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TO : LES FOTHERGILL BY EMAIL
CC : ANC BOARD
DATE : 23 JANUARY 2009

Dear Les

RE : BB93 REVIEW

Further to your recent call for comments on the review of BB93, you have received a number of responses direct from some of our members. I have received a number of emails containing comments which I assumed had also been sent to you as I had requested when forwarding your call for comments to the members. To avoid any possible omission I have copied these to you unaltered and without comment.

I have received phone calls from a number of members eager to discuss the issues, rather than didactically to set out views on issues on which many acknowledge that different views might be equally valid. We also had a very constructive informal technical forum at the ANC Company Meeting on 19 January. The following is my compilation of the issues raised, with some indication of members' views where appropriate. At this stage I think it more valuable to ensure that all of the issues are raised than to attempt to put forward solutions – that will be the task of the Review panel, informed no doubt by the joint IoA / ANC workshop on 24 February.

I have divided the issues into headings which seem logical and which should be self-explanatory ; they might be used as the structure for the review. I appreciate that some of the detailed discussions will not be possible to cut and paste into a spreadsheet so I have appended a tabular summary of our comments using the same reference numbers. These do not relate to section numbers in BB93, which are referenced in the text as required.

1 SCOPE, APPLICATION AND REGULATION

1.1 The value of BB93

Building Regulation E4 and BB93 has resulted in a significant improvement in acoustic conditions in new and refurbished schools. The simple reason for this is that prior to regulation, guidelines on acoustics in schools were widely ignored. Many of our members are still sorting out basic acoustic problems in schools built while BB87 was in existence but was not enforced.

The existence of minimum compliance standards in BB93 has probably led some designers and consultants to use the criteria therein as a matter of course, without due consideration of whether they are the correct or sufficient criteria for each project. That is an inevitable consequence of any published criteria – BB93 is not a substitute for proper thoughtful consultancy.

I have, however, heard no-one working in this field – whether acoustics consultant, architect, teacher or educationalist – suggest that BB93 should be withdrawn or that the principle of regulation of school acoustics is bad.

1.2 Regulation, guidelines and contracts

Many of the problems with application of BB93 arise because the one document contains both conformance values for compliance with regulations, and guidelines on acoustic design. It is not widely understood that these are two different aims. Regulations must, by definition, set minimum standards while guidelines will generally be for good or excellent standards. This is not widely understood even among acoustics consultants.

BB93 does differentiate between its two roles but, unfortunately, very few users refer to anything other than to the tables and criteria set out in Section 1. Even worse, a substantial number of schools building contracts have no acoustic specification other than "Compliance with BB93" although this is not the intention of BB93.

The net result is that many schools are being built to achieve the minimum standards where higher standards would be appropriate. For example, the standards for sound insulation between practice rooms are adequate for classical music instruments and were set because they are practicable to build using partly-isolated dry-lined constructions. For louder instruments, however – brass, percussion, bass guitars etc – much higher standards of sound insulation are necessary, and these require a different approach, either with fully-floated masonry rooms or, more realistically, using stores and circulation areas as buffer zones between rooms.

This conflict between roles of BB93 needs to be addressed and there may be an argument for reverting to two separate documents – a compliance document similar to ADE, and a separate good practice guide. As I suspect that, in the time available, your review can only address Section 1 of BB93, splitting the document into two parts might be a very practicable approach. It would also allow the guidance to be a dynamic web-based document capable of revision without the consultation that would be needed to revise Section 1.

1.3 Scope - Types of premises covered.

Regulation E4 only applies to schools as defined in the Education Act. This does not apply to many nurseries, or to sixth form colleges which are defined as Colleges of Further Education. BB93 is widely used as a basis for these but until standards are made mandatory, they will not be applied to all CFEs. We have encountered a number of CFEs where application of BB93 would have prevented significant acoustic problems.

