

MANAGEMENT OF THE VERIFICATION PROCESS

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1. INTRODUCTION

It is now nearly a decade since the publication of BS 7580 part 1, and during that decade there has been a major change in attitudes to verification, a corresponding growth in the number of laboratories offering verification services, and various measurement standards and procedures have been revised to include verification requirements. These developments must surely have contributed to an improvement in the quality of sound level measurements during that period, and it is necessary to review progress and identify priorities for future.

In operating any standard, it becomes obvious that it has shortcomings, and those concerned will be keen to correct any errors or omissions. In the case of BS 7580, attention has been drawn to a number of areas which are not covered at all by the standard, and to some where the tests prescribed may be inadequate. Examples of these are;

- ◆ Limited tests on the frequency response of the microphone
- ◆ No check on accuracy of L_n calculations
- ◆ No check on Peak time constant (due to inadequate specification in IEC 651)
- ◆ No checks on reverberation time measurements
- ◆ Frequency response of band filters not covered

One approach to improving verification standards is to work towards progressively plugging these and other holes. It may well be more extensive and therefore more expensive tests.

Another approach to raising verification standards is to write explicit verification requirements into more measurement and assessment procedures to try to catch those who may still be using with instruments whose reliability is suspect.

Both these steps can be justified, but they suffer from the disadvantage that neither tends to place responsibility for the reliability of sound measuring instruments where it belongs; with a responsible person within the organisation using those instruments.

2. THE AIMS OF VERIFICATION

The aim of any verification process is to enable those making sound level measurements, and those who may use data collected by others, to have confidence that the reliability of that data is not compromised by the quality and condition of the instrument used. (It may still be compromised by other factors, and we use other measures such as staff training programmes, standard measurement protocols etc to control these).

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This was traditionally achieved by "...believ(ing) the manufacturer's statement of compliance and (going) into the field with nothing more than our trusty calibrator – a device for calibrating not to be calibrated!" (Campbell, 2000). It is probably true that a competent acoustician will soon spot any problem with the measuring instrument, but we may find it difficult to persuade others that this is the case, so there is a further aim of the verification process which needs to be added to the list. This is to ensure that the tests have been carried out, and records kept, which enable the reliability of the instrument used to be demonstrated to others who may have an interest in the measurement outcome.

There is no reason why clients, lawyers, planners and others should be impressed by an acoustician's 'feel' for the accuracy of the data, but we would expect them to accept a documented series of verification tests as evidence of reliability.

3. HOW THE PROCESS IS MANAGED IN PRACTICE

Information was collected from a number of organisations about the management of the verification process within that organisation. Acoustic consultancies were not included in the survey, since it was considered that the expertise available would give them a different perspective, and the specifically acoustic focus of their activities would mean that funds for verification would be more freely available than in other organisations. Organisations consulted included local authorities and other public bodies, manufacturing companies and consultancies who did acoustic work as one part of a wider-ranging practice.

Most organisations claim to send all their type 1 sound measuring equipment for verification at intervals of either 12 or 24 months, normally at a UKAS accredited laboratory. The reasons for choosing either 12 or 24 months vary; 12 months is frequently recommended by manufacturers and by verification laboratories, and one local authority thought it important to be able to demonstrate that they had followed the manufacturer's recommendations. 24 months is the maximum period allowed by a number of standards and is of course the cheaper option.

Few organisations showed any awareness that a number of factors could affect the maximum period between verifications (number of users, conditions of use, etc). Some had worked out that with two instruments it was possible to arrange that both had been verified within the last 24 months while normally having one instrument that was within 12 months of its last verification. One sometimes lent equipment to another department on the basis that the borrowing department would make good any damage while in its possession; the lenders had not considered that this may make it less likely that accidents to the equipment would be reported.

It is rare to find an organisation that carries out any in-house checks on its instruments beyond the normal battery check and field calibration which accompany any measurement.

