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BACKGROUND NOISE CORRECTION FOR MEASUREMENTS OF SPECIFIC NOISE LEVEL $L_{Aeq,Tr}$ OF BS4142:1990

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1. INTRODUCTION

Specific noise level $L_{Aeq,Tr}$ is defined in Clause 2.3 of BS4142:1990 [1] as the "*equivalent continuous A-weighted sound pressure level in decibels at the measurement position produced by the specific noise source over a given reference time interval*". The phrase "*produced by*" is important, and implies that the specific noise level $L_{Aeq,Tr}$ is that **solely attributable** to the specific noise source. This means that contributions to specific noise level $L_{Aeq,Tr}$ of noise from sources other than the specific noise source must be negligible.

Specific noise level $L_{Aeq,Tr}$ can be determined (Clause 5.1.1) from one or more specific noise measurement(s) $L_{Aeq,T}$. Each specific noise measurement $L_{Aeq,T}$ is measured over time interval T with the specific noise source on. Since contributions to specific noise level $L_{Aeq,Tr}$ of noise from sources other than the specific noise source must be negligible, it follows that each specific noise measurement $L_{Aeq,T}$ must be corrected for any significant contributions from residual noise. This is a form of background noise correction, and is provided for in the standard by Clause 5.4.4. The method of Clause 5.4.4 appears to be based on decibel subtraction of the background noise level $L_{A90,T}$ of the residual noise from the specific noise measurement $L_{Aeq,T}$.

In this paper[1], the results of a theoretical analysis and a practical investigation are used to critically analyse the background noise correction procedures of Clause 5.4.4. The paper may answer some of the questions previously reported [2], [3] and [4] regarding BS4142:1990.

Terminology and symbols

The terms "background noise" (as in general use) and "residual noise" (as in BS4142:1990) are both used in this paper. It appears that the terms have similar meanings.

The following symbols are used, where appropriate, to indicate source(s) of noise:

$L_{Aeq,T(s)} = L_{Aeq,T}$ due to source noise
$L_{Aeq,T(b)} = L_{Aeq,T}$ due to background/residual noise
$L_{Aeq,T(s+b)} = L_{Aeq,T}$ due to combined source and background/residual noise
$L_{A90,T(b)} = L_{A90,T}$ due to background/residual noise

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[1] This paper is based, in part, on an IOA Diploma project: 'Background noise correction for source noise $L_{Aeq,T}$: implications for determining specific noise level $L_{Aeq,Tr}$ using BS4142:1990', M F Rickaby, N.E.S.C.O.T., 1993.

2. THEORETICAL ANALYSIS

For determining the total $L_{Aeq,T(s+b)}$ from a source and a background, the source and the background can be considered as separate noise sources. Since $L_{Aeq,T}$ values over the same time interval T can be added using decibel addition, it follows that:

$$L_{Aeq,T(s+b)} = 10*\log_{10}[10^{0.1LAeq,T(s)} + 10^{0.1LAeq,T(b)}] \quad . \quad . \quad . \quad (1)$$

where time intervals T are concurrent and of equal duration.

Equation 1 can be rearranged to give the following background noise correction equation which uses decibel subtraction of $L_{Aeq,T(b)}$ of the background noise:

$$L_{Aeq,T(s)} = 10*\log_{10}[10^{0.1LAeq,T(s+b)} - 10^{0.1LAeq,T(b)}] \quad . \quad . \quad . \quad (2)$$

where time intervals T are again concurrent and of equal duration.

In practice, $L_{Aeq,T(b)}$ cannot normally be measured concurrently with $L_{Aeq,T(s+b)}$, and has to be measured before or after measurement of $L_{Aeq,T(s+b)}$. This may introduce random errors if $L_{Aeq,T(b)}$ is time variable.

Equation 2 can be compared with the following background noise correction equation which uses decibel subtraction of $L_{A90,T(b)}$ of the background noise:

$$L_{Aeq,T(s)} = 10*\log_{10}[10^{0.1LAeq,T(s+b)} - 10^{0.1LA90,T(b)}] \quad . \quad . \quad . \quad (3)$$

For time-varying background noise, $L_{Aeq,T(b)}$ is not normally equal to $L_{A90,T(b)}$. Comparison of Equations 2 and 3 therefore shows that Equation 3 is incorrect for **time-varying** background noise. Equation 3 would only be correct in the special circumstances of $L_{Aeq,T(b)}$ equal to $L_{A90,T(b)}$, which would occur with **time-constant** background noise not thought relevant in the present context.

