Proceedings of the Institute of Acoustics

CERTIFICATE OF COMPETENCE IN ENVIRONMENTAL NOISE MEASUREMENT; COURSE DELIVERY AND PRACTICAL APPLICATION.

D Bull (1) & T Johnson (2)

(1) Colchester Institute, Sheepen Road, Colchester, Essex, CO3 3LL
(2) East Northamptonshire District Council, Midland Road, Thrapston, NN14 4LZ

1. INTRODUCTION TO TRAINING NEEDS

A well developed approach to training for workplace noise has been described in previous papers [1], [2], and [3]. The Certificate of Competence in Workplace Noise Assessment of the Institute of Acoustics has very successfully met the needs of many hundreds of delegates right across the UK. However the objective criteria of the Noise at Work Regulations are totally different to the very subjective assessment of general environmental noise.

Annoyance is much more difficult to assess than established criteria for ear damage. Whether you are annoyed or not will depend on many different factors. For example:-

a) the nature of the noise - its loudness (relative to background sounds?), pitch and temporal variation

b) your activity at the time - working, or at leisure, or resting, associated with your personality and social expectations

c) how you perceive the source of noise - is it necessary?, is it a useful activity in that particular location etc.?

Because of this whole range of variables, many of which cannot be easily quantified, the competent assessment of environmental noise is more difficult. There are standards and criteria to be used but they need careful interpretation and application.

Noise awareness in the general public is also steadily rising; indeed Local Authorities receive far more complaints about noise than any other single pollution issue. We live in a crowded island and the incidence of noise sources near people is increasing. In addition the Environmental Protection Act is focusing minds on effluents of all kinds. Unseen noise is often overlooked until complaints arise, and by that time residents have become very sensitive about the issue, making them that much more difficult to satisfy. All those concerned with such problems (industrial environmental managers, local authority regulators etc.) need training to deal with general environmental noise problems.

CERTIFICATE OF COMPETENCE - ENVIRONMENTAL NOISE

2. COURSE DEVELOPMENT

From its professional viewpoint the Institute of Acoustics recognised the requirement for a short intensive course to meet these needs to ensure that at the very least such noise problems are approached in the proper manner. The implication was for a much shorter course than the usual professional membership qualification i.e. Diploma in Acoustics and Noise Control.

A strong advisory panel was set up comprising environmental noise specialists (local authority and industry), practical acousticians, and training professionals to devise, develop, and oversee the operation of a properly recognised course of education and training.

One of the main objectives was to ensure that noise measurements are correctly made i.e. they are accurate, reliable and properly representative of the situation. This requires a thorough awareness of acoustic principles, as well as knowing how to use the instrumentation correctly. A clear guiding principle was that expensive equipment is only as good as the person using it. Hence the essential requirement of a practical test to prove competence.

A good understanding of appropriate standards and codes of practice is clearly essential. In addition, a person making measurements will inevitably be asked what can be done about the noise problem, so a working knowledge of possible noise control principles is required. This is not to make them noise control specialists, more to ensure they are aware of their own limitations.

After carefully considering all the requirements the needs for competency were drawn up, which led to the following objectives.

After successfully completing the course delegates should be able:-

- to make reliable measurements of back ground noise, and noise from a variety of noise sources, according to the requirements of the relevant British Standard or guidance document
- to present and interpret measured data in a form suitable for inclusion in a consultant's report
- to assess the significance of measured noise levels in terms of acceptability to people, with reference to established rating procedures, guidance documents and standards set by local authorities
- to identify in outline the principle methods of noise control to mitigate the impact of noise on the community
- to critically appraise the noise measurement methodology, data, and interpretation in reports and environmental appraisals, and comment on proposals for noise impact mitigation.

3. COURSE CONTENT

The advisory group recommended a five day programme, with a format similar to the very successful Certificate of Competence in Workplace Noise Assessment. As with this well established national qualification, rigorous course assessment was considered to be very important for the credibility of the new environmental certificate. Hence the requirement for a national written examination with a high pass mark, and a practical test to verify the actual doing and reporting on proper noise measurements.

The following very brief outline indicates how the course content was divided up for delivery at the Colchester Institute, one of the two pilot centres that successfully presented the course in June 1993.