It is clearly illogical to set mandatory standards for sixth-form facilities in schools but not in CFEs, many of which continue to be built to lower acoustic standards than secondary schools. While we appreciate that the difficulty inherent in changing the regulations so that E4 would apply to CFEs, we strongly request that this should be considered or that there is some other means of ensuring that adequate acoustic standards are met in CFEs and other educational premises currently not covered by Regulations.

If compliance can not be made mandatory for CFEs, at the very least the DCLG should formally recommend that BB93 should be considered as a minimum standard for the design of teaching spaces. If designers then consider that BB93 is not applicable to a particular project, they should be required to provide a formal reasoning as to the basis for their performance targets selected which are relevant to the scheme in question.

1.4 Scope – Refurbishments and renovations

There is widespread confusion about whether BB93 applies to alteration and refurbishment work. This is discussed in the introduction but not, unfortunately, very clearly unless the reader happens to be familiar with Building Regulations 3 and 4. This needs clarification along with a stronger recommendation or mandatory requirement for application to refurbishments and renovations where there is not a Material Change of Use as defined under Building Regulations. This may be possible through enforcement of the Educational Premises Act rather than through Building Regulations.

1.5 Scope – DDA, SEN and Hearing impaired.

These matters are discussed in the Introduction to BB93 which, unfortunately, hardly anyone reads; partly because it is an introduction and partly because some sections of the introduction are not very readable. In particular the section on Scope is rather densely written and needs substantial re-structuring to make it more readily comprehensible. However definitive the guidance may be, it is of no practical use unless the intended readership can be persuaded to read it.

1.6 Enforcement – Building Control

There is great variation in what, if anything, Building Control Bodies require to demonstrate compliance. We find that Building Control Officers, and particularly Local Authority Building Control, can be very inconsistent in their approach even within a single authority. In general we find Approved Inspectors much more consistent. Some LABC bodies are excellent and take BB93 seriously but our members experience is that many more do not. This is not, of course, limited to BB93 but applies to all of Part E of the Building Regulations. This is a matter which we have taken up with LABC and CLG with little effect to date.

1.7 Commissioning

Almost the first paragraph of Section 1 makes a strong recommendation that acoustic testing should be carried out as being the best practical means of ensuring that the design intent is met. This recommendation is re-stated in Section 1.3.

The experience of many consultants, however, is that acoustic commissioning is rarely undertaken except when it is a contractual requirement under a PFI or design-and-build contract, or when BREEAM credits are required. It is commonplace for measurements to be requested where users have complained about poor acoustics and it is often found under those conditions – often long after practical completion – that there are substantial faults in construction resulting in failures to comply with BB93. This is certainly my practice's experience ; out of some 200 school projects which we have undertaken, we have never been asked to commission, but when called in to investigate complaints we have always found significant failures to comply with BB93. It seems likely that many such failures go undetected.

Mandatory pre-completion testing for dwellings has resulted in a huge increase in compliance, and hence in the quality of life of the buildings' occupiers. Mandatory testing under BB93 would certainly have the same effect for schools.

Under HTM 08-01, acoustic commissioning is now a requirement for healthcare buildings and it is increasingly difficult to justify the absence of a similar requirement for schools. We strongly recommend that you consider this in your review.

1.8 Alternative performance standards

Many of our members have stated that Section 1.2.1 is being mis-used to allow acoustic standards significantly below those which are deemed a minimum in BB93 where there is no good reason for such a relaxation other than cost savings. Some of our members are put under pressure by clients to misapply Section 1.2.1 in that way. The wording on this section is generally clear but it should be further emphasised that this is not a licence for derogation, which could result in schools being approved by BCBs while being acoustically inadequate. That is neither in accordance with the wording or the intent of this clause.

This clause is also frequently invoked to meet the demands of individual teachers, resulting in acoustics suitable for individual teaching styles, but which may have to be changed when there is a change of staff and / or teaching style. This applies particularly to head teachers and music staff.

There is a school of thought that because of this abuse, clause 1.2.1 should be omitted. In any case, it must be emphasised that Clause 1.2.1 is not a derogation clause.