3. PRACTICAL INVESTIGATION

3.1 Method

A sound source providing constant-level wide band noise was set up outdoors, on grass-covered ground, at a distance of 23 m from a lightly trafficked road. Noise measurements were taken at positions 8, 16, 32 and 64 m from the source, and lying on an imaginary straight line parallel to the road. At each noise measurement position, $L_{Aeq,5mins,(s+b)}$ was measured with the sound source on, and $L_{A90,5mins,(b)}$ and $L_{Aeq,5mins,(b)}$ were measured with the sound source off. Noise measurements were taken with the sound source at a first output setting I, and a second output setting II 10 dB lower than setting I.

All noise measurements were taken with time weighting "F", and included all prevailing ambient noise, the main component of which was noise from passing road vehicles. The intervening ground between source and measurement positions was grass covered. The site was open, and free of reflecting surfaces. The noise measurements were taken with an integrating-averaging sound level meter complying with Type 1 of BS 6698, and positioned at a height of 1.2 m above the ground. The sound source and sound level meter were calibrated before and after the series of noise measurements. The weather was mild and dry, with a wind speed of not more than 2 m/s.

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3.2 Calculations

For each noise measurement position, the following calculations were made:

(i) $L_{Aeq,T(s)}$ was calculated by decibel subtraction of $L_{A90,T(b)}$ from $L_{Aeq,T(s+b)}$.

(ii) $L_{Aeq,T(s)}$ was calculated by decibel subtraction of $L_{Aeq,T(b)}$ from $L_{Aeq,T(s+b)}$.

(iii) The "true" $L_{Aeq,T(s)}$ of the sound source was calculated using the inverse square law from the noise level $L_{Aeq,T(s)}$ measured at the 8 m position with sound source setting I (at which sound source noise level $L_{Aeq,T(s)}$ was more than 10 dB above $L_{Aeq,T(b)}$). The value of $L_{Aeq,T(s)}$ calculated is, of course, only "true" within the accuracy of inverse square law prediction, which is thought adequate for present purposes.

