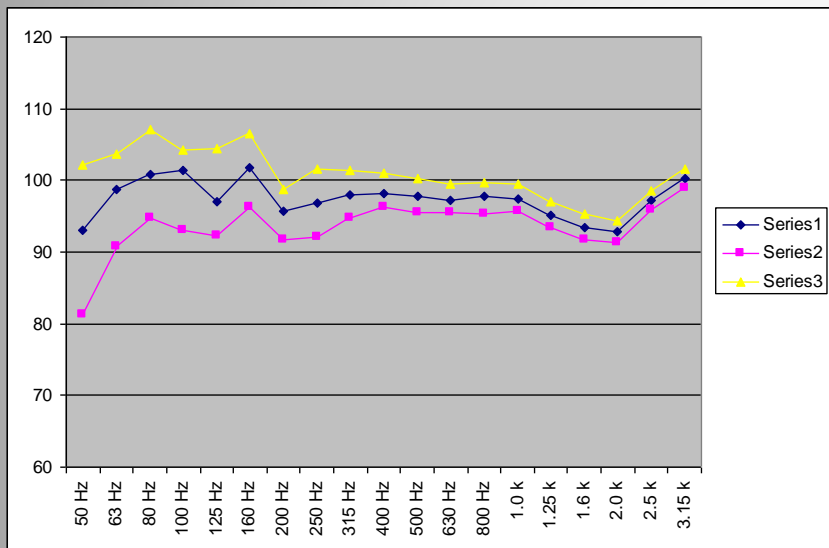
Lead author Iain Critchley MIOA

August 2007

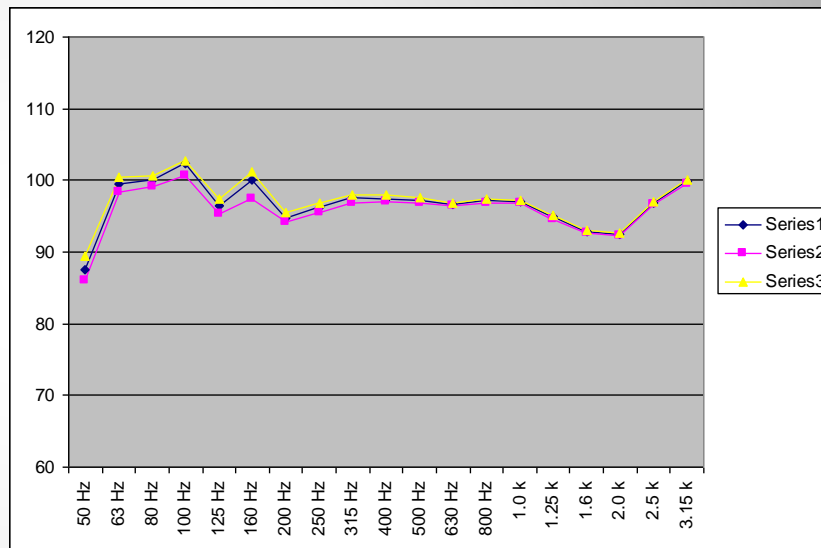
The study proved two things beyond doubt.....

- The presence of a person in the test rooms makes no significant difference to the test result, with just a small effect observed in rooms of 20m^3 or less.
- The manual moving microphone method is more repeatable than using fixed mic positions and was remarkably repeatable at low frequencies.