1.9 Use of BB93 as an acoustic specification

Many members report that "Compliance with BB93" is being used as a contractual condition or as an acoustic specification. This is incorrect and inadequate. Clause 1.2.1 would in any case make such a generalised clause worthless.

Compliance with building regulations should in any case be a minimum contractual requirement. For reasons discussed in 1.2 above, it is possible to comply with the minimum standards set out in BB93 without necessarily providing acoustics which are fit for purpose for a given project. It therefore needs to be stated clearly in BB93 that it must not be used as an acoustic specification or contractual requirement.

1.10 Basis for review

Any changes to values in BB93 should be based on published research or on collated data from projects undertaken since BB93 came into force. Where such research does not exist, time and funding for research will be required, and there should be provision for future changes to BB93 to take account of the results.

In the absence of a requirement for commissioning, the ANC does not currently have a database of measured results for schools as we do for sound insulation of dwellings, but such a database could be compiled if a formal commissioning requirement is introduced.

1.11 Case studies

There is now an opportunity to add case studies of schools built under BB93. As well as examples of good practice, it would be useful to include (anonymously of course) examples of bad practice to illustrate common problems and to prevent designers from repeating the same mistakes.

1.12 Reference to the Association of Noise Consultants

It has always been a matter of concern to us that where BB93 refers to the appointment of acoustics consultants (e.g. in Note 1 on Page 7) it refers to the Institute of Acoustics but not to the Association of Noise Consultants. The IoA represents all branches of acoustics and only a small minority of IoA members are acoustic consultants with competence in school design, whereas the majority of ANC member organisations are experienced in this field. It is also a condition of ANC membership that at least 50% of consulting staff should be at MIOA or FIOA grade.

We do not suggest that only ANC members should be allowed to design school acoustics but even if the DfES did not recognise the ANC five years ago, the growth

in the size and reputation of the ANC since that time must justify some mention in BB93. We would request that both the IoA and ANC are referenced, along with links to their websites and a note that the client should check that the consultant appointed can demonstrate experience and expertise in this field.

2 CRITERIA FOR AMBIENT NOISE LEVELS

2.1 Ambient noise levels in Table 1.1

There is general acceptance that the use of $L_{Aeq,\ 30\ minutes}$ and the majority of levels listed in Table 1.1 are appropriate, although we have assumed that the levels will be re-assessed by the review panel.

More room types should be included, e.g. IT rooms, Prep Rooms for Science and Technology, Store Rooms, Media Rooms, TV Studio. This may be best provided as a dynamic table on the website rather than having too many options within the tables. (Some mechanism to approve changes to data on the website would however be needed – it should not be possible for changes to be made without proper advice and consultation at least with the Review panel).

Design and technology rooms need to be categorised. Clarification of the status of junior schools and reception classes should be added.

Developments in school design have led to new types of areas, new names for some types of area and different combinations of uses, and these should be reflected both in the Table and in appropriate, up-to-date case studies.

2.2 LA1 recommendation

The reference to L_{A1} in Note 1 to Table 1.1 is guidance only but has caused some confusion as of course it is impossible to exceed the 55 dB L_{A1} without also exceeding 35 dB L_{Aeq} over the same period. L_{A1} is a very little-used criterion and there is a case for replacing this with a criterion on terms of $L_{Amax,\ slow}$.

2.3 Noise and natural ventilation

BB93 must of course be updated so as to be consistent with the guidance in BB101 on ventilation rates.

At the time of publication of BB101, there was considerable concern about the permitted level of 40 dB $L_{Aeq,\ 30\ minutes}$ in classrooms with windows or ventilators open to provide 8 l/s/person fresh air. It was felt that this very significant change to the levels set out in BB93 had been made without due consultation. This change also gave rise to considerable confusion and we believe that there has been widespread abuse of this clause, with an adoption of 40 $L_{Aeq,\ 30\ minutes}$ as a permitted ambient level in many classrooms irrespective of ventilation rates. It should be stressed that this is not permitted.