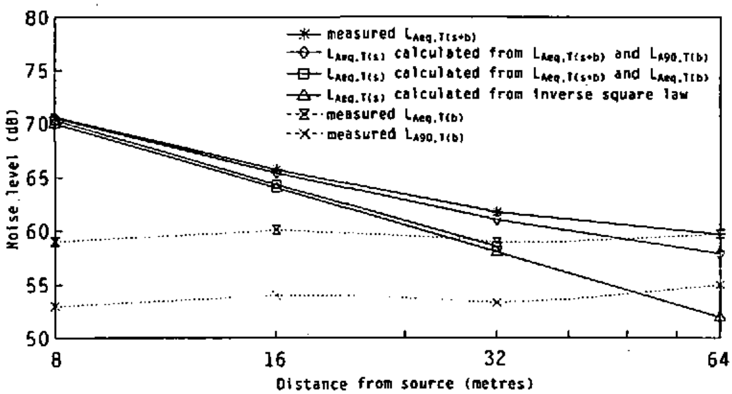

Figure 1
Noise level v distance: sound source setting I

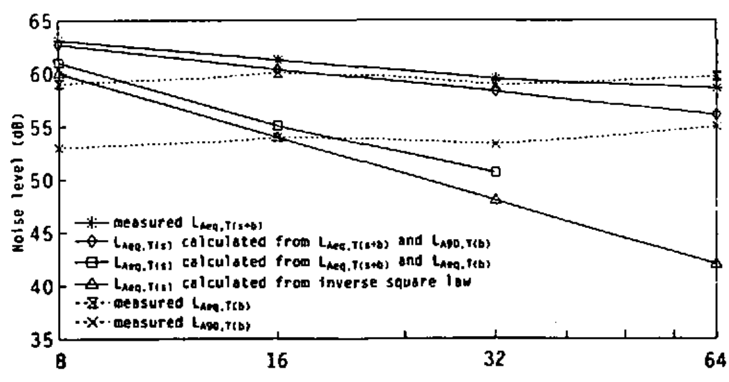

Figure 2
Noise level v distance: sound source setting II

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3.3 Results
The measured values of $L_{Aeq,T(s+b)}$, $L_{A90,T(b)}$ and $L_{Aeq,T(b)}$, and the measured/calculated values of $L_{Aeq,T(s)}$ are given in Figure 1 (sound source setting I) and Figure 2 (sound source setting II). Figures 1 and 2 both show that measured source $L_{Aeq,T(s)}$ is nearer the true source $L_{Aeq,T(s)}$ with measured $L_{Aeq,T(s+b)}$ corrected for background noise using decibel subtraction of $L_{Aeq,T(b)}$, rather than using decibel subtraction of $L_{A90,T(b)}$. This is consistent with Equation 2 being correct, and Equation 3 being incorrect. The results of the practical investigation are therefore in agreement with the theoretical analysis. It can be seen from Figures 1 and 2 that decibel subtraction of $L_{A90,T(b)}$ using Equation 3 consistently overestimated source $L_{Aeq,T(s)}$. The overestimation became increasingly large as source $L_{Aeq,T(s)}$ reduced with distance from source.

4. CRITICAL ANALYSIS OF CLAUSE 5.4.4

4.1 Choice of procedures contained in Clause 5.4.4
Table A below is thought to summarise the criteria contained in Clause 5.4.4 for determining choice of procedures.

Table A

Criterion	Procedure
$L_{Aeq,T} - L_{A90,T} \geq 10$	use Clause 5.4.4 lines 1 to 4 (background noise correction not required)
$3 \leq L_{Aeq,T} - L_{A90,T} < 10$ (residual noise steady)	use Clause 5.4.4(a) (background noise correction required)
$3 \leq L_{Aeq,T} - L_{A90,T} < 10$ (residual noise fluctuates)	use Clause 5.4.4(b) (background noise correction required)
$L_{Aeq,T} - L_{A90,T} < 3$	use Clause 5.4.4(c) (measure closer to specific noise source)

All four criteria above involve a comparison of $L_{Aeq,T}$ with specific noise source on (i.e. $L_{Aeq,T(s+b)}$) and $L_{A90,T}$ with specific noise source off (i.e. $L_{A90,T(b)}$). This corresponds to use of incorrect background noise correction Equation 3. The criteria may therefore be invalid.

The criterion for choosing between Clause 5.4.4(a) and Clause 5.4.4(b) requires a determination of whether the residual noise is steady or fluctuates. Clause 2.10 is understood as implying that residual noise is deemed steady if residual noise sound pressure level L_{pA} fluctuates over a range of not more than 5 dB on time weighting "S", and is deemed fluctuating if residual noise sound pressure level L_{pA} fluctuates over a range of more than 5 dB on time weighting "S". Residual noise may therefore need to be measured twice, once with time weighting "S" (Clause 2.10) to determine if the residual noise is steady or fluctuates, and once with time weighting "F" (Clause 3.2) to determine background noise level $L_{A90,T}$.

The criterion for use of Clause 5.4.4(c) in effect means that $L_{Aeq,T(b)}$ minus $L_{A90,T(b)}$ must be less than 3 dB. This may limit the use of Clause 5.4.4(c). Clause 5.4.4(c) does not provide a background noise correction procedure, and is not considered further in this paper.

4.2 Table 1 of Clause 5.4.4

4.2.1 Derivation of Table 1 corrections. Table 1 gives corrections for use in the background noise correction procedures of Clause 5.4.4(a) and Clause 5.4.4(b). $L_{Aeq,T(s)}$ is obtained by subtracting the correction from measured $L_{Aeq,T(s+b)}$.

Thus, $L_{Aeq,T(s)} = L_{Aeq,T(s+b)}$ - background noise correction

Therefore, background noise correction = $L_{Aeq,T(s+b)} - L_{Aeq,T(s)}$

Equation 3 can be rearranged to give the required background noise correction:

$$L_{Aeq,T(s+b)} - L_{Aeq,T(s)} = -10*\log_{10}[1 - 10^{-0.1(LAeq,T(s+b) - LA90,T(b))}] \quad (4)$$

Equation 4 can be used to calculate the corrections of Table 1, as in Example 1.

