BS 4142:2014 – measurement planning and practice

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This article is based on a presentation at the Measurement & Instrumentation Group's BS4142 workshop on 19 May. It is a guide to planning and making a measurement for BS 4142:2014 with suggestions on how to report and support your assessment. This article is split into two parts, the second of which will appear in the next issue.

Planning your measurement

An individual's response to sound is subjective and the level of impact depends a number of factors including:

Absolute level, exceedance over background level, time of day, character of sound, local attitude to the premises and nature of the neighbourhood.

BS 4142:1997 was mainly concerned with the exceedance over background sound and the character of the sound. BS 4142:2014 will use similar data for the calculation but requires the consideration of context at all stages of the assessment and therefore all of the above factors must be noted.

In order to perform the rating calculation two sets of Ambient Sound Level data are required. One when the specific sound is present; this could be measured or modelled. The other is when the specific sound is absent; this will give the residual and background levels.

This data should be acquired at least in the reference periods of 15 minutes at night (11pm to 7am) and one hour during the day. You may need several of these measurement periods in order to show that your chosen period is the most relevant for your assessment. More variability in sound level and weather conditions will cause greater uncertainty and require longer measurement periods. A steady level will have less uncertainty and therefore a shorter measurement period may be sufficient.

Before making any measurements consider what you need to measure and why. In order to measure the ambient noise with the specific sound present you should understand how much variation there is from the sound source. It may be possible to discuss the process schedule with the plant operator to determine how much variation there will be. If you cannot determine the level of variation in the source you will need to measure for a longer period to demonstrate that the reference period used for the assessment is the most appropriate. On occasions it might be necessary to measure for a whole week or at different times throughout the year.

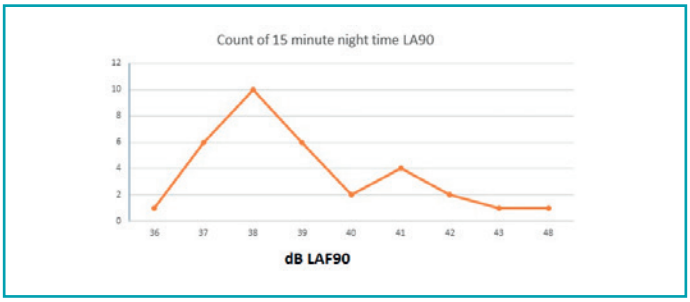
When measuring the residual sound level you should pick a period that is as similar as possible to when the site is operating. This could, for example, be lunch time, just before the morning shift or after the site has closed for the day. This residual period (Lr) will allow you to

correct your ambient level with the site sound present (La) to give you the Specific Sound level LAeq (Ls). Use the following formula:

Ls = 10lg[(10^La/10) – (10^Lr/10)]

This removes the contribution of the residual from the ambient to leave a specific level that can be used for the rest of your calculations.

Background LA90 levels could be acquired at the same time as the residual but in some cases this will not be the most suitable period. You should consider when the complaint is occurring or when proposed change would have most impact. On occasions you will need to measure LA90 periods throughout the day and/or night. With this data it is possible to show the distribution of different LA90 levels and decide which level to use.



The graph above shows that an LA90 of 38dB would be the most reasonable level to use. It is also advisable to note what contributes to the background sound. Transport, foliage, water and dawn chorus can all cause significant variation in the residual acoustic environment.

In some situations it may not be possible to measure in the absence of the specific sound. In this case a proxy measurement location should be found. You should explain why the proxy location is suitable, taking note of the distance from any main roads or significant sound sources.

Measurements should ideally be taken in the nearest residential garden, outside dwellings or on the site of the proposed dwellings. Note the distance to site from the measurement location and take photos. Measure long enough to show that your chosen calculation period is the most suitable; this could be a few hours on one day or multiple periods on several different days. Have an understanding of the typical local weather and try to perform measurements in representative conditions. Avoid periods with heavy rainfall and wind speeds above 5m/s unless you can justify that this is typical weather for the location.

What data do we need?

The essential parameters are LAeq and LA90. The obvious logging period is 15 minutes for night time and one hour during the day but if you can also log LAeq and statistics every second. This could allow exclusion of erroneous data and recalculation to reference periods, depending on your post processing software.

You will be measuring outside so use a wind-shield and turn on the correction in the meter if available.

In addition to this the following will be of use:

- Log fast LAF data for impulsivity - 10, 25, 50, 100 or 125ms - use fastest available (10 & 25ms can be used for the objective method. 50, 100 and 125ms will support your subjective assessment)
- LZeq 1/3 octaves for objective tonal assessment
- Record wind speed and direction, temperature, humidity, rainfall & pressure – synchronise with noise data if possible
- Use audio recording – uncompressed recordings such as wave files could be used for post analysis of tonal characteristics to the reference method. Audio files can also be used to back up your subjective opinion about the character of the noise
- Check you have sufficient space on your meter's memory, one hour of wave file recording (up to 20KHz) with one second logging of the above parameters will be about 340MB.

The second part of this article will look at performing a measurement, what to report and the use of checklists.