Some of our members still believe that ambient levels in classrooms should not be allowed to exceed 35 dB $L_{Aeq,\ 30\ minutes}$ irrespective of ventilation, while some maintain that higher levels should be allowed where necessary. From a show of hands at the recent technical forum, however, the vast majority of members considered that the revised BB93 should confirm the currently permitted level, including the variation introduced by BB101.

Case studies should include several different types of attenuated natural ventilation as this is possibly the area in which most of our members need more information. A specialist in Natural Ventilation for schools would be a valuable addition to the review panel. We can suggest some suitable people if required.

2.4 Rain noise

Reference to rain noise needs to be updated to take account of new standards, availability of data in accordance with that standard, and examples. Current confusion between guidance in BB93 and BREEAM for schools should be addressed. A noise limit or separate table for “heavy” rainfall could be given for each of the spaces listed in Table 1.1 (typically 20 dB LAeq greater than the indoor ambient noise level limit).

2.5 External ambient noise levels

Since BB93 was published there has been an increase in emphasis on outdoor teaching areas, particularly for reception class pupils. The criteria suggested in Section 2 need to be re-considered and the possibly reinforced. The guidance should be clarified by area function, if possible, by distinguishing between terms such as “formal teaching”, “informal teaching”, “recreational areas” etc and grouping them by criteria, e.g. External area for formal teaching, for the teaching of sport and games, for playing sport and games, recreation areas (playgrounds) not used for teaching

2.6 Vibration

It has been suggested that Vibration criteria should be included, due to external vibration (e.g. trains) and building services, based on BS 6472-1: 2008.

3 SOUND INSULATION WITHIN SCHOOLS

3.1 Airborne sound insulation – Table 1.2

In general the approach using tables 1.1 and 1.2 seems to work well although the standards for some areas may need to be reconsidered. It may be helpful to add a note to table 1.2 that these standards are minimum standards for compliance with building regulations and do not in themselves guarantee fitness for purpose. In some cases (e.g. between music rooms) higher standards may be necessary and it is the responsibility of the acoustics consultant to advise on such standards for individual projects. This would address a number of comments received on the numbers in this table.

Note 3 is unnecessary and should be deleted or replaced by a more generalised note on layout.

Note 4 is helpful but as a note to a table it is often ignored – it should receive greater prominence.

3.2 Standardised level difference

Ever since the publication of BB93 there has been considerable concern and confusion over the standardisation of both airborne and impact sound level differences to a specific value of RT. The nomenclature is unnecessarily complex for what is supposed to be a simple guide accessible to non-specialists.

The principle of standardisation to the maximum permitted RTs in table 1.5 is of questionable value, as the parameter of interest on site is the level difference that users will experience in the finished rooms with the RTs achieved in those rooms, particularly in view of the limitations on RT criteria listed in BB93 (see later comment on this). The only value of standardising to a particular RT is where BB93 is used as an acoustic specification or contract document, which is in any case a mis-use of BB93.

Many consultants have proposed – and indeed already use in their reports – a simple weighted sound level difference Dw, and provided that the receiver room RTs are within the values permitted in Table 1.5 this seems to be a more realistic approach.

3.3 Standardised impact sound pressure level

Our comments on standardisation of airborne level difference apply equally to impact sound pressure level – revert to use of L'w without standardisation.

3.4 Sound insulation between rooms and circulation spaces

The principle of using laboratory Rw values for this is generally accepted although reverting to measured values on site might be possible using the guidance in BSEN ISO 140 part 14. This should be considered by the review panel.

The values in Table 1.3 should be reviewed, particularly in the light of natural ventilation schemes using ventilators between classrooms and corridors. Case studies are available and should be referred to both by the review panel and in the revised version of BB93.

3.5 Doors

Rw values required of doors should be reviewed. Doorsets rated at 40 dB Rw are now widely available and may be appropriate for music rooms. References to accessibility (including the 20N requirement in Part M), adjustment of door closers, use of soft seals to reduce noise from closing doors, and requirements for glazed panels in doors should be included.