Example 1

$L_{Aeq,T(s+b)} - L_{A90,T(b)}$ = 4 dB (as given in left column of Table 1)

Background noise correction = $-10*\log_{10}[1 - 10^{-0.4}]$ = 2.2 dB

= 2 dB to nearest dB (as given in right column of Table 1)

It would therefore appear that the corrections of Table 1 correspond to use of incorrect Equation 3, and may therefore be in error. It is observed that in Table 1, the time intervals T for $L_{Aeq,T}$ and $L_{A90,T}$ are not necessarily of the same duration.

4.2.2 Use of Table 1. The errors in measured $L_{Aeq,T(s)}$ caused by use of the Table 1 corrections can be predicted, as shown in Example 2.

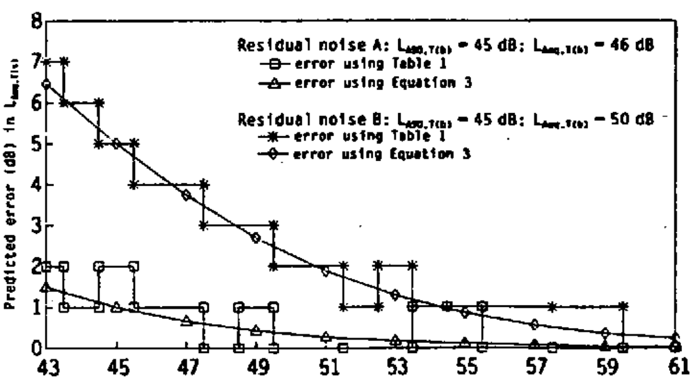

Figure 3
Predicted error in $L_{Aeq,T(s)}$ v true $L_{Aeq,T(s)}$

Example 2

Consider a source having a true $L_{Aeq,T(s)}$ of 47 dB measured in residual noise A having $L_{A90,T(b)}$ of 45 dB and $L_{Aeq,T(b)}$ of 46 dB.

From Equation 1, measured $L_{Aeq,T(s+b)} = 10*\log_{10}[10^{4.7} + 10^{4.6}]$ = 50 dB (to nearest dB)

Noise level reading $L_{Aeq,T(s+b)}$ - background $L_{A90,T(b)}$ = 50 - 45 = 5 dB

Thus, Table 1 correction = 2 dB; corrected $L_{Aeq,T(s)}$ = 50 - 2 = 48 dB
Therefore, predicted error in measured $L_{Aeq,T(s)}$ = 48 - 47 = +1 dB
The errors in measured $L_{Aeq,T(s)}$ caused by use of the Table 1 corrections have been predicted, as shown in Example 2, for illustrative source and residual noise levels. These illustrative noise levels are a true source $L_{Aeq,T(s)}$ from 43 dB to 61 dB measured in residual noise A having $L_{A90,T(b)}$ of 45 dB and $L_{Aeq,T(b)}$ of 46 dB, and in residual noise B having $L_{A90,T(b)}$ of 45 dB and $L_{Aeq,T(b)}$ of 50 dB. The predicted errors caused by use of Table 1 corrections with residual noise A and residual noise B are given in Figure 3.

Figure 3 appears to show that predicted errors in measured $L_{Aeq,T(s)}$ caused by use of the corrections of Table 1 generally increase (i) as the difference between $L_{Aeq,T(b)}$ and $L_{A90,T(b)}$ increases, and (ii) as true source $L_{Aeq,T(s)}$ reduces for given values of $L_{Aeq,T(b)}$ and $L_{A90,T(b)}$.

Note. Figure 3 shows that errors using Table 1 corrections follow a step-character function. This step character is caused by rounding of all noise levels to the nearest whole number of decibels. Thus, the corrections in Table 1 are given as integers, although they correspond to use of Equation 3. The predicted errors in measured $L_{Aeq,T(s)}$ caused by use of Equation 3 can be calculated directly, as shown in Example 3. These predicted errors caused by use of Equation 3 for the above illustrative noise levels are also given in Figure 3.

