

BS 4142:2014 Measurement planning and practice

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This article is based on a presentation at the Measurement and Instrumentation Group's BS 4142 workshop in May. It is a guide to planning and making a measurement for BS 4142:2014 with suggestions on how to report and support assessments. This article has been split into two parts, the first of which appeared in the previous issue of *Acoustics Bulletin*.

Making measurements

When on site BS 4142 recommends making measurements at height of 1.2 to 1.5m above ground and at least 3.5m from any reflecting surface. In some situations it may not be possible to get far enough from walls or fences or you may need to measure outside a flat well above ground level. In this case measurements should be made at 1m from a facade, then the measured level can be adjusted to a free-field level by subtracting a 3 dB correction factor.

Take a photo of the measurement location and note the measurement position, height and the distance from any reflecting surface.

Make measurements of the weather conditions. Some manufacturers have weather stations that will plug in to their sound level

meters to synchronise the weather and noise data. This will simplify your reporting and is most valuable in unattended assessments. For shorter attended assessments the use of handheld anemometers and local weather data from the web should be sufficient.

The sound level meter should be calibrated with a matching calibrator before every series of measurements. It should then be checked (not re-calibrated!) after every series of measurements. Make a note of these checks; if the level has varied more than 0.5dB you may need discard your measurements as this would suggest a fault in your measurement system.

BS 4142 requires a more detailed accredited calibration of the complete measurement system. The sound level meter must be calibrated every two years provided it is checked with a calibrator that has calibration no older than 12 months.

Processing your results

Check with your measurement equipment supplier as to what their software can do for you so you don't have to reinvent the wheel. Ideally you should be able to:

- View measurements and listen to recordings
- Exclude periods with adverse weather conditions or unrelated sounds
- Recalculate logged periods to give 15 or 60 minutes periods
- Select sections as specific or residual periods
- If appropriate for your assessment export periods of background sound to a spreadsheet for statistical distribution of the LA90 values
- Listen to recordings to help make a subjective assessment of the acoustic correction features (Ideally this would have already been assessed on site and you should be considering character at receptor location - which may not be the measurement location).

In order to produce a more robust assessment of the acoustic features you may wish to use the objective or reference methods.

- Identify periods with tonal and impulsive noises, your software may be able to do this automatically
- Take note of how long each tonal noise is present during the measurement period
- If you use the objective tonal assessment method bear in mind that it only takes account of tones that would incur a 6dB penalty, therefore there is a risk that less prominent tones could be ignored

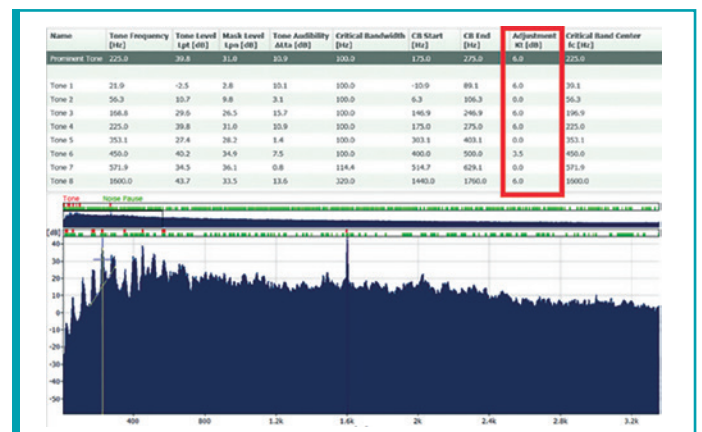


Figure 1. FFT analysis with tonal penalties

- Using the Reference (FFT) method will provide an absolute value for acoustic feature correction for a tonal noise. However, you should still subjectively consider how long the tone is present and if the full correction value should be applied
- Objective assessment of Impulses using 10 or 25 millisecond LAF data will need the same consideration. The Joint Nordic method will provide an exact correction value but if that impulse only occurs occasionally should it incur the same penalty as a period that has many impulse events? Show how often Impulses occur to back up your chosen correction feature.

Your software may also be able to perform the rating calculation by allowing you to choose which figures are used.

Reporting

When you produce your report be sure to include the following information:-

Ambient sound LAeq

Containing the specific sound, 15 minutes (night) or 60 mins (day) at the most representative period

Residual sound LAeq

15 minutes (night) or 60 minutes (day) measured at a time as similar as possible to the ambient period but without the specific sound present

Level correction

Calculated from the difference between ambient and residual, subtracted from ambient to give the specific level

Acoustic feature corrections

Tonal (up to 6dB), impulse (up to 9dB), intermittent (3dB) and other, in the absence of Tonal and Impulsive (3dB)

Background LA90

15 minutes (night) or 60 minutes (day) chosen as the most representative from a suitable range

Rating over background

Corrected specific sound level plus acoustic correction features minus background

Context

Include any factors which could influence your conclusions such as local attitude to the site, the residual acoustic environment characteristics (other noises including transport noise), the terrain and how it could vary throughout the year.


State the effect of uncertainty on result

See Richard Collman's article in the Jan/Feb 2015 *Acoustics Bulletin*.

Additional information that will help validate your conclusion and could be invaluable if you have to justify your findings court:

- Photos of the noise source, the proposed site, the measurement location and nearest dwellings
- Map showing Industrial site with measurement locations
- Details of how acoustic correction features were calculated (Screen shots of software or exports of data could be useful)
- Justification of chosen LA90 period and distribution graph if appropriate
- Annotated time history, audio recordings and weather data
- Calibration certificates
- Details of your experience and qualifications to demonstrate competence.

To conclude

Every BS 4142 assessment will be different and not all of the above will be appropriate or practical but hopefully this will act as a useful guide to ensure your results as robust as possible. BS 4142:2014 checklists are becoming available which could prove to be very useful, Derek Nash of Acoustic Central has produced one for the ANC and some IOA regional branches are developing them with their local authorities. If all parties involved are able to agree on a methodology before an assessment takes place then this should lead to greater consistency in conclusions. 

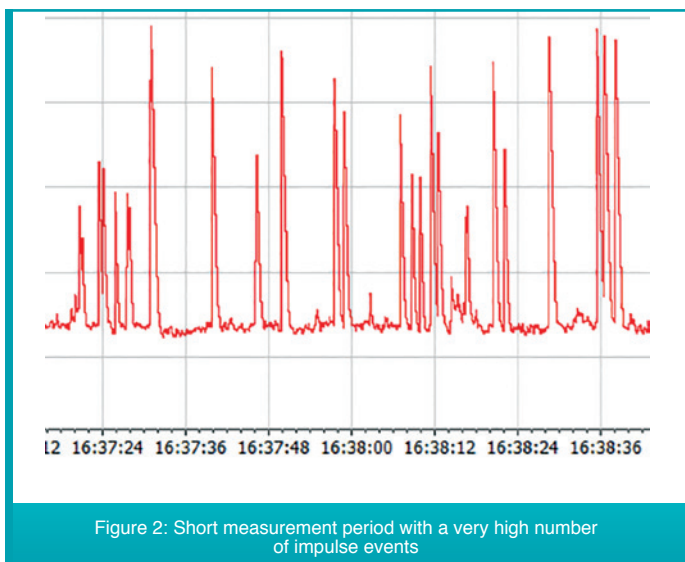


Figure 2: Short measurement period with a very high number of impulse events