Record keeping is normally interpreted as keeping the verification certificates at least until the next verification is carried out on that instrument.

On the surface, there is an growing awareness that a verification guarantees the accuracy of an instrument only at the time the verification is carried out, but this does not seem to result in any further checks being carried out between external verifications.

4. RELIABILITY IN MEASUREMENT; THE REQUIREMENTS

4.1. The Components of a Verification System

It seems to be a widespread misconception that the responsibility for the accuracy of sound measuring equipment is handed over to a verifying laboratory when the instrument is sent away. The true position is that this responsibility resides with one or more individuals within the organisation which owns and/or uses the equipment, and the use of external laboratories is just one component of effective quality management. Other components would normally include.

- ◆ Responsibility of one or more named individuals for maintaining the reliability of the instruments.
- ◆ Choice of appropriate criteria for sending equipment away for verification. Within an overall maximum period there could be other factors such as possible damage to the instrument, frequency of use, the importance of the measurements being made, etc.
- ◆ Internal checks on equipment which may range from a simple swapping of calibrators between kits, to the use of a multi-function calibrator to carry out a range of tests on frequency response, crest factor handling etc.
- ◆ Documentation of internal and external procedures, dates and outcomes of tests, reports of possible damage etc.

4.2. Obstacles to Effective Management

For many public sector organisations, the most obvious problem with implementing an effective verification programme is the recurring cost involved; the cost of verifying a small number of type 1 SLM's on an annual basis is comparable with the cost of replacing them at the rate of one per year. If funding on this sort of scale is available at all, this might seem to be a more attractive option!

For any small organisation, the problem of having equipment out of use for extended periods can be acute. Verification laboratories do not always return equipment within the predicted period, and their employees have an inconvenient tendency to take their holidays during the summer period or around Christmas when equipment is less likely to be needed. Even if a speedy turn-round is achieved, allowance needs to be made for travelling time in both directions and equipment can be unavailable for work which arises unexpectedly.

Equally important is the lack of understanding within many organisations of the reasons for verification, the limitations of external verifications, and the other components of equipment management. That the Institute of Acoustics organises meetings on the topic is evidence that many acousticians are well aware of these issues. The current syllabus for the Diploma in Acoustics (introduced in 1995), though, does not actually refer to verification, although the examiners have in practice assumed that candidates would have a knowledge of the topic.

4.3. Towards Effective Verification Management

It can be argued that three separate processes need to take place if the standards of equipment reliability are to continue to be improved;

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1. The verification standards need to be improved and extended to cover additional functions
2. More instruments need to be brought within verification procedures by making verification requirements more explicit in measurement procedures and standards
3. More effective management of the verification process needs to be established within a wide range of different organisations which use sound measuring equipment.

Serious thought must be given to priorities under these three headings; it would cause considerable confusion and impose unreasonable financial burdens on many organisations if more complex verification tests were introduced without weighing up the costs and benefits imposed on all the different organisations which would be expected to pay for them. At the other extreme, it is difficult to imagine circumstances under which it would be justifiable to make no external check at all on a sound level meter, and yet there are many instruments in use whose purchase price was less than the cost of verifying a type 1 sound level meter, and which are seldom if ever verified.

5. CONCLUSIONS

So far as the management of the verification process is concerned, it needs to be emphasised that primary responsibility for the reliability of the instrument lies within the organisation using it.

There is a need for more agreement on suitable in-house verification tests which can be carried out between external verifications, or immediately before an important series of measurements to supplement field calibrations. These could be based on commercially available multi-function calibrators. Properly documented, these tests could supplement external verifications, or could extend the period between them.

The requirements for making accurate, repeatable measurements in acoustics should probably be more prominent in all courses in acoustics, or which include acoustics among other subjects. The management of the verification process is one aspect of this. Suppliers of equipment also have a responsibility for supplying information about verification requirements when selling their products.

6. REFERENCES

BS 7580. Specification for the verification of sound level meters. BSI, London, 1992

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