A36.4.1.3 The calculation procedure that uses physical measurements of noise to derive the EPNL evaluation measure of subjective response consists of the following five steps:

(a) The 24 one-third octave bands of sound pressure level are converted to perceived noisiness (noy) using the method described in section A36.4.2.1 (a). The noy values are combined and then converted to instantaneous perceived noise levels, PNL(k).

(b) A tone correction factor C(k) is calculated for each spectrum to account for the subjective response to the presence of spectral irregularities.

(c) The tone correction factor is added to the perceived noise level to obtain tone-corrected perceived noise levels PNLT(k), at each one-half second increment:

PNLT(k) = PNL(k) + C(k)

The instantaneous values of tone-corrected perceived noise level are derived and the maximum value, PNLTM, is determined.

(d) A duration correction factor, D, is computed by integration under the curve of tone-corrected perceived noise level versus time.

(e) Effective perceived noise level, EPNL, is determined by the algebraic sum of the maximum tone-corrected perceived noise level and the duration correction factor:

EPNL = PNLTM + D

A36.4.2 *Perceived noise level.*

A36.4.2.1 Instantaneous perceived noise levels, PNL(k), must be calculated from instantaneous one-third octave band sound pressure levels, SPL(i, k) as follows:

(a) Step 1: For each one-third octave band from 50 through 10,000 Hz, convert SPL(i, k) to perceived noisiness n(i, k), by using the mathematical formulation of the noy table given in section A36.4.7.

(b) Step 2: Combine the perceived noisiness values, n(i, k), determined in step 1 by using the following formula:

$$N\,(k) = n\,(k) + 0.15\left\{\left[\sum_{i=1}^{24} n\,(i,k)\right] - n\,(k)\right\}$$

$$= 0.85\,n\,(k) + 0.15\sum_{i=1}^{24} n\,(i,k)$$

where n(k) is the largest of the 24 values of n(i, k) and N(k) is the total perceived noisiness.

(c) Step 3: Convert the total perceived noisiness, N(k), determined in Step 2 into perceived noise level, PNL(k), using the following formula:

$$PNL\,(k) = 40.0 + \frac{10}{\log 2}\log N\,(k)$$

NOTE: PNL(k) is plotted in the current advisory circular for this part.

A36.4.3 *Correction for spectral irregularities.*

A36.4.3.1 Noise having pronounced spectral irregularities (for example, the maximum discrete frequency components or tones) must be adjusted by the correction factor C(k) calculated as follows:

(a) Step 1: After applying the corrections specified under section A36.3.9, start with the sound pressure level in the 80 Hz one-third octave band (band number 3), calculate the changes in sound pressure level (or "slopes") in the remainder of the one-third octave bands as follows:

$s(3,k)$ = no value
$s(4,k) = \mathrm{SPL}(4,k) - \mathrm{SPL}(3,k)$

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•

$s(i,k) = \mathrm{SPL}(i,k) - \mathrm{SPL}(i-1,k)$

•
•

$s(24,k) = \mathrm{SPL}(24,k) - \mathrm{SPL}(23,k)$

(b) Step 2: Encircle the value of the slope, s(i, k), where the absolute value of the change in slope is greater than five; that is where:

$|\Delta s(i,k)| = |s(i,k) - s(i-1,k)| > 5$

(c) Step 3:

(1) If the encircled value of the slope s(i, k) is positive and algebraically greater than the slope $s(i-1,$ k) encircle SPL(i, k).

(2) If the encircled value of the slope s(i, k) is zero or negative and the slope $s(i-1,$ k) is positive, encircle $\mathrm{SPL}(i-1,$ k).

(3) For all other cases, no sound pressure level value is to be encircled.

(d) Step 4: Compute new adjusted sound pressure levels SPL′(i, k) as follows:

(1) For non-encircled sound pressure levels, set the new sound pressure levels equal to the original sound pressure levels, SPL′(i, k) = SPL(i, k).

(2) For encircled sound pressure levels in bands 1 through 23 inclusive, set the new sound pressure level equal to the arithmetic average of the preceding and following sound pressure levels as shown below:

$\mathrm{SPL}'(i,k) = \tfrac{1}{2}[\mathrm{SPL}(i-1,k) + \mathrm{SPL}(i+1,k)]$

(3) If the sound pressure level in the highest frequency band (i = 24) is encircled, set the new sound pressure level in that band equal to:

$\mathrm{SPL}'(24,k) = \mathrm{SPL}(23,k) + s(23,k)$

(e) Step 5: Recompute new slope s′(i, k), including one for an imaginary 25th band, as follows:

$s'(3,k) = s'(4,k)$
$s'(4,k) = \mathrm{SPL}'(4,k) - \mathrm{SPL}'(3,k)$

•
•

$s'(i,k) = \mathrm{SPL}'(i,k) - \mathrm{SPL}'(i-1,k)$

•
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