There are reports of some consultants advising that door seals should be removed for ease of access and maintenance. This suggests some misunderstanding of the purpose of acoustic doors and the text may need to be re-written in simpler terms. More detailed guidance is required on the installation of doors to achieve reasonable sound insulation, including the proper adjustment of seals.

We are aware of at least one manufacturer supplying a large number of classroom doors which fall well short of the 30 dB Rw requirement although a UKAS-registered laboratory claimed that they had been shown to achieve this standard. This was found to be due to errors in the calculation procedure of the laboratory, which apparently was UKAS-registered for other types of test but not for acoustic tests. We therefore recommend that BB93 should include a requirement for the contractor to supply both test certificates and raw data for checking for such doors.

Case studies should include the common requirement where it is essential to have doors directly linking classrooms, Design and Technology rooms, and practice rooms leading directly off music rooms (often required for supervision of students in practice rooms). In these cases the opportunity to test doors on site should not be missed.

3.6 Folding partitions

Many recent new schools include folding partitions which are not used. They may be specified from to an unspecified desire for flexibility, with little understanding of the acoustic and operational limitations and cost implications. Further information and discussion are needed in BB93 along with case studies to compare Rw values with results achieved on site.

3.7 Circulation spaces, atria,"Streets"etc

It has become commonplace for teaching spaces to open directly off atria which are used both for circulation and for other purposes, e.g. as relaxation areas, cafeterias, library resource areas, or locations for computer workstations. In some cases the acoustic problems inherent are ignored by simply considering these as circulation spaces. Some discussion of this is required.

3.8 Reception areas and WCs

It is common for several classbases – often reception classes - to open on to a single set of WCs or cloakrooms. This layout needs to be considered.

3.9 Measurement of sound insulation

Reference to new and revised standards (e.g. BSEN 140 Part 14, ISO 3382-1 and 3382-2) is required. The statement that one in four teaching rooms should be tested is ambiguous when applied to sound insulation measurements. The effect of transmission between rooms through airborne noise via open windows, and flanking transmission through closed glazing, should be discussed. The question of soft floor coverings for impact sound tests should be re-visited – most classrooms are carpeted and will remain so, and providing a separate resilient layer to provide adequate impact insulation without the carpet may therefore be a pointless expense.

3.10 Airborne Sound Insulation between Kitchens and Dining Rooms

It is customary to have roller shutters between these rooms, making the specified sound insulation difficult to achieve. This was not considered in the original BB93 and it would be reasonable to allow for roller shutters with a recommendation that, in that case, the use of Dining Rooms for teaching activities should be prohibited when noisy activity would typically be taking place in the Kitchen.

4 REVERBERATION TIMES AND ROOM ACOUSTICS

4.1 Furniture, diffusion and flutter echoes

A very common cause of problems has been the requirement to meet the reverberation time criteria by measuring inside unfurnished classrooms, combined with the exposition in Sections 4 and 5 of calculation methods using Sabine Theory without consideration of whether the rooms are in fact Sabine spaces. Many classrooms are designed with all or most of the absorption provided by a suspended ceiling. Without furniture, the lack of diffusion inside the room frequently results in flutter echoes or other effects resulting in longer than expected RTs in the empty rooms. In some cases it is necessary to add wall panels to allow the values in table 1.5 to be met in unfurnished rooms. Once the rooms are furnished, the diffusion (and to a smaller extent the absorption) provided by the furniture generally eliminates flutter echoes, rendering such wall panels redundant.

There is a strong consensus of opinion that this problem needs to be addressed and that it should be permissible to measure reverberation time in furnished rooms. This obviously raises practical difficulties which will need to be considered, but the current system of specifying and measuring the unfurnished condition must be changed.

4.2 Halls including sports halls

The problem described in Section 4.1 applies on a larger scale to halls including sports halls. Again, the inevitable furnishings and contents that such halls will have should be taken into account in the design : e.g. seating and audience in auditoria and climbing bars in sports halls, which tend to add diffusion and so reduce the effects of flutter echoes. BB93 should make it clear that halls with absorption on the ceilings only are not Sabine spaces and that other methods are needed to calculate RTs in these spaces.