Fixed mic positions



Moving mic hand held



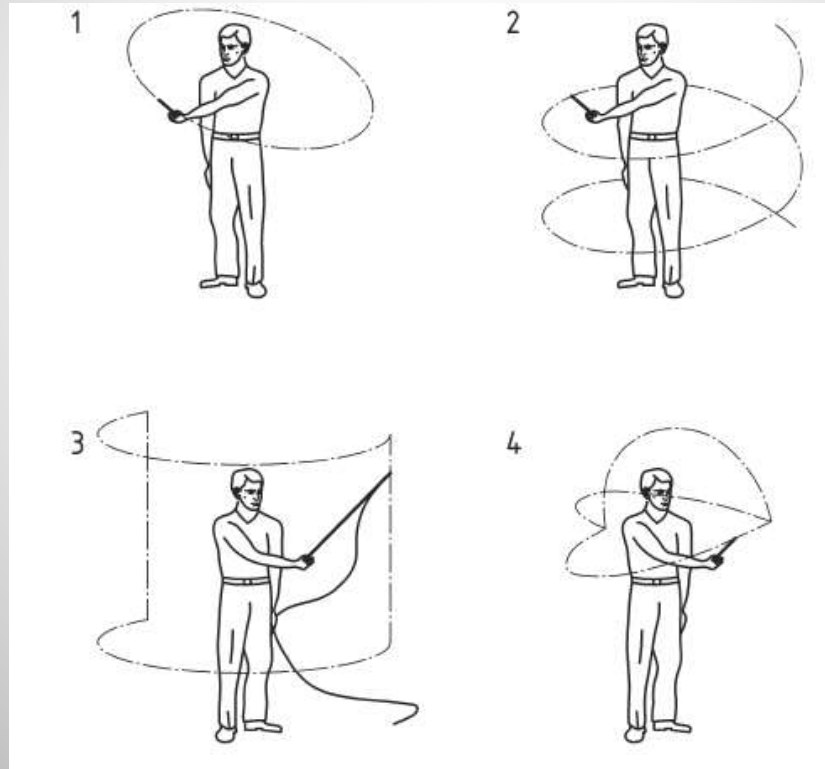
So much for “waving a microphone about in the source room”

Summary test results compared

(we had to calculate the SNQ to 2 dp to see the differences)

| Test | Date | Room Size | Method | Mean (rounded) | Mean (to 2dp) | SD | Min | Max | Range |
|------|------------|-----------|-------------------|----------------|---------------|------|-------|-------|-------|
| 9 | 16/07/2007 | 50 | Static unoccupied | 51 | 51.01 | 0.34 | 50.08 | 51.94 | 1.860 |
| 10 | 16/07/2007 | 50 | Static, occupied | 51 | 50.91 | 0.37 | 49.76 | 51.7 | 1.940 |
| 11 | 16/07/2007 | 50 | Moving microphone | 50 | 50.19 | 0.19 | 49.65 | 50.67 | 1.020 |
| 12 | 26/07/2007 | 50 | Static unoccupied | 51 | 51.06 | 0.33 | 50.18 | 51.81 | 1.630 |
| 13 | 26/07/2007 | 50 | Static, occupied | 51 | 50.77 | 0.29 | 49.89 | 51.47 | 1.580 |
| 14 | 26/07/2007 | 50 | Moving microphone | 51 | 50.55 | 0.16 | 50.24 | 50.94 | 0.710 |
| 21 | 17/10/2007 | 30 | Static unoccupied | 53 | 52.67 | 0.23 | 51.92 | 53.19 | 1.260 |
| 22 | 17/10/2007 | 30 | Static, occupied | 52 | 52.37 | 0.27 | 51.63 | 53.04 | 1.400 |
| 23 | 17/10/2007 | 30 | Moving microphone | 52 | 52.11 | 0.14 | 51.8 | 52.49 | 0.690 |
| 24 | 18/10/2007 | 20 | Static unoccupied | 52 | 52.46 | 0.22 | 51.87 | 52.99 | 1.120 |
| 25 | 18/10/2007 | 20 | Static, occupied | 52 | 52.32 | 0.25 | 51.63 | 52.88 | 1.250 |
| 26 | 18/10/2007 | 20 | Moving microphone | 52 | 51.5 | 0.31 | 50.58 | 52.23 | 1.650 |

The joint research project led to the widespread acceptance of 'body in room' and 'manual scanning' by BRE and UKAS and is now incorporated in BS EN ISO 16283 Parts 1 and 2.



BS EN ISO 16283-1:2014

Incorporating corrigendum June 2014



BSI Standards Publication

Acoustics — Field measurement of sound insulation in buildings and of building elements

Part 1: Airborne sound insulation

BS EN ISO 16283-2:2015



BSI Standards Publication

Acoustics — Field measurement of sound insulation in buildings and of building elements

Part 2: Impact sound insulation

BS EN ISO 140 Parts 1 and 2

~~BS EN ISO 140 Parts 1 and 2~~

WITHDRAWN

The official position, under advice from DCLG, regarding pre-completion sound insulation testing in dwellings (excluding schools and commercial buildings) is to follow the withdrawn ISO 140 Standards (Parts 4 and 7) until Approved Document E, Annex B, is superseded, updated or amended to specifically reference the replacement ISO 16283:2014 Standards (Parts 1 and 2).

But in the meantime we can use it as 'guidance'.

ISO 16283 'guidance'

BS EN ISO 16283:2014 Part 1 (and Part 2 for impact) should be used as guidance and Annexes C and D should now be referenced where appropriate, replacing previous guidance in BS EN ISO 140-14:2004 for 'special situations in the field', which is also now withdrawn.