Example 3
Source and residual noise levels as Example 2.
From Equation 1, measured $L_{Aeq,T(s+b)} = 10*\log_{10}[10^{4.7} + 10^{4.6}] = 49.54$ dB
From Equation 3, measured $L_{Aeq,T(s)} = 10*\log_{10}[10^{4.954} - 10^{4.5}] = 47.66$ dB
Thus, predicted error in measured $L_{Aeq,T(s)}$ = 47.66 - 47 = +0.66 dB

Note. The errors identified in Section 4.2.2 are **theoretical** errors which appear to be inherent in the Table 1 corrections. The errors which could arise **in practical use** of Clause 5.4.4 are considered in Sections 4.3 to 4.6 below.

4.3 Use of Clause 5.4.4 lines 1 to 4
Lines 1 to 4 of Clause 5.4.4 indicate that background noise correction is not required if measured $L_{Aeq,T}$ with specific noise source on (i.e. $L_{Aeq,T(s+b)}$) is 10 dB or more above measured $L_{A90,T}$ with specific noise source off (i.e. $L_{A90,T(b)}$). The value of 10 dB is presumably related to the decibel subtraction contained in Equation 3. Thus, Equation 4, derived from Equation 3, gives the background noise correction as less than 0.5 dB for $L_{Aeq,T(s+b)}$ minus $L_{A90,T(b)}$ equal to 10 dB. The procedure of lines 1 to 4 of Clause 5.4.4 therefore seems to correspond to use of incorrect Equation 3, and may consequently fail to correctly determine whether or not a background noise correction is required.

Example 4
Suppose the true $L_{Aeq,T}$ produced by a specific noise source at an assessment position is 47 dB, and that the residual noise has $L_{A90,T}$ of 40 dB and $L_{Aeq,T}$ of 47 dB.
Measured noise levels would be:
$L_{Aeq,T}$ (specific noise source on) = $L_{Aeq,T(s+b)} = 10*\log_{10}[10^{4.7}+10^{4.7}]$ = 50 dB (Equation 1)
$L_{A90,T}$ (specific noise source off) = 40 dB
Since $L_{Aeq,T}$ (specific noise source on) of 50 dB exceeds $L_{A90,T}$ (specific noise source off) of 40 dB by 10 dB, lines 1 to 4 of Clause 5.4.4 indicate that background noise correction is not required. This gives measured specific noise $L_{Aeq,T}$ of 50 dB compared with true specific noise $L_{Aeq,T}$ of 47 dB, i.e. an error of +3 dB.

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Note. A question has been reported [2] and [4] asking how one can deal with a situation where $L_{Aeq,T}$ exceeds $L_{A90,T}$ by more than 10 dB even when the source noise is not operating. The question states that in such a situation, the standard would appear to predict a likelihood of complaints for a totally silent machine. This situation can be explained by considering the errors caused by the Table 1 corrections with a residual noise having $L_{Aeq,T(b)}$ minus $L_{A90,T(b)}$ greater than 10 dB. The hypothetical error, predicted as in Example 2 above, is equal to $L_{Aeq,T(b)}$ for $L_{Aeq,T(s)}$ equal to zero dB.

4.4 Use of Clause 5.4.4(a)

A number of visits to residential areas have been made in an attempt to find steady residual noise[2]. One of the visits was at night (01:15 hrs. to 01:45 hrs.) to a residential area thought to be particularly quiet. Over 5-mins. periods, the residual noise sound pressure level L_{pA} has, on each occasion, fluctuated over a range of more than 5 dB on time weighting "S" (Clause 2.10). It may be that steady residual noise will be encountered only rarely using the standard, since the standard relates to outdoor noise levels in mixed residential and industrial/commercial areas. The likelihood of steady residual noise being encountered during use of the standard could be determined, if necessary, by undertaking an ambient/residual noise survey covering different types of mixed residential and industrial/commercial areas.