4.3 RT criteria in Table 1.5

The reverberation criteria should be revisited. Areas of particular concern are studios and practice rooms, where the RTs in Table 1.5 are considered excessive, and sports halls where it can be difficult to achieve 1.5 seconds within the constraints of such spaces. It may be desirable to make the RT criterion a function of room volume. This could be achieved using a simple formula.

4.4 Criteria for circulation spaces

The circulation area sound absorption requirements may be applicable to areas that are directly linked to teaching areas by only one door or less (i.e. corridors). In some cases remote circulation areas (e.g. stairwells) have been excluded on the assumption that the RT is being limited only to reduce noise ingress to teaching areas. There is a need for clear and unambiguous guidance on this.

4.5 Speech intelligibility in open-plan spaces

This has been an area of considerable uncertainty. There is a great deal of discussion about this but not necessarily backed up with any definitive research results. You have seen a number of comments on this, and rather than repeat these here, we will simply recommend that this subject needs substantial discussion and revision, starting with identification of different uses and definitions of such spaces.

5 GUIDANCE IN CHAPTERS 2 ONWARDS

Nearly all of the comments received relate to Section 1 and the application thereof. Only when the fundamental issues concerning Section 1 have been reviewed will it be possible to make decisions as to the format and content of guidance in Sections 2-7 and the appendices. There is a case for separating these from Section 1.

The above points are summarised in the following table.

Adrian James

For the Association of Noise Consultants.

1	SCOPE, APPLICATION AND REGULATION
1.1	The principles of enforcing requirements for acoustics of schools through E4 and BB93 are very good and that BB93 should be retained albeit with some changes and updates as discussed in this document.
1.2	Stress that Section 1 sets out the minimum standards enforceable under E4, which may not be good or even adequate in some cases. Consider having separate compliance and guidance documents.
1.3	Minimum acoustic standards should also be set for educational premises other than schools, either through BB93 or through another mechanism.
1.4	The application of E4 and BB93 for renovations and refurbishments should be clarified and if possible reinforced.
1.5	The introduction to BB93, and particularly the section on the Scope, need to be re-written and possibly moved into Section 1 where they may be read by more users of BB93.
1.6	As with other parts of ADE, BB93 is very unevenly applied by Building Control Bodies and particularly LABC. Some BCBs clearly have no interest in enforcing it – others do not make any attempt to understand it. We strongly request DCLG to address this with LABC.
1.7	A requirement for acoustic commissioning, similar to that for dwellings under E1 or for health buildings under HTM 08-01, is essential to prevent continued building of acoustically sub-standard schools.
1.8	There are widespread reports of Clause 1.2.1 being misused to secure commercial advantage in tenders or cost savings, resulting in schools failing to achieve acoustically adequate standards. Emphasise that this is not a derogation clause and must not be used as such.
1.9	It must be emphasised that “Compliance with BB93” is not in itself an adequate specification for acoustic design of a school, and this should not be used as part of a contract or specification.
1.10	Any changes to values in BB93 should be based on published research or on reliable data from projects undertaken since BB93 came into force.
1.11	Case studies are very valuable. Include examples of bad practice and ideas which have not worked, to prevent designers from repeating the same mistakes.

1.12	When recommending the appointment of acoustics consultants, we would request that the Association of Noise Consultants is referred to as well as the Institute of Acoustics, with links to their websites and a note that the client should check that the consultant appointed can demonstrate experience and expertise in acoustics of schools.