BS EN ISO 16283:2014 Parts 1&2 usefully permit the tester to remain in the test room and describe several manual scanning techniques, which the withdrawn ISO 140 Parts 4 and 7 do not.

BS EN ISO 16283:2014 Parts 1&2 also describe impulsive sound sources for reverberation time measurement, using reverse integration methods, according to BS EN ISO 3382-2:2008, which the withdrawn ISO 140 Parts 4 and 7 do not.

BS EN ISO 16283:2014 Parts 1&2 gives guidance on 'damped' rooms and 'oddly shaped rooms'.

It is therefore permitted for ANC Scheme members to adopt BS EN ISO 16283:2014 Part 1 and Part 2 as guidance, where appropriate, subject to the following conditions:

1. Tests must fully comply with Annex B of ADE.
2. There is no relaxation of the '6dB' rule.
3. There is no change to the current 'rounding' requirements.
4. Calculations of DnT and L'nT shall be in accordance with ISO 140 Parts 4 and 7.

The Pros of ISO 16283-1

More accuracy and better repeatability than ISO 140 Part 4.....

Ambiguities clarified as follows:

- No more rounding errors as rounding is included in the calculation procedure.
- Floating point error also eliminated by rounding.
- The 'what is meant by less than 10 dB?' error eliminated in the conditional background correction.
- Preference for T20 over T30, a significant cause of uncertainty under ISO 140 Parts 4 and 7.
- Manual scanning now officially endorsed – much improved repeatability.
- No more averaging errors – arithmetic vs. linear no longer ambiguous and reliant on ADE.

- Use of omnidirectional sound sources means source orientation irrelevant, no need to consider sound field (except in highly damped rooms).
- Impulsive RT's can be used following ISO 3382-2 for better repeatability.
- Guidance on source positioning etc. now incorporated into the main document – no additional documentation, practice guidance etc. really necessary.

(This is an important consideration and is one argument for adopting the new ISO standard in ADE, sooner rather than later, as ADE applies also to non ANC members who don't have the benefit of workshops, conferences and practice guidance)

- Uncertainty statement included in reports.

In summary...

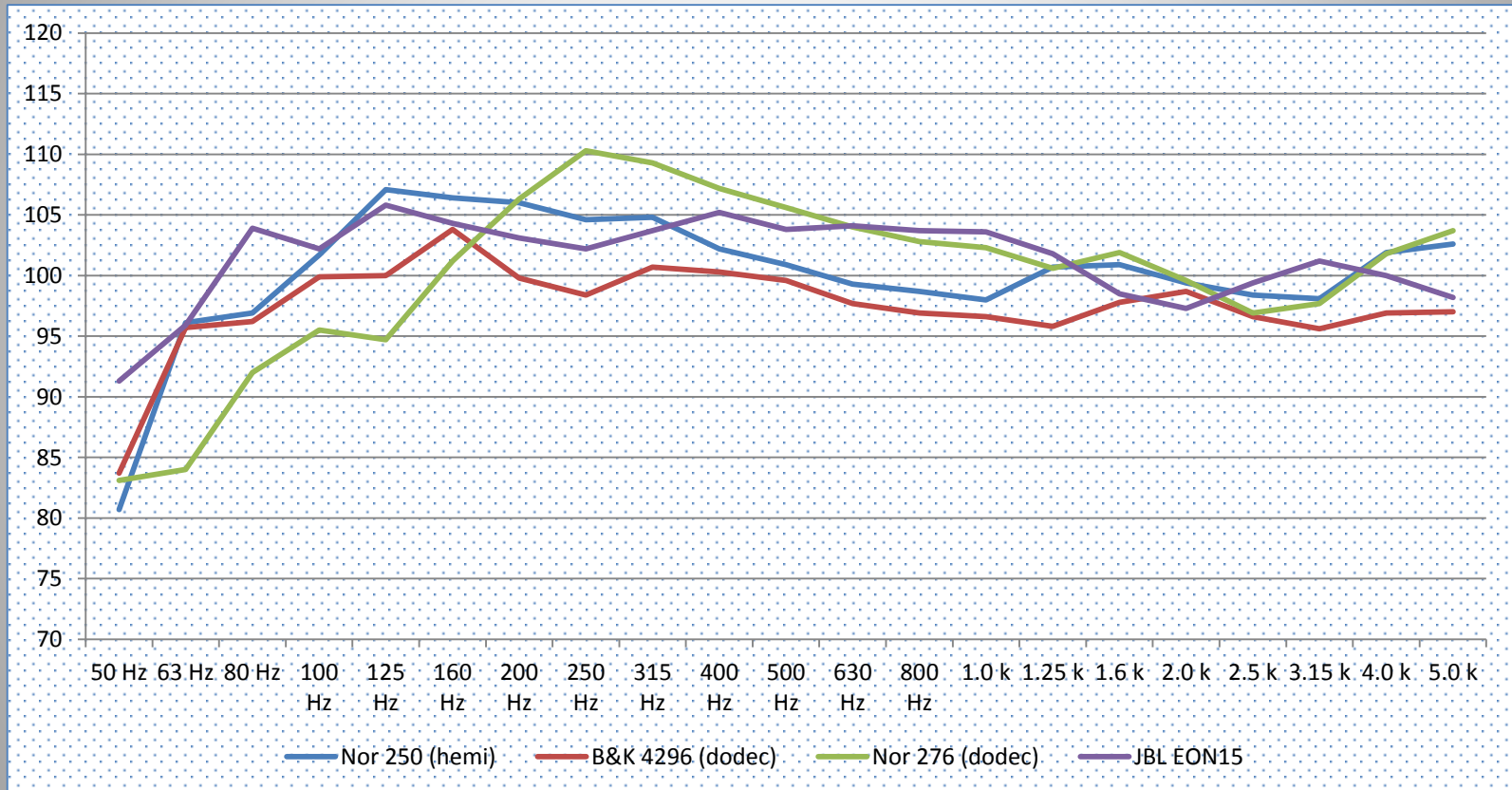
- Basically, when working to ISO 140 the tester is required to have additional supporting documentation to hand i.e. ISO 140-14, ADE Annex B and the Good Practice Guide to explain all the anomalies and ambiguities in the Standard.
- With ISO 16283, all the guidance is included in the main document.