Day 1 Basic acoustic concepts and calculations - measurement and instrumentation - initial measurement exercise

Day 2 Criteria and standards - objective and subjective including BS 4142 - planning guidance - law, nuisance, and the Environmental Protection Act

Day 3 Sound sources, propagation, fields, and prediction methods - internal measurement exercise - noise screens - noise attenuation at source and in the transmission path

Day 4 Requirements for noise surveys and reports including BS 7445 - external noise measurement exercises with machines, transport, impulsive sources, and a full industrial BS 4142 survey

Day 5 Revision and further development as required - exam preparation - national examination - practical test.

4. COURSE DELIVERY AT COLCHESTER

As at the Institute of Acoustics, at Colchester we are also concerned about course quality, ir particular the way the course is to be delivered. Bearing in mind that there are no specific entry requirements, and delegates could come from a very wide range of backgrounds, two essential approaches were built into the method of delivery:-

4.1 Very PRACTICAL APPROACH to all aspects
4.2 Individual TUTORIAL WORK whenever possible.

4.1 PRACTICAL APPROACH

At the Colchester Institute we have developed a unique practical approach to a range of courses in Acoustics, Noise and Vibration Control e.g. [4] & [5]. This has a proven record for quality of learning, and has been very well received by a very wide range of delegates, from the very inexperienced to professional acousticians. Each delegate receives a fresh set of illustrated and bound notes on each day of the course. Lectures given around these notes are illustrated with live practical demonstrations. Typical examples are listed below under the main headings of the course content.

CERTIFICATE OF COMPETENCE - ENVIRONMENTAL NOISE

TYPICAL PRACTICAL DEMONSTRATIONS

A) BASIC ACOUSTIC CONCEPTS.
Wave properties, particularly diffraction and interference
Audio & visual dB steps of loudness, 'A' weighted simulation
Individual perception of audio frequency range
Octave division of white noise and fan noise

B) MEASUREMENT AND INSTRUMENTATION.
Range of meters with analogue and digital outputs
RMS and Peak response, and clipping of signal (overloading)
Statistical evaluation and SEL
Briefly, potential of powerful modern real time analysis (RTA) instrumentation

C) REDUCTION OF NOISE
Noise barriers/screens with different noise sources
Basic sources: Vibration, Impact, Fluid Disturbance
Reduction at source:-
Force Excitation; reducing magnitude & rate of change; Machine Structures; damping, reducing and isolating radiating surfaces
Reduction in transmission path:-
Absorbers and screens; Acoustic enclosures (full & partial) Silencers & anti-vibration mountings
Complete noise control treatments

D) NOISE SURVEYS AND ASSESSMENTS
Internal survey; noise contours and fields
External surveys; noise propagation with distance from traffic, from a machine, and from an impulsive source;
Full BS 4142 procedure on external fan noise problem

Such practical approaches stimulate interest particularly when the delegates carry out their own measurements, when they become involved in demonstration work and when they try out tests for themselves. Case histories have shown that action learning techniques generate an enthusiasm to apply the knowledge gained in the practical workplace; see also [4] & [5] for more details. Delegates are certainly aware that they are not noise control experts. However they are able to give basic advice to management, and discuss ways forward with consultants. They are much more aware of their own limitations.

4.2 TUTORIAL WORK
As with the workplace certificate it was decided that all calculation work (dB manipulation) should be done by calculator rather than by graphical or nomogram methods. A very variable intake of delegates almost certainly means individual help is required with such calculations, and so tutorial periods were built into the course programmes each evening.

These sessions have proved to be invaluable in helping with individual calculation problems (several delegates went away delighted at using a calculator properly for the first time) and sorting out practical measurement difficulties. We certainly see such tutorial sessions as a vital element in the quality of such a specialist course.

5. FEEDBACK AND FUTURE DEVELOPMENT

The feedback from the pilot course at the Colchester Institute has been very favourable. The practical content and individual tutorial help were the most appreciated features. Later feedback from local authorities and industry has confirmed the confidence of delegates on completion of the course, although my fellow author will comment more fully under the heading of practical application.

Critical learning occurs during the practical measurement exercises, so these will be extended. The practical test is a very important part of the course (as for the workplace certificate) to demonstrate competence. In the pilot course this test was based on a carefully monitored practical exercise, with subsequent written report. This procedure, with BS 4142 type requirements, and involving a practical scenario, will be further refined and specified for future courses.