2	**CRITERIA FOR AMBIENT NOISE LEVELS**
2.1	Use of $L_{Aeq,\ 30\ minutes}$ and the majority of levels listed in Table 1.1 remain appropriate. Table 1 should reflect recent developments in school design and nomenclature, with reference to up-to-date case studies.
2.2	L_{A1} is a very little-used criterion and there is a case for replacing this with a criterion on terms of $L_{Amax,\ slow}$.
2.3	BB93 must be updated so as to be consistent with the guidance in BB101 on ventilation rates. It is generally considered that the currently permitted levels in classrooms, including the variation introduced by BB101, are adequate. This clause must NOT be mis-used as a blanket relaxation from 35 to 40 $L_{Aeq,\ 30\ minutes}$. Case studies are required
2.4	Guidance on rain noise to be updated and clarified with case studies.
2.5	Guidance on noise in outdoor areas to be updated and clarified by area function, e.g. outdoor teaching, sports teaching, and recreational areas.
2.6	Consider including vibration criteria based on BS 6472-1: 2008
3	**SOUND INSULATION WITHIN SCHOOLS**
3.1	General approach to airborne sound insulation using tables 1.1 and 1.2 seems to work well. Review criteria for some areas and review notes to tables. Emphasise that these are minimum standards for compliance with building regulations and do not in guarantee fitness for purpose.
3.2	Standardisation of airborne sound level difference is unnecessary and unrealistic, and the nomenclature is very complex. We recommend use of the non-standardised weighted level difference Dw, provided that the RT in the receiver room is within the permitted criteria and is recorded.

3.3	Standardisation of impact sound pressure level is unnecessary and unrealistic, and the nomenclature is unnecessarily complex. We recommend use of the non-standardised impact sound pressure level L'w, provided that the RT in the receiver room is within the permitted criteria and is recorded.
3.4	The principle of using laboratory Rw values for this is generally accepted but consider measurements using the guidance in BSEN ISO 140 part 14. Review values in Table 1.3 in the light of natural ventilation schemes using ventilators between classrooms and corridors. Add case studies .
3.5	Doors – Review Rw values in table 1.3. Specify acoustic information required from manufacturers to include certificates and raw test data. Provide guidance on fitting and maintenance of seals, door closers, glazing etc with reference to other parts of building Regulations. Add case studies of commonly encountered "forbidden" layouts with single doors linking classrooms, DT rooms and music rooms.
3.6	Folding partitions – add discussion of advantages and drawbacks of these. Add case studies to compare Rw values with results achieved on site.
3.7	Discuss use of circulation areas for other purposes, e.g. as library resource areas, common room areas and as locations for workstations.
3.8	Consider the common layout where several classbases – often reception classes - open on to a single set of WCs or cloakrooms.
3.9	More guidance on measurement of sound insulation is needed, referring to number of tests, new and revised standards, transmission between via open windows, flanking transmission, and soft floor coverings.
3.10	Consider the common case of kitchens linked to dining halls by hatches with roller shutters.
4	**REVERBERATION TIMES AND ROOM ACOUSTICS**
4.1	Measuring RTs in empty rooms often results in artificially long RTs due to flutter echoes which disappear when the rooms are furnished. This often results in expensive and unnecessary remedial treatment using wall panels. This is a very common and serious problem. Consider a scheme to specify and measure rooms containing normal items of furniture.
4.2	Expected furniture and fittings should be taken into account in the design to prevent over-design caused by flutter echoes in empty rooms. Emphasise that calculation methods other than Sabine / Eyring methods are required in non-Sabine spaces.

4.3	The reverberation criteria in Table 1.5 should be reviewed. Consider specifying RT criterion as a function of room volume.
4.4	Consider whether criteria for absorption should apply in circulation spaces which do not link to teaching areas. Clarification needed.
4.5	The whole approach to acoustic design in open-plan spaces needs to be re-considered in the light of changing teaching practices, different types and uses of such spaces, and experience since the introduction of BB93. There are many arguments backed up by individual case studies ; we need an objective review and further research of this subject.
5	**GUIDANCE IN CHAPTERS 2 ONWARDS**
5.1	Nearly all of the comments received relate to Section 1 and its use Only when the fundamental issues concerning Section 1 have been reviewed will it be possible to make decisions as to the format and content of guidance in Sections 2-7 and the appendices. There is a case for separating these from Section 1.