Cons of ISO 16283-1

- Omnidirectional sound source essential – dodec, cube, or hemi-dodec.
- Cost of a dodec is about 8 times the cost of a cabinet speaker.
- Dodecs less powerful than equivalent IB (cabinet) sound sources, especially at LF
- Very tedious procedure required for extended frequencies in small rooms (LFMP). Arguably unnecessary!
- Intended for room sizes up to 250 m³ what about bigger spaces?
- Comparison of test data shows that about 1 in 40 tests are 1 dB 'worse' when compared to ISO 140-4, due to different 'averaging' method.

Example source spectra compared (30 m³ unfurnished)



Pros of ISO 16283-2

- Clarification of background correction and averaging procedures, depending on number of tapper positions.
- Background correction is applied to each tapper measurement before averaging!
- The $L'nT$ values are energy averaged, not the receiver room levels.
- Option of rubber ball should it be required.

Cons of ISO 16283-2

- Standard poorly written – confusing
- Can be complicated, when applying background correction and averaging (too many options).
- Background correction applied to individual tapper positions or ‘pairs’ of positions, e.g....
- $4 \times 2 = 8$ measurements (average of 4 L'_{nT} calculations)
- $8 \times 1 = 8$ measurements (average of 8 L'_{nT} calculations)

SITRI Scheme (Ireland)

- Officially launched on 27th January 2016
- TGD E references ISO 16283 Parts 1 and 2.
- 100 Hz to 3150 Hz
- Supported by DECLG.
- Scheme operated and owned by ANC.
- Currently audited by ANC examiners.
- Different to ANC Scheme in that testers do not have to be acoustic consultants and are not members of the ANC.
- But – they have to interpret a complicated test regime resulting in a lot more testing than for PCT (new build and conversion treated differently).



- Competent person scheme in accordance with ISO 17024.
- Two routes to entry; Training or Experience
- Training is the IOA's CCIBAM
- Extensive supporting information required, insurances, QA procedures etc.
- Experience of ISO 16283 to date has flagged up several anomalies with the new standard (Part 1).
- Practice notes issued and on the SITRI website.
- Too early to comment on Part 2.

Practice Notes

- Source height difference 0.7 metres?
- (not possible in normal rooms)
- Same requirement for all planes making the diagrams in the annexes a bit 'wrong'.
- Complicated geometry?
- Uncertainty statement?

Latest updates.

- So far 12 testers and 4 'in progress'.
- Construction industry has been slow to get going with only 11,000 completions in 2016, rather than 25,000 planned.
- Testing by unregistered testers