6. A LOCAL AUTHORITY VIEWPOINT

6.1 INTRODUCTION.

As an Environmental Health Officer, I am employed in a predominantly rural authority serving a population of 70,000 in six towns and 56 villages. The environmental health department is a self contained unit and its duties include the investigation of noise complaints and advising the planning department on the environmental implications of proposed developments.

Many complaints are received about noise with issues ranging from barking dogs through noisy neighbours to factory noise. Many complaints can be investigated and remedied without using instrumentation. However it was felt that where detailed observation and measurement was required there was insufficient expertise available within the department. There was also a lack of confidence in our ability to interpret the data obtained; e.g. have we obtained the correct background noise level?

A planning application relating to the construction of a Formula 1/Indycar race track in a particularly quiet part of the District highlighted our lack of expertise in noise level calculations and predictions. With the help of acoustic consultants suitable and enforceable planning conditions were successfully applied. The process was lengthy and our lack of confidence meant that the application demanded a considerable time resource.

It became increasingly obvious that we needed to increase the level of acoustics knowledge within the department. If time and money had been of less consequence I would have enrolled to study the Diploma in Acoustics and Noise Control. Unfortunately these commodities are becoming increasingly scarce in local authorities and it was not possible for me to attend such a course. When information about the Certificate of Competence in Environmental Noise Measurement was received it was seen as an appropriate stop gap. The syllabus appeared to be wide enough to cover many of our needs and the duration of the course allowed the topics to be covered at reasonable depth. It was decided that I should attend such a course and I enrolled at the Colchester Institute

6.2 EXPERIENCE OF COURSE

The course more than met my expectations with practical demonstrations of theoretical concepts used to dispel the "horrors" of acoustic theory. A hands on approach to calculations, including step by step use of calculators to reach correct answers built confidence in the class members and in their ability to perform such evaluations. The use of many examples in the tutorial sessions further reinforced this confidence, and by the end of the course all were satisfied that they could carry out noise calculations, and could question the validity of calculations done by others.

The requirement that the delegates operate their own sound level meter wherever possible was extremely beneficial. Practical proof that they had the ability to operate the instrumentation gave increased confidence to carry out noise surveys. All of the class were able to, benefit from each others mistakes in operating meters, and to gain a very useful insight into the capabilities of other makes of monitoring equipment. The practical measurement exercises were extremely valuable, with varied noise sources provoking thought on how best to measure certain occurrences, so extending the experience of correctly operating sound level meters.

The small numbers on the course allowed for good team work and individual tuition where required. The practical demonstration philosophy of the course allowed for easy and entertaining learning. Without this approach an intensive and demanding course could have been unbearable. I found the one week long day format stimulating and rewarding, allowing and requiring me to devote my whole attention to the topic. Others found this format to be very demanding, and it may be worthwhile to consider offering a weekly day release mode of study.

6.3 PRACTICAL APPLICATION

As a result of the course I feel much more confident to go out and measure specific and background noise levels correctly, and to make reasonable predictions about future noise levels. In fact these activities have been successfully carried out since completing the course on a variety of problems. These particularly relate to external industrial noise, which previously had been difficult to resolve in a satisfactory manner.

I am very much aware that this course has not made me a noise control expert. However increased confidence in my abilities and a much better awareness of acoustic principles has greatly assisted me in carrying out noise pollution duties in the local authority. I would thoroughly recommend the qualification as either an introduction to noise monitoring or as a refresher for environmental health officers, who like myself have been too long away from the subject.

7. REFERENCES

[1] D G BULL, "Certificate of Competence in Workplace Noise Assessment - its operation at the Colchester Institute"; Proceedings of Institute of Acoustics (Autumn Conference 1989) ISBN 0946731934

[2] D G BULL, "Meeting the Training Needs: the educational role of the Institute of Acoustics"; National Conference - The Noise at Work Regulations: the needs of industry; Institute of Acoustics 1991, Bury St. Edmunds

[3] D G BULL & D R BALCOMBE, "Certificate of Competence in Workplace Noise Assessment: course delivery and industrial application"; Euronoise '92 London, ISBN 1873082363

[4] D G BULL, "Train to Reduce the Noise Around You"; Health and Safety at Work magazine, November 1991

[5] D G BULL, "Quality Practical Education to Reduce Noise at Source"; Internoise '92 Toronto; ISBN 0931784239