A digital audio tape recording of ambient/residual noise was made in the middle of a public park (i.e. not near a dwelling). The tape was analysed on time weighting "S" (Clause 2.10), and a number of individual non-consecutive 1-minute periods of steady residual noise were identified. These 1-minute portions of the tape were analysed using time weighting "F" (Clause 3.2), and gave values of $L_{Aeq,1min,(b)}$ minus $L_{A90,1min,(b)}$ varying between 1 and 2 dB. Residual noise A referred to in Figure 3 has $L_{Aeq,T(b)}$ minus $L_{A90,T(b)}$ equal to 1 dB, and could therefore represent steady residual noise. It can be seen from Figure 3 that errors in specific noise measurement $L_{Aeq,T(s)}$ caused by use of the Table 1 corrections of +2 dB could arise with such steady residual noise. The errors would be correspondingly larger if the steady residual noise had $L_{Aeq,T(b)}$ minus $L_{A90,T(b)}$ equal to 2 dB.

4.5 Use of Clause 5.4.4(b)

4.5.1 General. The procedure of Clause 5.4.4(b) seems to involve taking a series of individual noise level readings during intervals when the residual noise level has subsided to "low" values, apparently either as short-term $L_{Aeq,T}$ noise levels (see reference to Clause 5.1.2), or as sound pressure levels L_{pA} if the specific noise sound pressure level L_{pA} is steady (see reference to Clause 5.1.3). Each measured $L_{Aeq,T}$ or L_{pA} noise level is then corrected, if necessary, for background noise. The corrected $L_{Aeq,T}$ or L_{pA} noise levels are subsequently used to calculate specific noise level using Equation 2 of Clause 5.1.2

[2]BS4142:1990 makes no reference to pausing out discrete noise events when taking period noise measurements. During the above visits, additional period noise measurements were made attempting to use the sound level meter pause button to pause out discrete noise events. It was observed that random noise events having a relatively low onset rate (e.g. a passing road vehicle, an overflying aircraft) can be paused out reasonably easily, whereas random noise events having a relatively high onset rate (e.g. a dog's bark, a car horn, a door slam) are less easy to pause out because they occur suddenly and cannot be anticipated. It may be possible to correct a period noise measurement $L_{Aeq,T}$ for noise contribution from a noise event occurring during the measurement period if the sound exposure level (SEL) of the noise event is known.

(for $L_{Aeq,T}$ noise levels) or Equation 3 of Clause 5.1.3 (for L_{pA} noise levels). The procedure of Clause 5.4.4(b) seems complex, and could be impracticable.

4.5.2 Use of short-term $L_{Aeq,T}$ noise levels. Figure 3 indicates the error in specific noise measurement $L_{Aeq,T}$ caused by use of the Table 1 corrections when measurements are made in residual noise B having $L_{A90,T}$ of 45 dB and $L_{Aeq,T}$ of 50 dB, which could be an example of fluctuating residual noise. By measuring short-term $L_{Aeq,T}$ noise levels during intervals when the residual noise sound pressure level L_{pA} fluctuates less, the error in each individual short-term $L_{Aeq,T}$ noise level can be reduced, for example towards the errors indicated in Figure 3 for use of the Table 1 corrections with residual noise A.

The fluctuations in residual noise sound pressure level L_{pA} occurring during the measurement intervals are unlikely to be less than those occurring with steady residual noise. The error in any individual corrected short-term $L_{Aeq,T}$ noise level will apparently therefore be at least as large as the error with steady residual noise identified in Section 4.4 above. The user may have difficulty identifying suitable measurement intervals, and this could lead to further errors. The overall error after combining the corrected individual $L_{Aeq,T}$ noise levels using Equation 2 of Clause 5.1.2 is likely to be considerably larger than the error with steady residual noise identified above.

The standard gives no indication of the time interval T of the short-term $L_{Aeq,T}$ noise levels. However, the time interval T presumably should be attainable with the measuring equipment specified in Clause 3. In this respect, it is noted that a common type of integrating-averaging sound level meter (Clause 3.1.(a)) complying with Type 1 of BS 6698, has a minimum time interval T of 1 min. for measurement of $L_{Aeq,T}$, and 5 mins. for measurement of $L_{A90,T}$.

4.5.3 Use of L_{pA} noise levels. Specific noise source sound pressure level L_{pA} which is deemed to be steady in the terms of Clause 2.10, may nevertheless fluctuate over a range of up to 5 dB measured on time weighting "S". The user may therefore have to contend with both fluctuations of the specific noise source sound pressure level L_{pA} and fluctuations of the residual noise sound pressure level L_{pA}, and this may make measurement of the individual L_{pA} noise levels problematical.

Table 1 of Clause 5.4.4 uses $L_{Aeq,T}$ and $L_{A90,T}$ noise levels, and it is therefore unclear how that table can be used to make the required corrections to the measured individual L_{pA} noise levels. Also, it does not seem clear how the time intervals T_i required for use of Equation 3 of Clause 5.1.3 are to be determined.

4.6 Misinterpretation of Clause 5.4.4

4.6.1 Choice between Clause 5.4.4(a) and Clause 5.4.4(b). As previously explained, it seems necessary to make a separate measurement of residual noise on time weighting "S" to choose between Clause 5.4.4(a) and Clause 5.4.4(b). This is inconvenient. Also, the procedure of Clause 5.4.4(b) seems complex. In consequence, some users may misinterpret Clause 5.4.4, and may make a single measurement of noise level $L_{Aeq,T}$ with the specific noise source on, and a single measurement of noise level $L_{A90,T}$ with the specific noise source off, and then make a correction according to Table 1. This approach may constitute use of the simplified procedure of Clause 5.4.4(a) for measurements in the presence of **fluctuating** residual noise, although that simplified procedure is intended for measurements in the presence of **steady** residual noise. The resulting errors in specific noise measurement $L_{Aeq,T}$ could be large (see, for example, the errors indicated in Figure 3 using the Table 1 corrections with residual noise B).

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4.6.2 Simultaneous measurement of $L_{Aeq,T}$ and $L_{A90,T}$. It appears that some users may be using a measurement method whereby noise levels $L_{Aeq,T}$ and $L_{A90,T}$ are measured **simultaneously** over the same time interval T with the specific noise source on. The measured noise level $L_{A90,T}$ is then used as the background noise level $L_{A90,T}$. This measurement method is clearly not in accordance with Clauses 2.7, 2.8 and 6.3.2, and also would not seem to enable a valid background noise correction to be made.

5. DISCUSSION

The method of Clause 5.4.4 is based on decibel subtraction of the background noise level $L_{A90,T}$ of the residual noise from the specific noise measurement $L_{Aeq,T}$. Theoretical Equation 2 requires decibel subtraction of **$L_{Aeq,T}$ of the residual noise** (i.e. $L_{Aeq,T(b)}$), rather than $L_{A90,T}$ of the residual noise (i.e. $L_{A90,T(b)}$). For time-varying residual noise, $L_{Aeq,T}$ is normally higher than $L_{A90,T}$. It would therefore seem that any errors caused by decibel subtraction of $L_{A90,T}$ of the residual noise will normally be positive. The method of Clause 5.4.4 therefore appears to contain an inherent systematic error which could lead to overestimation of the specific noise level $L_{Aeq,Tr}$ and, consequently, the assessment level.

The background noise correction procedures referred to in this paper generally relate to A-weighted noise levels. Many industrial/environmental noise problems can be adequately assessed using A-weighted noise levels. However, A-weighted noise levels may not be suitable for measuring and assessing certain types of noise [5] and [6]. In order to identify the noise components of a specific noise source for noise assessment and control, it may accordingly be necessary to carry out detailed spectral analysis.

An amended version of BS 4142 is currently being prepared. It is hoped that this paper may be of use in making any necessary amendments.

6. CONCLUSIONS

1. Clause 5.4.4 of BS4142:1990 gives a method for carrying out a background noise correction which is based on decibel subtraction of the background noise level $L_{A90,T}$ of the residual noise from the specific noise measurement $L_{Aeq,T}$. This method could lead to errors which may overestimate the specific noise level $L_{Aeq,Tr}$.

2. A theoretical equation (using the symbols of this paper) for background noise correction is:

$$L_{Aeq,T(s)} = 10 * \log_{10}[10^{0.1 L_{Aeq,T(s+b)}} - 10^{0.1 L_{Aeq,T(b)}}]$$

where time intervals T are concurrent and of equal duration.

7. ACKNOWLEDGEMENTS

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